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MESSAGE

I would like to begin with a hope and desire that all our healthcare providers are safe in this unexpected battle against COVID-19 pandemic which has gripped the world and has cost so much in life & resources.

First of all, I would like to congratulate the Chief and associated Editors, Advisory Board comprising of Professors from various distinguished institutions, other faculty members and contributors, patrons and our beloved stundets and researchers associated with the Journal of Oral and Dental Health. It gives me tremendous delight to see this journal bringing up yet another issue. I want to specially congretulate **Mithila Minority Dental College & Institution** for its brilliant effort and statesmanship for making the Journal of Oral and Dental Health the official publication of L.N. Mithila University, Darbhang.

It gives me immense pleasure to see the Journal in widespread circulation and benefitting numerous researchers and academicians in their quest for scientific temper and knowledge. This Journal and its issues are greatly benefitting Dental professionals and practitioners associated with the field of Dentistry and its allied post-graduate branches, thereby providing an overall enlightenment.

Today, Dentistry has evolved much since its inception and humble beginnings. The skeletal and aesthetic treatment & satisfaction of a patient often involves an inter-disciplinary approach. As such, the Journal of Oral Dental Health through its collection of brilliant researches from all across the country, Epidemiological studies and data presented in its various issues boost a lot of confidence in young surgeons and Dentists alike.

I would conclude by wishing lots of success to the Editorial and Advisory Board in its present and future endeavours.

Best wishes & regards,

Surendra Pratap Singh

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MESSAGE FROM THE MANAGING DIRECTOR

–It is the supreme art of the teacher to awaken joy in creative expression and knowledge.

Albert Einstein

I am extremely happy and proud that a new issue of our esteemed Journal is being published. Our editorial team is continuously working hard to upgrade the quality of the publications. I am sure that these articles will be of extreme help to upgrade the knowledge of dental education.

Our faculties and post graduate students are getting an opportunity to publish their work which I am very happy about. And I came to know that even authors from many other Dental Colleges are contributing their articles. This I believe will be an excellent platform for sharing scientific thoughts.

With more and more original articles pouring in, I am sure that Journal of Oral & Dental Health will be one of the premium Journals in the field of Dentistry.

Wishing success and best wishes to the Editorial team.

Imbesat Shaukat

Managing Director
Mithila Minority Dental College & Hospital,
Darbhanga, Bihar

MESSAGE FROM THE EDITOR IN CHIEF

Dear Readers,

Authors of various articles appriciated for chosen ― Journal of oral & dental health" for publication. How ever our priority of publication is always remains for innovative research, work.till date no concretework has been done on prevention of spread of viral infection from patient to dental surgeon vice versa.

So scope is awaited for research & innovation. Hope authors take interest to gohead with research on this aspect brings shield of Protection.

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Dr. M.S. Raju,
Principal, Professor & Head , Oral Medicine & Radiology
Editor in Chief
Journal of Oral & Dental Health

Mithila Minority Dental College & Hospital

MESSAGE FROM THE ADVISORY BOARD

–Research is the creation of new knowledge
- Neil Armstrong
Greetings to one & all!

It gives me immense pleasure to welcome all avid readers to this inaugural edition of the Journal of Oral and Dental Health. This Journal is an official publication of the Mithila Minority Dental College & Hospital, Darbhanga (Bihar) affiliated to the State run Lalit Narayan Mithila University, Darbhanga, Bihar State (India) established and administered by the State Govt. of Bihar State and holds abundant potential to provide a platform for budding research professionals in Dental Sciences across the country and the South East Asian region.

In today_s era of constant need of advanced technologies in every discipline, it has become imperative for young professionals and academicians alike to keep themselves updated with the latest scientific innovations & break through. This is only possible through a constant review of scientific literature and adopting a temperament of scientific research.

Every scientific break through has been made possible only by inculcating a scientific temperament which promotes scientific curiosity & research in individuals. Research is a constant and dynamic pursuit of an idea and developing into an hypothesis, testing it through various methodologies which finally culminates into publishing it through various platforms.

A publication signifies the efforts of various individuals associated with an idea and the results and thus a scientific journal is a worthy platform which helps in showcasing these efforts. This journal, a culmination of efforts from stalwarts of various disciplines, will definitely prove to be wonderful opportunity for academicians as well budding professionals

My gratitude to the Founder Chairman of Mithila Minority Dental College & Hospital and the leadership of this journal, the Chief Patron – Acharya Shaukat Khail for his invaluable guidance. I thank the Patron of the Journal as well as Managing Director of MMDCH Mr. Imbesat Shaukat for getting me on board with this wonderful initiative. I thank the Editor in Chief, Dr. Rohit Miglani and the rest of the Editorial Board for their support.

I also take this opportunity to invite faculties in various dental institutes, clinicians, students, etc. to contribute to this journal by sending in their scientific studies and help enhance the scientific content of our discipline of dentistry.
Lastly I congratulate the authors of the articles of this inaugural edition for successful publication of research.

Thank You
Regards

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ORIGINAL ARTICLE

Journal of Oral and Dental Health
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REVIEW ARTICLES

CASE REPORTS

Association Between Abo Blood Groups and Oral Diseases Among 20-60 Year Old Population

Abstract

INTRODUCTION: With the development in researches throughout the years, it has been understood that, certain unknown factors like genetic inheritance play a role in the progress of oral diseases regardless from the common etiological agents and environmental factors. Blood groups are transferred through gene, there is a chances of hereditary relationship between oral diseases and blood groups.

OBJECTIVE: To determine the association between ABO blood group and oral health status among 20-60 year old population.

METHODOLOGY: A total of 400 participants (100 from each blood group) of 20-60 years age group visiting outpatient department of Mithila Minority Dental College and Hospital and holding a certified copy indicating their blood group were randomly selected for the study. Intraoral examination was carried out to assess DMFT index and OHI-S index.

RESULTS: In the present study, highest number of patients with poor oral hygiene status belonged to B blood group whereas the least number of patients with poor oral hygiene status belonged to AB blood group. The study participants with B blood group had the highest (5.51) mean DMFT score and AB had the lowest (1.46). The comparison of study participants based on blood group and DMFT score was found to be statistically significant (p=.001).

CONCLUSION: Study concluded that DMFT and oral hygiene scores vary in different blood groups and suggest a positive association between blood groups and oral diseases.

Keywords: blood group, oral diseases

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INTRODUCTION

Dental caries and gingival diseases are common oral diseases in human, with a multifactorial etiology affecting a large population worldwide. Dental plaque, dietary habits, oral hygiene are considered to be the major contributing factors, so mostly studies carried out have emphasised on these factors. One major factor which is inherited from birth is genetic factor like blood groups. Every individual has their own blood group similar with caries index[1]. The most important blood-typing system, the ABO blood group, is the determinant for transfusion reactions and organ transplantation and much more like digestive and immunological characteristics of the body[2].

An Austrian Karl Landsteiner discovered the ABO blood group system in 1901. There are mainly four major blood groups known as ABO blood group, divided into groups- A, B, AB and O according to the presence of the antigens and agglutinins. No true antigen are present in blood group O, but they carry antibodies of both A and B antigens. A and B antigens are carried out by type A and B erythrocytes and make antibodies to the others.

Type AB erythrocytes do not manufacture antibodies to other blood types because they have both A and B antigens[2]. The antigens of the ABO system are an integral part of the red cell membrane, which is also found in plasma and other body fluids. The presence or absence of certain antigens has been associated with various diseases and anomalies, simultaneously antigens also acts as receptors for infectious agents. Rhesus (Rh) system is the other blood system which is considered significant and is determined by the nature of different proteins present on the surface of erythrocytes [3].

Limited efforts have been made to investigate the relationship between ABO blood group and oral diseases. The majority of the researchers have claimed that different ABO blood groups constitute an increased risk for the development of periodontal and other oral diseases[4]. Knowledge of the ABO blood groups of patients and their association, if any, with the severity of oral disease may be important in the development of early treatment strategies[5].

The aim of this study was to investigate the association, if any, between ABO blood group and oral health status among 20-60 year old patients visiting the outpatient department of Mithila Minority Dental College and Hospital in Bihar.

MATERIALS AND METHODS

The present cross sectional study was conducted among 20-60 year old patients visiting outpatient department of Mithila Minority Dental College and Hospital in Bihar. Before the start of the study, an ethical clearance was obtained from the Institutional Review Board of Mithila Minority Dental College and Hospital and an official permission was obtained from the college authority. After explaining the study protocol, written informed consent was obtained from the study participants.

Inclusion criteria:

- Patients in the age group of 20-60 years visiting Mithila Minority Dental College and Hospital.
- Patients holding a certified copy indicating blood group obtained from a registered pathological laboratory were selected for the study.
- Patients willing to participate in the study.

Exclusion criteria:

- Teeth having restorations due to aesthetic purposes or reasons other than caries like laminates, crowns will not be scored.
- Patients who are unaware of their blood group were not included in the study.

The A pilot study was conducted on 16 patients visiting the outpatient department of Mithila Minority Dental College and Hospital to determine the disease prevalence, severity and feasibility of the study. Based on pilot study results, proportion of subjects with various oral diseases was found to be 73%. The subjects participated in the pilot study were not included in the main sample.

Sample size is determined using the formula:

$n = \frac{Z_\alpha^2 PQ}{d^2}$ where $Z_\alpha = 1.96$

P - Proportion of subjects suffering from halitosis

Q =1-P

d =5% = 0.05

$$n = \frac{1.96 \times 1.96 \times 0.73 \times 0.27}{0.05 \times 0.05}$$

$$= 302.8 \simeq 400$$

A total of 400 participants (100 from each blood group) of 20-60 years age group visiting outpatient department of Mithila Minority Dental College and Hospital were randomly selected for the study. Intraoral examination was carried out by a mouth mirror, a standard WHO probe and normal illumination light. Oral health status was assessed with the help of DMFT index and gingival index. The blood group was determined from the certificate.

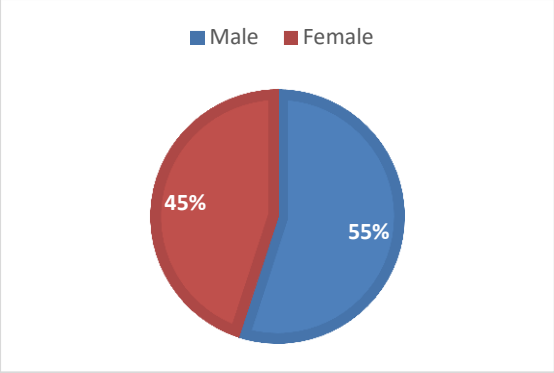
Statistical Analysis: All data were collected patient wise. The data was then arranged systematically and the information collected was transferred to computer for analysis using SPSS. One way ANOVA was used to compare followed by turkey's post hoc test.

RESULTS AND DISCUSSION

Table 1: Distribution of study subjects based on blood group and age

BLOOD GROUP	NUMBER OF PERTICIPANTS
A	100
B	100
O	100
AB	100
AGE	
20-30	90
31-40	122
41-50	96
51-60	92

Fig 1: Distribution of study subjects based on gender



A total of 400 patients (100 form each blood group) participated in the study of which 160 were males and 220 were females.

Table 2: Distribution of study subjects based on Oral Hygiene Index-Simplified (OHI-S)

BLOOD GROUP	Good	Fair	Poor
A	48	27	25
B	37	25	38
O	38	37	25
AB	57	25	18

In the present study, highest number of patients with poor oral hygiene status belonged to B blood group whereas the least number of patients with poor oral hygiene status belonged to AB blood group.

Table 3: Comparison of Mean DMFT Score between different blood groups

VARIABLE	BLOOD GROUP	MEAN	STANDARD DEVIATION	F	SIGNIFICANCE
DMFT	A	2.91	2.42	54.580	0.001(S)
	B	5.51	3.14		
	O	3.91	2.52		
	AB	1.46	1.25		

The study participants with B blood group had the highest (5.51) mean DMFT score and AB had the lowest (1.46). The comparison of study participants based on blood group and DMFT score was found to be statistically significant (p=.001).

DISCUSSION

With the development in researches throughout the years, it has been understood that, certain unknown factors play a role in the progress of oral diseases regardless from the common etiological agents and environmental factors.

There are a lot of evidence suggests that blood groups have a significant role in capability or resistance to different infectious and non-infectious diseases; and as blood groups are transferred through gene, there is a chances of hereditary relationship between oral diseases and blood groups[6].

With Saliva originates from several specialized glands located under the tongue and along the inside of the mouth. As mucins are composed of glycoproteins, it can be imagined that ABO blood type antigens are copiously produced by the submaxillary-sublingual salivary glands and extensively distributed in human saliva. The blood antigens are secreted into the saliva and have been proposed to be growth medium for the bacteria to grow and it helps to growth of bacteria causing dental caries[7].

In the prsent study, the participants with B blood group had the highest (5.51) mean DMFT score and the comparison of study participants based on blood group and DMFT score was found to be statistically significant (p=.001) which is similar to the studies conducted by

Singla et al. , Mazumdar et al. and Shunmugam Kumar et al. [8,9].

Studies showing the association between ABO blood grouping and oral hygiene status are limited. However, in the present study, highest number of patients with poor oral hygiene status belonged to B blood group whereas the least number of patients with poor oral hygiene status belonged to AB blood group.

The limitation of the study was small sample size and determination of secretor status was not evaluated and hence further studies need to be conducted considering the secretor status and on a larger population .

CONCLUSION

Study concluded that DMFT and oral hygiene scores vary in different blood groups and suggest a positive association between blood groups and oral diseases. Further, long-term studies are needed to confirm this conclusion.

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Analysis of saliva for enzymatic changes in individuals undergoing treatment with self ligation and MBT techniques-a comparative study

Abstract

OBJECTIVE: Objective of this study was to measure changes in Acid and Alkaline phosphatase levels in saliva in different phases of bone remodeling in moderate crowding cases using self-ligation and MBT technique and comparison of the levels.

MATERIALS AND METHODS: E19 orthodontic patients with class 2 div 1 malocclusion with maxillary 1st premolars extraction and retraction were included. During alignment, 4 salivary samples were collected - baseline, One hour after bonding, after 4 weeks and after 8 weeks during the alignment phase. During retraction phase 2 samples were collected – just before retraction and after 4 weeks. E chain was used. Student t test (unpaired) was used. For data not following normal distribution Mannwhitney test was used.

RESULTS: Showed hike in the level of Acid Phosphatase 1 month after retraction and reduced later on. While the level of Alkaline Phosphatase was least 1 month after alignment and increased later on. Level of Acid Phosphatase was more in Self Ligating than in MBT patients in initial time interval while in late stages levels of both the enzymes reached equilibrium.

CONCLUSION: We conclude that comparative analysis of acid and alkaline phosphatase activities in saliva in the two bracket prescriptions MBT and selfligating would be a useful means for monitoring the rate of bone turnover.

Keywords: alkaline phosphatase, acid phosphatase ,saliva, MBT, self ligating

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INTRODUCTION

Orthodontic tooth movement implies application of forces that initiates a remodeling process in the periodontium. This stimulus causes an inflammatory response in the periodontal ligament tissues leading to the release of various mediators of inflammation[1].

Inflammation is characterized by a localized release of inflammatory cells. These inflammatory cells as for polymorphonuclear leukocytes contain enzymes (matrix metalloproteins, arachadonicacid, myeloperoxidase, interlukins, chondroitin sulfate, glycosaminoglycans, prostaglandins, acid and alkaline phosphatase,) that enhances osteoclastic and osteoblastic activity.

Owing to the increase in the level of inflammatory mediators during orthodontic tooth movement, it can be hypothesized that the levels of these enzymes also rise during tooth movement.

Total alkaline phosphatase levels in saliva can be used as a diagnostic biomarker to assess the health and pathology of the periodontium during orthodontic treatment. It can be used in early detection of changes in the periodontium and can assess the efficacy and prognosis of orthodontic treatment especially in periodontally compromised patients[3]

With the advent and popularity of self ligating brackets in orthodontics, a comparative study to determine the enzymatic levels which are a marker of the bony remodelling process is appropriate[9].

Saliva samples are collected, evaluated and compared for increase and decrease in the levels of acid and alkaline phosphatase, in patients being treated with MBT and those with Self Ligating Brackets

The aim of this study is to compare the changes in salivary levels of the enzymes in moderate crowding

cases using self ligation and MBT technique during alignment and retraction phase

AIM AND OBJECTIVES

To Aim of the study saliva to compare salivary levels of acid and alkaline phosphatase in patients treated with MBT and self-ligation technique in moderate crowding cases.

MATERIALS AND METHOD

The study was carried out on 19 orthodontic patients with class 2 div 1 malocclusion under the treatment plan of bilaterally maxillary 1st premolar extraction and further retraction. Investigation was approved and informed consent was taken

INCLUSION CRITERIA

The study was carried out on 19 orthodontic patients with class 2 div 1 malocclusion under the treatment plan of bilaterally maxillary 1st premolar extraction and further retraction. Investigation was approved and informed consent was taken

EXCLUSION CRITERIA

Previous history of orthodontic treatment. Previous history of periodontal therapy. Patients with oral gingival/periodontal infections.

METHODOLOGY

80 subjects 19 subjects were observed longitudinally to assess tooth movement, plaque and inflammation .Patients divided in two categories.9 patients are enrolled for self ligation and 10 patients for MBT technique. Appropriate wires and brackets for self ligating and MBT technique was used. Saliva samples were collected at baseline, before bonding of brackets-T0 ,after 1hour of bonding of brackets and placement of wire – T1, after 1 month of bonding of bracket and placement of wire –T2, after 2 months of bonding of brackets and placement of wire-T3, before retraction -R0,1month after retraction – R1 by 'SPIT TECHNIQUE' during alignment and retraction phase.

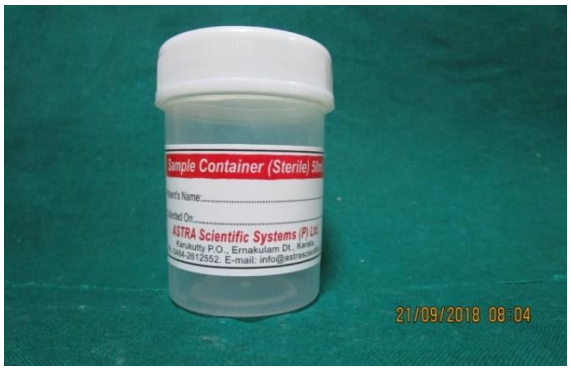

ILLUSTRATION1: SALIVA CONTAINER

ILLUSTRATION2: SALIVA COLLECTION USING SPIT TECHNIQUE

STATISTICAL ANALYSIS

All the data was statistically analyzed using SPSS version 22.0 software. The collected information was summarized by using frequency, percentage, and mean and standard deviation. To compare the outcome measures student t test (unpaired) was used. For data not following normal distribution Mann-Whitney test was used. The p value<.05 was considered significant
The following will be the criteria for this study:

RESULT

Alkaline and acid phosphatase activity in saliva was analyzed in alignment and retraction phase at different time intervals which include 0, 1hour, 1month, 2months, initiation of retraction, 1 month after initiation of retraction in moderate crowding cases. After the initial activation of the wire, when comparision between the two groups MBT and self-ligating system was done, increase in the level of ACP was observed after 1 month in alignment phase which further increased after 2 month of alignment .increase in the ACP level was more significant in self-ligating system compared to MBT. (table1)

Table 1:- Comparison between groups at each time interval - Saliva – ACP in U/L

	Group	N	Mean	Std. Deviation	Mean Difference	95% CI		t	df	p-value
						Lower	Upper			
Baseline	1	10	.86	0.62	0.18	-0.54	0.90	0.52	17	0.61(NS)
	2	9	.87	0.87						
Time 1	1	10	.87	0.62	0.18	-0.54	0.90	0.52	17	0.61(NS)
	2	9	.88	0.86						
Time 2	1	10	1.60	0.81	-0.05	-0.81	0.71	-0.15	17	0.88(NS)
	2	9	1.78	0.75						
Time 3	1	10	1.73	0.71	0.94	0.37	1.50	3.52	17	0.003*
	2	9	2.00	0.37						
Time 4	1	10	1.22	0.54	0.30	-0.26	0.85	1.13	17	0.27(NS)
	2	9	1.36	0.60						
Time 5	1	10	1.12	0.50	0.14	-0.42	0.70	0.54	17	0.60(NS)
	2	9	1.34	0.65						

Independent Sample T Test
*P<0.05 Statistically significant, p>0.05 Non Significant, NS

When compared between time intervals in each study group in the patients treated by self-ligating system, the level of acid phosphatase is maintained after 1 hour of force application and is drastically increased after 1 month. After 2 months of force application there was further increase in the level of acid phosphatase which was maintained at the end of 1 months after retraction.

While in the MBT system hike in the graph was reduced compared to self-ligating system while the level of both the systems equalizes after 1 month of retraction. (graph1)

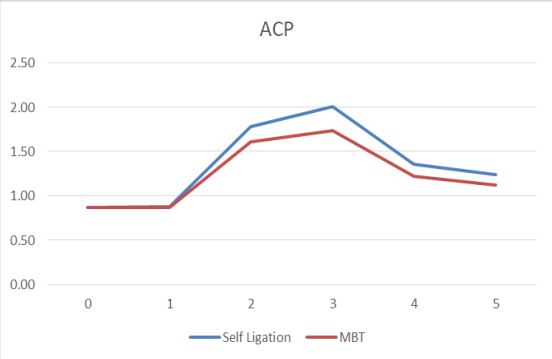

Figure 1: Comparison of the fluctuation in the levels of ACP in between MBT and self signating

On comparision between groups at different time intervals there is increased level of alkaline phosphatase in patients treated by MBT compared to self ligating at initial time intervals. Level of ALP in self ligating system is almost maintained till 1 month after alignment whereas there is decreased level of ALP after 1 month of initial alignment, further increased after 2 months of alignment phase . While in MBT system level of ALP follows the same slope as self ligating. (TABLE2)

Table 2:- Comparison between groups at each time interval - Saliva – ALP in U/L

	Group	N	Mean	Std. Deviation	Mean Difference	95% CI		t	df	p-value
						Lower	Upper			
Baseline	1	10	15.83	3.04	2.53	-0.86	5.93	1.58	17	0.13(NS)
	2	9	15.76	3.95						
Time 1	1	10	15.33	3.03	2.53	-0.87	5.92	1.57	17	0.13(NS)
	2	9	13.07	3.96						
Time 2	1	10	13.59	2.80	-0.40	-3.12	2.32	-0.31	17	0.76(NS)
	2	9	12.55	2.81						
Time 3	1	10	12.92	2.16	-0.68	-3.21	1.85	-0.57	17	0.58(NS)
	2	9	11.91	3.03						
Time 4	1	10	14.82	4.04	0.22	-3.06	3.50	0.14	17	0.89(NS)
	2	9	15.84	2.46						
Time 5	1	10	14.91	4.72	-1.42	-5.43	2.58	-0.75	17	0.46(NS)
	2	9	16.73	3.35						

Independent Sample T Test
*P<0.05 Statistically significant, p>0.05 Non Significant, NS

On comparing two groups at subsequent time intervals decreased level of ALP activity was observed in both the system at the end of 1 month initial alignment which further reduced after 2 months of alignment. Increase in the level was observed after retraction. But the decrease in the spike of the graph was observed more in the self ligating system. But at the end of 1 month after retraction level of ALP was more in self ligation compared to MBT. (GRAPH2)

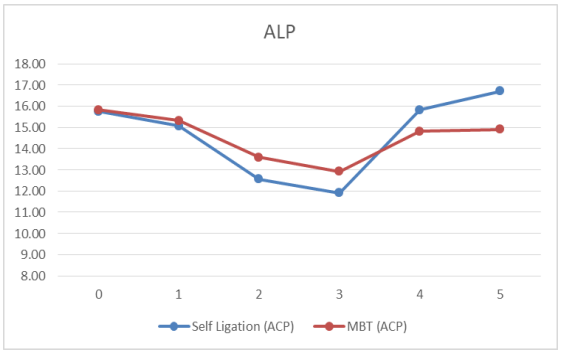

Figure 2: Comparison of the fluctuation in the levels of ALP in between MBT and self ligating techniques

DISCUSSION

Bone is a remarkably labile tissue which is being constantly remodeled throughout life. The much proved hypotheses that prolonged pressure on teeth results in remodeling of the alveolar bone, which consists of bone deposition and resorption is still the major platform for future research. Remodeling of bone is based on the combination of resorptive and formative cells so that old bone may be replaced with new bone and so the skeletal integrity be secured. There should be strict regulation of resorption and deposition by local and systemic factors. This sequencing has to be regulated properly by both local and systemic factors, because appreciable divergence from this balance of bone metabolism would mean intensified acceleration of bone loss or bone gains with catastrophic results in terms of amplified risk of fracture or compression syndromes[2]. According to Forst remodeling of bone takes place which comprises of osteoclasts, osteoblasts, and osteocytes which forms the Basic Multicellular Unit

In this study we have considered time intervals- Baseline, one hour after bonding, after 4 weeks during alignment phase and after 8 weeks during alignment phase .During retraction phase 2 samples were collected-just before retraction and after 4 weeks during retraction. These time intervals are based on the specific phenomenon that occurs at micro or macro level. Burstone in 1962 gave 3 phases of tooth movement-initial phase, lag phase and post lag phase. Initial phase lasts from 24hours to 2 days. Later post lag phase starts when active tooth movement occurs, after 1 month of force application[9]. Alteration in the architecture of bone is initiated by resorption caused by osteoclasts, which creates a resorption lacuna. The resorption period continues for 1 month and is followed by bone deposition over a period of 5 months and that is why time interval of 2 months after the fixed orthodontic treatment is chosen[10].Inorder to understand the exact enzymatic fluctuations at these stages following timelines are chosen-baseline, 1hour, 1month, 2months after activation.

Molecules which are biologically active like phosphatases are secreted by the cells of the bone matrix at certain stipulated times to regulate the ongoing remodeling processes. Monitoring and analyzing the salivary activities of acid and alkaline phosphatase can be suggestive of the tissue changes during orthodontic tooth movement[2]. This analysis could give us a clear picture of the underlying bone remodeling. The bone remodeling process can show timely changes in the biochemical markers, especially phosphatase activities during the various tooth movements. Alkaline phosphatase is synthesized and secreted by osteoblasts. It causes hydrolysis of phosphatase ester which is a potential inhibitor of the process of mineralization and causes formation of calcified tissue. A study done by Inosoft et al (1996), the subject had a peak ALP activity between 1-4 weeks when the tooth movement was minimum. Secretion of ALP during bone formation is due to osteoblastic cells (Intan et al 2008).Based on this study we presumed that ALP is secreted in saliva, thus monitoring the enzyme activity would monitor bone formation. ALP plays a clear role in bone formation and osteoid mineralization[6]. ACP are lysosomal enzymes that hydrolyzes phosphomonoesterase at low ph value and catalyzes bone resorptive pathway. Hence proved that during phases of active tooth movement there is increased secretion of acid phosphatase than alkaline phosphatase.

It is possible to gain information about therapeutic response faster by measuring the concentration of biomarkers. Biomarkers are biologically active substances which are classified as biomarkers of inflammation, bone resorption, cell necrosis, bone deposition, and mineralization. Significant change in biomarker is discovered after 1 to 3 months of the therapy[4].

This study assessed acid and alkaline phosphatase activity based on inflammation caused by orthodontic forces applied on the patients in different phases of bone remodeling. The study was carried out in patients treated by MBT as well as self ligating system of brackets .In order to standardize the study patients with moderate crowding based on TPI index were only included in the study which required extraction of 1st premolar and en masse retraction. Salivary enzymatic fluctuations were recorded at different time intervals. For initial leveling and aligning arch wires generating light and continuous forces were considered desirable. It is known fact that in the initial alignment phase tipping occurs in the MBT system .Whereas in the self ligating system due to more flexibility of wire and faster decrowding due to very light forces ,more osteoclastic than osteoblastic activity occurs and so faster tooth movement is expected[9].

We have considered self ligating bracket system and compared it with MBT, since it is considered as a system utilizing light forces and thereby resulting in active rate of tooth movement than MBT. In order to substantiate this fact at the enzymatic level and at specific time intervals its measurement and further comparision was required with MBT, since it is known fact that whatever changes occur at macrolevel are the result of fluctuation of enzymes.

It Samples were collected in 5 time intervals (baseline, 1 hour after fixed appliance therapy, after 1 month, after 2 months, start of retraction phase and 1 month after retraction phase).The results were expected to cause increase in osteoblastic and osteoclastic activity, with more increase in clastic activity in selfligating system which causes relative increase in tooth movement in self ligating system compared to MBT. This is explained by the fact that Friction at juntion of bracket slot and archwire can affect the force expressed to the teeth (Frank and Nikolai, 1980) and Self-ligating brackets abolishes the idea of force degeneration or friction from elastomeric module and disproportionate force of ligation generated by steel ligatures, therefore increased tooth movement[15] and so clastic activity as aforesaid.The samples were collected from two groups of patients ,one group treated with self ligating and other with MBT system. Peak value of ACP in self ligating system is found at t3 and peak value in MBT system is found in t2.Gradual increase in ACP level is found from baseline to t3 and later decreased. Height in the slope of ACP is more in self ligating system. This might be explained by the bracket arch wire combination in the self ligating system which gives a sliding motion in the slot rather than tight ligation in the MBT system. Sliding of bracket along the archwire occurs when the force applied to the bracket creates a force that overcomes the friction between the surfaces in contact (Kapila et al., 1990).This sliding motion in the slot is because of the design of the bracket in the self ligating system which is closed tubelike. Studies have revealed a disintegration of 12 per cent to 60 per cent of the applied force due to friction (Kusy and Whitley, 1997; Husmann et al. 2002) hence it leads to reduced binding and friction especially with lower dimension wires ie in time interval t2 and t3. Therefore more of osteoclastic activity than osteoblastic activity occurs in the initial stages. At later stages ie time interval t4 and t5 there is simultaneous increase in both osteoclastic and osteoblastic activity since there is increased production of both acid and alkaline phosphatase. At later stages when the patient is shifted to heavier wires ie rectangular NITI and SS, there is increased binding leading to increased friction[8]. Subsequently there is more of hyalinization and strangulation of vessels .This reduces enzymatic activity. Ultimately, there is reduction in the spike of acid phosphatase and consequently level of both acid and alkaline phosphatase is balanced. Both clastic and blastic activity occurs simultaneously at the same rate. This fluctuation is evident in the self ligating system and can be seen in the graph accordingly.

This concides with the findings in the previous studies, which also showed an increase in the enzyme activity during the 1st week of active orthodontic tooth movement. This increase in the enzyme activity might be explained by the fact that there is chemoattraction of osteoblasts or their precursors to the site of bone formation or to the site of inflammation during orthodontic tooth movement. In contrast to controversial findings of animal studies[1,2] assessing activity of alkaline phosphatase in periodontal ligament, the result of this

study is in congruity with longitudinal studies on human subjects carried out previously.

Some previous studies observed that the peak of ALP activity occurred at day 14 whereas in our study the peak was seen after 2 months of activation and at start of retraction respectively. Some other investigations also reported that bone formation appeared to begin after osteoclastic resorption phase that lasted from 10 days to 3 weeks.

Therefore appliance prescription can be selected on the basis of enzymatic evaluation of these intracellular enzymes whose levels effect the tissues on microscopic levels differently.

In this study we have observed that there was a significant increase of ACP levels in patients treated with Self-ligating bracket prescription at week 4, meaning increased bone resorption and hence faster tooth movement taking place. ALP enzymatic levels showed increased levels in MBT system than self ligating system. These enzyme biomarker profiles showed increased osteoclastic activity which leads to faster tooth movement in self-ligating bracket prescription which reduces the treatment time. However, the level of enzymes were very low and hence did not present a very clear picture of the bone remodeling. Therefore, more subtle detection methods are required to obtain a proper and clearer picture of the remodeling cycle. Moreover study can be done on a large sample size to get appropriate results. Compared to MBT, since lesser forces are expected to be exerted in the self ligation system, less increase in the levels of salivary acid and alkaline phosphatase may be expected. This may help predict the difference in the rate of bone deposition and resorption among the two technique and can formulate a treatment plan accordingly.

CONCLUSION

Level of alkaline phosphatase in saliva can be used as one of the diagnostic markers for .increased level of ALP in saliva in MBT compared to self ligating system signifies of slower tooth movementIncreased level of ACP in self ligating system compared to MBT in the initial levelling and aligning signifies of faster tooth movement.

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Relationship of Obesity With Periodontitis Among Patients Attending Dental College Hospital in Patna, Bihar: - A Cross Sectional Study

Abstract

BACKGROUND: Obesity is a common but often underestimated condition of clinical and public health significance in many countries around the world. And on the other hand, Periodontitis has been ranked as the sixth most prevalent chronic disease worldwide. Several epidemiological studies have reported an association between high body weight and Periodontitis.

AIM & OBJECTIVE: 1. To assess the periodontal & Obesity status of patients attending dental college hospitals in Patna.

2. To find the association (if any) between obesity and Periodontitis among patients attending dental college hospitals in Patna.

METHODOLOGY: A cross sectional study was conducted in dental colleges of Patna district, Bihar among simple random sample of 600 subjects aged 18-65 year after satisfying the inclusion & exclusion criteria. A specially prepared and pre tested proforma, designed for collecting all the required and relevant general information (demographic) and clinical findings were used for recording data. WHO ORAL HEALTH ASSESSMENT FORM (2013) was used to assess the Periodontal status (CPI-modified) and Loss of attachment. And weight in kilograms and height in meters (Body Mass Index) were recorded by the investigator to determine the obesity of the individual Data were collected, compiled & tabulated using Microsoft excel & analyzed by Chi-square test & Anova test with $p < 0.05$ as statistically significant.

.**RESULT:** A majority of 43.3% belonged to overweight category. An overall 40.5% of the study population demonstrated gingival bleeding on probing and the rest 59.5% of the study subjects had healthy gingiva.The periodontal pocket was present in 28.5% of the study subjects, among whom 24.3% had shallow and 4.2% had deep pocket. When different categories in BMI of study subject is compared with periodontal status (gingival bleeding, periodontal pocket & loss of attachment), the results were found to be significantly associated with each other.

CONCLUSION: The results of the present study show a higher BMI could be a potential risk factor for Periodontitis establishing a link between obesity and Periodontitis.

Keywords: Obesity, Periodontitis, BMI, CPI

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INTRODUCTION

The Obesity is a common but often underestimated condition of clinical and public health significance in many countries around the world.[1] Obesity is defined as a condition of abnormal or excessive fat accumulation in adipose tissue to the extent that health is impaired.[2]

If secular trends continue, by 2030 an estimated 38% of the world's adult population will be overweight and another 20% will be obese.[3] Obesity greatly increases risk of chronic disease morbidity—namely disability,

depression, type 2 diabetes, cardiovascular disease, certain cancers—and mortality.[4]

According to estimates of the International Obesity Task Force, 1.7 billion people are exposed to health risks related to body weight, while the increase in Body Mass Index (BMI) is responsible for more than 2.5 million deaths annually, which is expected to double by 2030.[5] Periodontitis is an inflammatory disease of the tooth supporting structures; it is initiated by colonization of periodontal tissues with harmful, mainly anaerobic, gram- negative bacteria.[6]

Periodontitis has long been considered an "old person's disease, as more than half of people aged 55 or older have it.[7]

We now know that widespread risk factors, such as obesity, may also compromise periodontal health in younger populations. It is the leading cause of bad breath, tooth loss, and dentures in older adults.[8] Severe Periodontitis has been ranked as the sixth most prevalent chronic disease worldwide.[9]

The association of obesity with periodontal infection has been investigated in several, mainly cross-sectional studies (reviewed by Chaffee & Weston 2010 and Suvan et al. 2011), and several possible biological explanations for this association have been suggested (Boesing et al. 2009, Pischon et al. 2007, Saito & Shimazaki 2007).[10]

OBJECTIVES

1. To assess the periodontal status of patients of age group between 18 to 65 years .
2. To assess the obesity status of patients attending dental college hospitals in Patna.
3. To find the association (if any) between obesity and periodontitis among patients attending dental college hospitals in Patna.

METHODOLOGY

A cross sectional study was conducted in Dental colleges of Patna from September 2019 to February 2020..Official permission was obtained from the concerned authorities-head of the institution, Department of OMR and the schedule date and time was fixed. Ethical Clearance was obtained from the Institutional Ethical Review Board-Buddha Institute of Dental Sciences and Hospital. After detailing the purpose of the study, Informed consent was obtained from the subject's participating in the study well before the clinical examination.

Study Population consisted of 600 subjects, aged 18-65 years attending dental colleges of Patna district. Study subjects were selected by simple random sampling method after satisfying the inclusion and exclusion criteria.

Inclusion criteria:

1. The subjects who are aged more than 18 years will be included.
2. Subjects who give consent will be included in the study.

Exclusion criteria:

1. The subjects who are medically compromised.
2. Subjects who are undergoing active orthodontic treatment.
3. Participants who will not give consent.
4. Uncooperative individuals.

Data was collected using a specially designed and pre tested close – ended questionnaire which included general information (demographic), oral hygiene practices & status of obesity of the study subjects. WHO ORAL HEALTH ASSESSMENT FORM FOR ADULTS, 2013(Annex 1)[11] was used to assess the periodontal status (CPI-modified)[12] and loss of attachment. And weight in kilograms and height in meters (Body Mass Index)[13] were recorded by the investigator to determine the obesity of the individual.

Four categories were established for assessing BMI: underweight, normal, overweight, and obese[16].

CATEGORIES OF BMI	
Underweight	< 18.5 kg/m^2
Normal weight	18.5 – 24.9kg/m^2
Overweight	25 -29.9kg/m^2
obesity	≥ 30 kg/m^2

Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. The various parameters used for the purpose of analysis were arithmetic mean, standard deviation and standard error. Data was analyzed using IBM SPSS, Statistics Windows, version 22(Armonk,NY: IBM Corp). For the comparison of proportions, Chi-square test14 & ANOVA15 was used with continuity correction whenever appropriate. 'P' value of < 0.05 was taken to be statistically significant for the purpose of analysis.

RESULT

A total of 600 (100%) subjects participated in the study, of which 86.2% were males and the rest 13.8% were females.(Figure 1). The age of the study subjects ranged between 18 to 65 years. A majority of 51% belonged to the age group 26-35 years, followed by 26.5% who were in the age group of 15-25 years; 13.2% belonged to 36-45 years and 9.3% belonged to 46-65 years age group. (Table 1)

Height in meter and weight in kilogram was used to assess body mass index. A majority of 43.3% belonged to overweight (25 – 29.9 kg/m2) category, followed by 35.8% who were in normal weight category (18.5 – 24.9 kg/m2); 18.2% were in the obese (> 30 kg/m2) category and a least of 2.7% were underweight (< 18.5 kg/m2).Among males, 37.5% were in over weight category, followed by 30.7% normal weight category, 16.2% in obese category and 1.8% were in underweight category and among females, 5.8% were in overweight category, followed by 5.2% in normal weight category and a least of 2% belonged to obese category. When the results were statistically compared with gender, it was found to be statistically not significant with p value more than 0.785. (Table 2)

Regarding the Periodontal status under study, presence or absence of gingival bleeding was considered. An overall 40.5% showed the presence of gingival bleeding and the rest 59.5% had no signs of gingival bleeding. Among males 36.7% had presence of gingival bleeding and the rest 49.5% had no signs of gingival bleeding and among females 3.8%had gingival bleeding and the rest 10%showed no signs of gingival bleeding. The results were not statistically significant with P-value (0.354). (Table 3)

Regarding the Community Periodontal Index -Pocket involvement. An overall 24.3% had pocket depth between 4-5mm, followed by 4.2% who had pocket depth of 6mm or more and 71.5% showed healthy pocket depth of less than 3 mm. Among males 22.5% had pocket depth between 4-5mm, followed by 3.3% who had pocket depth 6mm or more and 60.3% showed healthy pocket depth of less than 3 mm. Among females 1.8% had pocket depth between 4-5mm, followed by 0.8% who had pocket depth of 6mm or more and 11.2% showed healthy pocket depth of less than 3 mm. The results were statistically significant with P-value (0.036). (Table 4).

Crude odds ratio and adjusted odds ratio for body mass index was calculated. It clearly revealed that the Individuals had an increased risk of periodontitis by 34% for each 1kg/m2increase in body mass index (Adjusted odds ratio, 1.34; 95% confidence interval, 1.16-1.28; p<0.05. (Table 5)

Association between Body Mass Index (Obesity) and Periodontal status is shown in Table 6A & 6B. There is a significant association existing with gingival bleeding when different categories of BMI of the study subjects P value less than 0.05. (Table 6A)

There is a significant association existing with periodontal pocket for score 1 (4-5mm) and score 2 (more than 6 mm) when different categories of BMI of the study subjects with P value less than 0.001. (Table 6B)

DISCUSSION

A total of 600 study subjects attending OPD in the department of Oral Medicine and Radiology, from 2 dental colleges in Patna city were included in the study. The subjects in this study represents predominantly adult male population (86.2%) when compared to females. The reason for increased gender difference can be attributed to more oral health issues with males when compared to females and dominance to access health care. The majority of the sample in this study represents young adults with 51% among 26 to 35 years and 26.5% of 15 to 25 years old which is similar to the findings of the study conducted by Sede MAet.al.17 where majority of study subject were young adult with 42.9% of 25-44 years.

In the present study the prevalence of overweight and obese was 43.3% and 18.2% respectively. With thorough literature search, it can be justified that increased prevalence of overweight and obesity can be credited to the use of modern mechanical transport, availability of ready to eat and fast food, modern ways of entertainment like smart phones and smart T.V, adaption of sedentary life styles, age, intake of high energy-dense diets, lack of physical activity, stress, genetic linkage are all contributory to this increased prevalence. Overweight and obesity are posing a great threat to the health of the people of India in both urban and rural areas as with increasing industrialization and urbanisation, the standard of living which also rise which results in weight gain. (Mohd Shannawaz, (2018)[18] In addition the present study supports prior research finding that overweight/obese people are more likely to be female and less educated compare to non-obese people. The study reports of D L Francis et.al. (2017)[19] and Chauhan R C et.al[20] shows less prevalence when compared to the present study. The difference in results may be attributed to complex and non-uniform dietary habits across the states and other may be the availability of nutritious and balanced food. Therefore, while interpreting, the overall prevalence of overweight and obesity requires extra cautiousness in the context of wide disparities with respect to diet, physical activity and life styles in general among the people of India. (Mohd Shannawaz, (2018).[21]

In the present study Community periodontal index (Modified) was used to assess the level of periodontal status. The prevalence of gingival bleeding was seen in 40.5% of the population. This is more when compared to the studies done in Hungarian population[22] which reported bleeding in 8% of the population. The National Health and Nutrition Examination Survey III (NHANES-III)[23] conducted in the USA between 1988-1994 demonstrated that 50%of the adult population had gingival inflammation, using gingival bleeding as the criterion. A study conducted in Italy[24], using bleeding on probing as the criterion, determined that the prevalence of individuals showing at least one site positive for bleeding on probing was 99%.[25]

In the present study 28.5% of the study population were affected by periodontal pockets. It is the apical shift of the junctional epithelium as a result of destruction. The following are the studies which reported similar findings.

i. Sood Sood in the field survey in Ludhiana observed 29.1% of periodontal pockets as assessed by WHO recommended methods.[26]

ii. Doifode et.al in a field survey found prevalence of periodontal pockets in 34.8% of the study subjects. Age, Low socioeconomic status, tobacco chewing, ghutka chewing and smoking were significantly associated with periodontal diseases.[27]

iii. Vandana et.al found 27% prevalence of periodontitis in fluoride affected patients attending periodontitis OPD. Prevalence increased with age and was significantly more in females. The prevalence should be considered keeping in mind that the population was hospital based one. The increased prevalence found among females could be attributed to their increased treatment seeking behaviour.[28]

iv. Classical studies – The study of Greene showed prevalence of 30.2% with periodontal pockets.[29]

And these are the studies which showed increased/higher prevalence.

1. Reports of National oral health survey and fluoride mapping (2002-2003) conducted by Dental Council of India, New Delhi, (2004) showed prevalence ranging from 57% to 79.9%. The age group ranged from 12 years to 74 years, i.e. all index age group was considered.[30]

2. A report of the multi centric study carried out under the Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India and World Health Organization Collaborative program showed that 100% of the study subjects suffered from periodontal diseases.[31]

3. Classic Shah in her report for the National Commission on Macroeconomics observed that more advanced periodontal diseases with pocket for formation and bone loss was seen among 40-45 % of the population.[32]

4. Ramfjord et.al in a WHO survey done in India along with 4 other countries found 100% prevalence of periodontal disease (including gingivitis) in India. He also reported that periodontitis was due to accumulation of calculus, Plaque and debris rather than due to age, sex, geography, economic status or nutrition.[33]

Also association between Obesity and Periodontal disease are significantly evident in this study. Overweight and obesity have been suggested to be associated with periodontitis, because obesity may have some effects on systemic health by affecting the host susceptibility to periodontitis due to inflammatory mediators. Periodontitis is common chronic inflammatory oral disease of the adult population characterised by a gingival inflammatory response against a pathogenic bacterial micro flora, resulting in alveolar bone loss and eventually tooth loss. The link between periodontitis and obesity may have relevant public health implications because both diseases are important risk factors for cardio vascular diseases.[34] However these associations is not entirely clear in the literature because there are controversies on the finding of the studies.

The reports of systematic review and meta-analysis on obesity and periodontitis by Moura-Grec PG et.al[35]clearly discusses the significance. Some recent cross sectional studies have suggested an association between body weight and periodontal diseases in young subjects[23, 26, and 34]however no association was detected in the study of Lundin et.al. Regarding to older subjects no association observed in this age group in numerous studies, [17,20,27,28,] suggesting that other systemic factors not the obesity, related to age may contribute to periodontitis, factors that possible have not been present in elderly Japanese women because in the studies of Saito and Satio et.al [35] reported an association of BMI with periodontal disease.

RECOMMENDATIONS

Oral health care professionals to arrange dental screening situations among the vulnerable groups for early detection of periodontal disease and recognize patients at risk to advocate promotion of healthy nutritional habits and physical activity to prevent the progression of obesity and periodontal disease.

CONCLUSION

It can be concluded that the prevalence of gingival bleeding and periodontal pockets were quite high among the study population. Also, the prevalence of overweight/

obesity was seen among 61.5% of the study population. The results of the present study show a higher BMI could be a potential risk factor for periodontitis establishing a link between obesity and periodontitis.

These findings warrant for efforts from the policy makers and clinicians to provide primary care of prevention with secondary level of prevention with early diagnosis and treatment and disability limitation and rehabilitation with those with critical situation and restoration of basic function of the oral structures.36 And as the prevalence of obesity is quite high, diet counselling and change in the life styles of the subjects with good health education is a must. This can benefit community at large and the purpose of medical world could rest in justification with uplifting health for all in the present scenario.

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FIGURE 1: SHOWS THE DISTRIBUTION OF THE STUDY SUBJECTS ACCORDING TO THE GENDER.

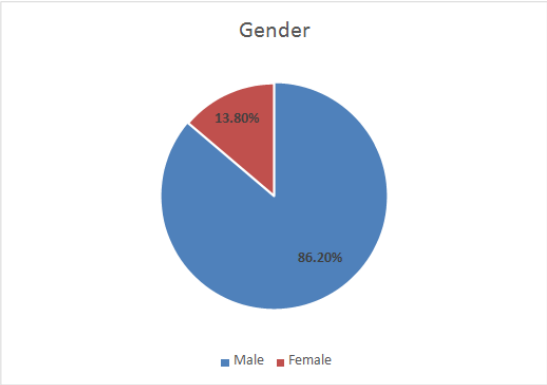

Table 1: Distribution of study subjects according to age and gender

Age (years)	Male	Female	Total
	N (%)	N (%)	N (%)
15-25	127 (21.2%)	32 (5.3%)	159(26.5%)
26-35	265 (44.2%)	41 (6.8%)	306(51.0%)
36-45	71 (11.8%)	8 (1.3%)	79(13.2%)
46-55	46 (7.7%)	2 (0.3%)	48(8.0%)
56-65	8 (1.3%)	0 (0.0%)	8(1.3%)
Total	517 (86.2%)	83 (13.8%)	600(100.0%)

Statistical Analysis: Pearson's Ch-square test. Statistically significant if P<0.05

Table 2: Distribution of study subjects according to body mass index interpretation

BMI Interpretation	Male	Female	Total
	N (%)	N (%)	N (%)
Underweight: < 18.5 kg/m^2	11 (1.8%)	5 (0.8%)	16 (2.7%)
Normal weight: 18.5-24.9 kg/m^2	184(30.7%)	31(5.2%)	215(35.8%)
Over weight: 25-29.9 kg/m^2	225(37.5%)	35(5.8%)	260(43.3%)
Obese: >30 kg/m^2	97(16.2%)	12(2.0%)	109(18.2%)
Total	517(86.2%)	83(13.8%)	600(100.0%)
Chi-square value=1.069; P value=0.785; NS			

Statistical Analysis: Pearson's Ch-square test. Statistically significant if P<0.05

Table 3: Distribution of study subjects according to the gingival bleeding

Gingival bleeding (Periodontal status)	Male	Female	Total
	N (%)	N (%)	N (%)
Absence of condition	297(49.5%)	60(10%)	357(59.5%)
Presence of condition	220(36.7%)	23(3.8%)	243(40.5%)
Total	517(86.2%)	83(13.8%)	600(100.0%)
Chi-square value=0.858; P value=0.354; NS			

Table 4: Shows the distribution of the study subjects according to the periodontal pocket

Periodontal Pocket	Male	Female	Total
	N (%)	N (%)	N (%)
Absence of condition (0-3mm)	362 (60.3%)	67 (11.2%)	429 (71.5%)
4-5mm	135 (22.5%)	11(1.8%)	146 (24.3%)
6mm or more	20(3.3%)	5 (0.8%)	25(4.2%)
Tooth excluded	0(0.0%)	0(0.0%)	0(0.0%)
Tooth not present	0(0.0%)	0(0.0%)	0(0.0%)
Total	517(86.2%)	83(13.8%)	600(100.0%)
Chi-square value=6.644; P value=0.036; S			

Table 5: Shows the distribution of the study subjects according to the periodontal pocket

Characteristics	Crude OR	Adjusted OR
BMI (Kg/m^2)	1.38(1.21-1.27)	1.34(1.16-1.28)
P -value	0.01*	0.001*
*Significant, BMI – Body Mass Index		

ASSOCIATION OF PERIODONTAL STATUS & OBESITY

Table 6 A: Shows the association between body mass index (obesity) and gingival bleeding

Gingival Bleeding	Body Mass Index- Interpretation				Total	Chi-square test P – Value
	Under Weight (< 18.5 kg/m^2)	Normal Weight (18.5-24.9 kg/m^2)	Over Weight (25-29.9 kg/m^2)	Obese (>30 kg/m^2)		
Absence of Condition	12(2%)	145(24.2%)	134(22.3%)	66(11%)	357 (59.5. %)	0.05 Significant
Presence of Condition	4(0.7%)	70(11.7%)	126(21%)	43(7.2%)	243 (40.5%)	
Total	16(2.7%)	215(35.8%)	260(43.3%)	109(18.2%)	600(100%)	

Periodontal Pocket	Body Mass Index- Interpretation				Total	Anova test P – Value
	Under Weight(< 18.5 kg/m^2)	Normal Weight (18.5-24.9 kg/m^2)	Over Weight (25-29.9 kg/m^2)	Obese (>30 kg/m^2)		
Absence of Condition (0-3mm)	14(2.3%)	166(27.7%)	197(32.8%)	52(8.7%)	429 (71.5%)	0.001 Significant
Pocket (4-5mm)	1(0.2%)	48(8%)	54(9%)	43(7.2%)	146 (24.3%)	
Pocket 6mm or more	1(0.2%)	1(0.2%)	9(1.5%)	14(2.3%)	25 (4.2%)	
Total	16(2.7%)	215(35.8%)	260(43.3%)	109(18.2%)	600(100%)	

Table 6 B: Shows the association between body mass index (obesity) and periodontal pockets

Dermatoglyphics: An Indicator Of Dental Caries In Humans

Abstract

BACKGROUND: We all know that fingerprints are found in human and some animals and they are unique to all individuals and remain unchanged over the life time. Today the study of the fingerprints has crossed its traditional realms and is being widely used as an adjunct in medical and dental fields to diagnose conditions with a suspected genetic base.

AIM & OBJECTIVE: 1. To record and evaluate the Dermatoglyphics pattern in subjects attending OPD of Buddha Institute of Dental Sciences & Hospital, Patna, Bihar. 2. To identify and compare the type of Dermatoglyphics pattern associated with dental caries. 3. To find association (if any) between different Dermatoglyphics patterns and Dental caries.

METHODOLOGY: A descriptive cross sectional study was conducted in OPD of Buddha Institute of Dental Sciences & Hospital, Patna among simple random sample of 76 OPD Patient in the age group of 18-40 years after satisfying the inclusion & exclusion criteria. The data was collected using a proforma consisting of demographic details, oral hygiene practices, Sugar consumption, fingerprints format and WHO ORAL HEALTH ASSESSMENT FORM (2013) was used to assess the Dentition status of the individual. Dermatoglyphic (Fingerprints) of the study subject were recorded using the Ink Method described by Cummin and Midlo & dermatoglyphic patterns were analyzed with the help of a magnifying glass (10×) under guidance of fingerprint expert. Data were collected, compiled & tabulated using Microsoft excel & analyzed by Chi-square test & independent sample T test with $p < 0.05$ as statistically significant.

RESULT: Prevalence of dental caries was highest among subjects with whorl pattern (3.59±2.18) followed by Loop pattern (2.73±1.56) whereas the subjects with Arch pattern shows lowest prevalence of dental caries (1.39±1.28) & this result came out to be statistically significant ($P < 0.05$).

CONCLUSION: From this study it is clear that Dental caries susceptibility of an individual increases in the subject having Whorl pattern & thus there is a definite correlation between fingerprint patterns and dental caries.

Keywords: Dental caries, Dermatoglyphics, whorl pattern

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INTRODUCTION

The We all know that fingerprints are found in human and some animals and they are unique to all individuals and remain unchanged over the lifetime.[1] Today the study of the fingerprints has crossed its traditional realms and is being widely used as an adjunct in medical and dental fields to diagnose conditions with a suspected genetic base.[2] Dental caries is defined as microbial disease of the calcified tissues of the teeth which is characterized by demineralization of the inorganic portion and destruction of the organic substance of the tooth.

It is the second most common cause of tooth loss and is found universally, irrespective of age, sex, caste, creed or geographic location.[3] Multifactorial etiology defines the causation of dental caries in mineralized tissues of teeth such as host, microbes, time and substrate etc. One of such causation factors is genetic predisposition which can be studied using ***Dermatoglyphic*** variations in individuals suggesting that dermatoglyphic patterns has both genetic and diagnostic role in Dental caries and thus can serve as genetic marker for dental caries in humans.[4] Recognition of irregular fingerprints among the patients of periodontitis, dental caries and other genetic anomalies like cleft lip and palate has been the recent interest of authors and academicians.[5] Based on the fact that development of teeth, alveolus and palate occurs at the same time as the development of dermal patterns it is evident that some correlation exists between dermal patterns and oral structures since they are both genetically governed structures.[6] Thus Dermatoglyphics can prove to be an extremely useful tool for preliminary investigations in conditions with a suspected genetic base especially in a developing country like India, it might prove to be non-invasive, inexpensive and effective tool for screening. Since caries is a multifactorial disease with the influence of genetic pattern, early prediction for high-risk individual can help in using effective and efficient caries preventive measures.[7] Thus this study was conducted with the aim to assess Dermatoglyphics as indicator of dental caries in human.

OBJECTIVES

4. To record and evaluate the Dermatoglyphics pattern in subjects attending OPD of Buddha Institute of Dental Sciences & Hospital, Patna, Bihar.

5. To identify and compare the type of Dermatoglyphics pattern associated with dental caries.

6. To find association (if any) between different Dermatoglyphics patterns and Dental caries.

METHODOLOGY

A descriptive cross sectional study was conducted in OPD of Buddha Institute of Dental Sciences & Hospital, Patna for 2 month, January & February, 2020. Ethical approval for the study was obtained from the Institutional Review Board, Patna and Informed Consent was obtained from the participants.

The study population comprises of 76 Patients in the age group of 18-40 years attending OPD of Buddha Institute of Dental Sciences & Hospital, Patna Study subjects were selected by simple random sampling method after satisfying the inclusion and exclusion criteria.

Inclusion criteria:

3. Patients willing to participate in the study.

Exclusion criteria:

- Subjects with skin disorder or having any developmental anomaly or any trauma to fingertips.
- Subject who are not willing to participate.

All the study subjects were pre informed and explained about the procedure. The data was collected using a proforma consisting of demographic details, oral hygiene practices, Sugar consumption, fingerprints format and WHO ORAL HEALTH ASSESSMENT FORM (2013) [8] was used to assess the Dentition status of the individual.

RECORDING OF DERMATOGLYPHIC (FINGERPRINT) PATTERN

Considering the ethical issue and confidentiality of fingerprints of patients, the procedure was explained to the study subjects and permission was obtained through written consent forms before recording the fingerprints.

7. After taking brief case history and clinical examination of the study subject, first the subject's hands were cleaned with soap and water and then scrubbed thoroughly with anantiseptic lotion (Savlon) and allowed to dry. This was done to enhance the quality of the dermatoglyphic prints, by removing sweat, oil, or dirt from the skin surface before imprinting.

8. Then Fingerprints of the study subject were recorded using the **Ink Method** described by ***Cummin and Midlo***.[9]

9. Based on the above method, the fingers of the subject's right hand were guided and pressed lightly on the ink pad and then guided by the examiner and pressed firmly on the A4 sheets. The subjects were made to do this repeatedly 2 to 3 times till clear prints were obtained.

10. The same procedure was repeated for the left hand and Prints were dried.Care was taken while recording the prints to apply the stamp ink material in adequate amounts.

11. The Likewise fingerprints of the entire 76 subject were recorded.

12. After taking the imprints of all fingers, ink was removed properly from the subject hand by using oil, soap and water.

METHOD OF READING FINGERPRINTS

13. The fingerprints were observed in a sequential manner and were analyzed from the fourth digit of the left hand moving in a clockwise direction till the thumb and then were analyzed from the thumb of the right hand till the fourth finger moving in a clockwise direction.

14. These dermatoglyphic patterns were analyzed with the help of a magnifying glass (10×) under guidance of fingerprint expert.

Dermatoglyphic Pattern Analysis

15. The various patterns of fingerprints were analyzed according to the standard guidelines for classification of patterns.

16. The ridge patterns on the distal phalanges of the fingertips observed were divided into three groups: arches, loops, and whorls.[10]

(i) Arches

These are the simplest patterns found on fingertips. These are formed by succession of parallel ridges which can be more or less and this traverse the pattern area and form a curve that is concave proximally. Sometimes, the curve is gentle while other times, it swings more sharply, in order to be designated as a low or high arch, respectively.

(ii) Loops

These are the most common patterns on fingertips. A series of ridges enter the pattern area on one side of the digit, recurve abruptly, and leave the pattern area on the same side. Loops may vary considerably in shape and size. They may be large or small, tailor short, and vertically or horizontally oriented.

(iii) Whorls

These are any ridge configurations with two or more tri-radii. One tri-radius is on the radial side and the other on the ulnar side of the pattern. Tri-radii are formed by the confluence of three ridge systems that form angles of approximately 120° with one another.

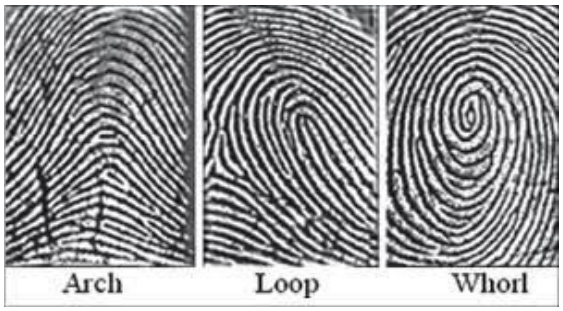

Figure Showing Type of Dermatoglyphic Patterns

The collected data were organized, tabulated and statistically analyze using SPSS software statistical computer package, version 22. The qualitative data was presented as frequencies and compared by Chi square test; the quantitative data was presented as mean and standard deviation (SD) and compared by independent sample t test. One Way ANOVA test was used for mean comparisons among different fingerprint pattern. Karl Pearson's correlation Analysis was used for correlating Dermatoglyphics pattern with dental caries. The differences between the two groups were considered significant at $P \leq 0.05$.

RESULTS

In the present study of the out of the total (76) subjects examined, majority of the study subjects 58(76.3%) were males and rest 18(23.7%) were females.(Figure 1). The mean age of the total 76 study subjects was 30.25±6.63 years.

Among all the 76 subjects, The Whorl pattern was found among majority of subjects 44.7% followed by Arch pattern among 40.8% subject and only 14.5% subjects having Loop pattern.(Table 1)

Prevalence of dental caries was highest among subjects with whorl pattern (3.59±2.18) followed by Loop pattern (2.73±1.56) whereas the subjects with Arch pattern shows lowest prevalence of dental caries (1.39±1.28) & this result came out to be statistically significant ($P < 0.05$).(Table 2)

When the mean comparison of different fingerprint pattern was done between male and female then all these results were found to be statistically insignificant with p value 0.467, 0.274 & 0.105 respectively. (Table 3)

In the present study Dental caries experience was assessed by correlating the DMFT Score with different fingerprint pattern (Arch, Loop and Whorl pattern) and it was found that the DMFT Score is in negative correlation with Arch pattern (r= -0.465) and this result was found to be statistically significant with p value < 0.001. Similarly, the DMFT Score is in negative correlation with Loop pattern also (r= -0.088) but this result was found to be statistically insignificant with p value 0.448. Alternatively, the DMFT score is in positive correlation with Whorl pattern (r= 0.482) and this result was found to be statistically significant with p value < 0.001 (Table 4). This means prevalence of dental caries increases with whorl fingerprint pattern and decreases with Loop and Arch pattern. In other words, it means that with an increase in the whorl pattern , the patient had an increased susceptibility to dental caries and with an increase in the Loop or Arch pattern the patient had decreased susceptibility to dental caries and vice versa. Thus our study shows significant relationship between Whorl fingerprint pattern and Dental caries.

DISCUSSION

When Dermatoglyphics pattern was analyzed in our study it was found that Whorl pattern was seen in majority of study subject (44.7%) followed by Arch pattern (40.8%) while Loop pattern was seen in only 14.5% study subject and all these findings are in contrast with the study done by Saumya Navit et al[11] where the frequency of loops pattern was highest (71%) followed by whorls (25.1%) and arches (3.9%). This may be due to the fact that our study sample consisted of OPD patients of dental college who were having some or the other dental problems especially dental caries and thus the frequency of whorl pattern was seen in majority of the study subjects.

In the present study the whorl pattern of fingerprint was found to be more prevalent in subjects having the highest mean of dental caries (2.57) and this findings are found to be similar to the studies conducted by B. R. Chinmaya et al[12] ., Vijender *et al*.[13], and Madan *et al.*[14] (2.82, 2.65, & 2.86) & contrast with the study conducted by Sengupta et al (2013)[15], where participants with caries mainly had loop pattern.

On the other hand the Arch pattern of fingerprint was found to be more prevalent in subjects having the lowest mean of dental caries (1.39) and these findings are found to be similar to the studies conducted by S Ekta et al (1.23)[16] & contrast with the study conducted by B. R. Chinmaya et al[12] where Loop pattern was found to be more prevalent in subjects having the lowest mean of dental caries (1.58).

As per our study, there exists a statistically significant relationship between whorl pattern and dental caries. The whorl pattern and dental caries were positively correlated (r = 0.482) (P =0.000). Thus, with an increase in the whorl pattern, there was an increase in dental caries. This is highly significant so, we analyze the possible reason for this significance. Dermal ridge differentiation takes place early in the fetal development. It is known that finger and palm prints are formed during the first 6 to 7 weeks of the embryonic period and are completed after 10 to 20 weeks of gestation. Abnormalities in these areas are influenced by combination of hereditary and environmental factors. These abnormalities are expected to appear only when the combined factors exceed a certain level. This threshold theory is now generally accepted and has been extrapolated by the studies of Carter (1969) & Mastunga (1977).[17] Basically, the pattern of the skin lines on the finger is formed in the second trimester of the fetus and it does not change for each individual during the life. The dermal ridges develop in relation to the volar pads, which are formed by the 6th week of gestation and reach maximum size between 12 and 13th week. The epidermal ridges of the fingers and the palms as well as facial structures like lip, alveolus, palate and tooth bud are also formed from the same embryonic tissue (ectomesenchyme) during the same embryonic period (6-9 weeks). The genetic message in the genome whether normal or abnormal is deciphered during this period and is reflected by Dermatoglyphics.[18]

However, a negative correlation was observed for arch pattern (r = - 0.465) and dental caries. Thus, in the subjects with the Arch pattern, Dental caries susceptibility was very less. Abhilash et al[19] conducted a study and found similar results.

Hence, with genetic information, the susceptibility for caries due to abnormality in the tooth structures like alterations in dental hard tissues like structure of dental enamel, tooth eruption and development may be reflected in the Dermatoglyphics pattern namely whorl , Arch and loop patterns. Hence, Dermatoglyphics could be an indicator of genetic susceptibility of an individual to dental caries.[20]

The strength of this study lies in the fact that this is the first study in Patna regarding Dermatoglyphics & dental caries. Apart from that a single examiner carried out the reading of all the handprints to decrease inter-examiner variability.

However, Limitation of the study is that selection of the age group in this study is 18-40 years and here dental caries can be due to other factors such as environmental factors etc and Dermatoglyphics mainly deals with genetic factor so lower age group selection would be able to reduce the bias to prove Dermatoglyphics as potential

genetic marker of dental caries. Apart from that the study sample size was small, institutional based and of short duration so further longitudinal study can be done on large sample size for better generalizability of results.

Despite the limitations, the findings of this study provide further insight in the role of various Dermatoglyphics pattern proving as potential indicator of dental caries in humans.

CONCLUSION

From this study it is clear that Dental caries susceptibility of an individual increases in the subject having Whorl pattern & thus there is a definite correlation between fingerprint patterns and dental caries.

Thus, Dermatoglyphics helps in the prediction of dental caries much before its initiation so that preventive measures can be implemented on time. In a developing country like India, it might prove to be a non invasive, inexpensive, and effective indicator for dental caries.[21] These patterns may represent the genetic makeup of an individual and finally his/her predisposition to certain diseases.

Thus 'Dermatoglyphics' might prove to be useful not only for the purpose of screening but also for studying the behavior of dental caries.[22]

Since, Dermatoglyphics is still an inexact science at the present time, further extensive research and studies in this field have to be done in order to determine, ascertain and to evaluate the significance of these variations in dermatoglyphic features of patients with dental caries.[9] Hence, it's not the end but an opening to a new arena, where in near future detecting oral diseases at an early stage will be possible using Dermatoglyphics as a diagnostic tool.[14]

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Figure 1: Distribution of study subject according to their Gender

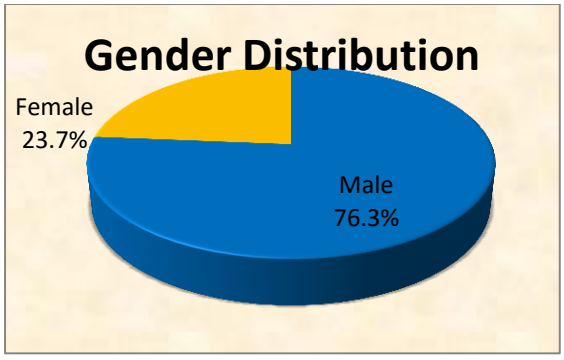

Table 1: Distribution of subjects based on their fingerprint patterns

Type of fingerprint pattern	No of subject	Percentage
Arch	31	40.8
Loop	11	14.5
Whorl	34	44.7
Total	76	100.0

Table 2: Comparison of study subject according to their Caries experience & Dermatoglyphics pattern

Type of finger	N	Decayed		Missing		Filled		DMFT	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Arch	31	1.00	1.06	0.19	0.54	0.19	0.48	1.39	1.28
Loop	11	1.36	1.36	0.36	0.67	1.00	0.77	2.73	1.56
Whorl	34	2.24	1.37	0.91	1.06	0.44	0.93	3.59	2.18
Overall	76	1.61	1.37	0.54	0.89	0.42	0.79	2.57	2.03
Statistical Analysis:									
Arch Vs Loop Vs Whorl		P=0.001 S		P=0.003 S		P=0.012 S		P=0.000 S	
Arch Vs Loop	Mean Difference	0.36		0.17		0.81		1.34	
	P value	P=0.688 NS		P=0.829 NS		P=0.009 S		P=0.086 NS	
Arch Vs Whorl	Mean Difference	1.24		0.72		0.25		2.20	
	P value	P=0.000 NS		P=0.002 S		P=0.385 NS		P=0.000 S	
Loop Vs Whorl	Mean Difference	0.88		0.55		0.56		0.86	
	P value	P=0.118 NS		P=0.144 NS		P=0.088 NS		P=0.347 NS	

Statistical Analysis:
ANOVA one way test for mean comparisons among Arch Vs Loop Vs Whorl.
Tukey's Post Hoc test for multiple comparisons (mean difference comparisons between two groups).

Table 3: Mean comparison of Finger print types between males and females

Finger print type	Gender	N	Mean	SD	Mean difference	P value
Arch	Male	58	3.86	2.65	0.53	0.467 NS
	Female	18	4.39	2.73		
Loop	Male	58	2.55	1.48	0.45	0.274 NS
	Female	18	3.00	1.61		
Whorl	Male	58	3.60	2.61	1.16	0.105 NS
	Female	18	2.44	2.64		

Statistical Analysis: Independent sample t test. Statistically significant if P<0.05

Table 4: Correlation between caries experience and fingerprint patterns

Finger print type Vs DMFT	No of pairs	Correlation coefficient (r)	P value	Result
Arch & DMFT	76	-0.465	0.000	Significant
Loop & DMFT	76	-0.088	0.448	Not Significant
Whorl & DMFT	76	0.482	0.000	Significant

Statistical Analysis: Karl Pearson's correlation Analysis.

Original Article Journal of Oral and Dental Health

The Role of Three Dimensional Computed Tomography In The Evaluation of Temporomandibular Joint Ankylosis

Abstract

AIM: The goal of the study was to assess the role of three-dimensional computed tomography (3D-CT) in the valuation of temporomandibular joint (TMJ) ankylosis and significance in treatment planning. The aim of study were to measure and assess the mediolateral extent of ankylosis mass in 3D-CT and to compare the extent with intraoperative evaluation. The study was also aimed to measure the coronoid process elongation in 3D-CT and its inference in treatment planning.

MATERIALS AND METHODS: This prospective study included 3D-CT evaluation of 11 patients with TMJ ankylosis during the period of September 2020–May 2022.

RESULTS: The 3D-CT assessment provided the length of the coronoid process and the relation of vital structures including maxillary artery to the ankylosed mass. Measurement of ankylosed mass also supports in preoperative quantity of the graft essential to reconstruct the defect succeeding removal of the ankylosed mass. Conclusion: 3D-CT is beneficial implement in the diagnosis and treatment planning of TMJ ankylosis.

Keywords: Computed tomography, temporomandibular disease, temporomandibular joint, three dimensional, unilateral ankylosis

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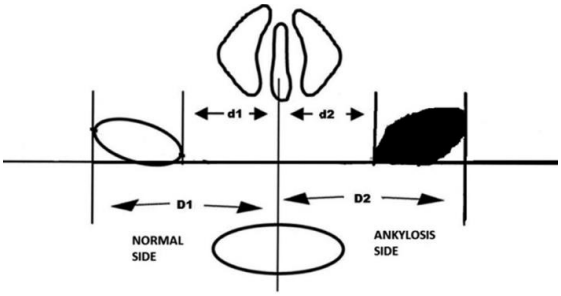
INTRODUCTION

Imaging could be a root for distribution of craniofacial diagnosis. Current progresses have directed to several assorted skills and approaches. Oral and maxillofacial surgeons have many radiographic projections and quite a lot of specific radiographic techniques. The surgeon usually chooses a radiographic examination which will outcome in supreme diagnostic produce with least amount of radiation exposure to patient. The temporomandibular joint (TMJ) ankylosis is an enormously disabling condition that causes hitches in mastication, deglutition, speech, appearance, and hygiene. In growing patients, distortions of the mandible and maxilla may along with malocclusion. The definite treatment of TMJ ankylosis significant role in preoperative evaluation of the kind and extent of the deformity. The standard radiography had played a major role in TMJ ankylosis till last few decades. The techniques used for TMJ imaging include plain radiography, panoramic radiography, tomograms, conventional computed tomography (CT), arthrography, three-dimensional CT (3D-CT), magnetic resonance imaging, ultrasonography, arthroscopy, kinesiology, and radionuclide imaging. The typical mandibular successions propositioned only two-dimensional view of the joint. The orthodox radiographs often impose several

views of the joint and prime to more radiation exposure to the patient. They need a hindrance of unfortunate structural resolution from superimposition of together anatomic structures and geometric error. Ankylosis is not clearly visualized in most of the standard radiographic techniques. Recently, 3D-CT constructed from the two dimensional image of CT scan to pretend the soft tissue or bony structure of the factual board was planned. With 3D-CT image, the extent and side by side of the flaw are visibly evident. The entire scan technique persists a couple of gesture artifacts are minimized. With the evolution of radiographic technology, 3D-CT has become a crucial radio diagnostic method in TMJ ankylosis. Due to the increasing use of the 3D-CT and its standing in the diagnosis, we review novel advances in 3D imaging and its conception and conjunction of the data with its clinical application in diagnosis and treatment planning of TMJ ankylosis.

MATERIALS AND METHODS

To This prospective study included 3D-CT evaluations of 11 patients with TMJ ankylosis through the amount of September 2020–May 2022. The patients of both sexes, of age group from 8 to 25 years, with unilateral ankylosis, with no previous history of surgery, and willing to undergo 3D-CT were included with in the study. Patients converge with in the study were imperiled to thorough case history and clinical examination. Constraints were observed and recorded are: Basis of the ankylosis, amount of mouth opening, and incidence of deviation of midline. The number of mouth opening was recorded by measuring interincisal distance between upper and lower incisors using slide calipers on maximum mouth opening. Following this, all patients underwent 3D-CT scan using Siemens 64-slice CT machine. Scan was performed using the subsequent parameters: section thickness, 1.0 mm; spiral gap, 1.0; window width, 2000 HU; window level, 600 HU; voltage, 120 kV; and electrical phenomenon, 100 mA. The CT images were reformatted into 3D-CT using Syngo CT. 3D software. The medial broadening of ankylosis physique and extent of coronoid process on intricate crosswise were recorded.The medial extension of ankylosis was resolved as follows. In the transverse plane, a orientation paramedian line was haggard to license over the nasal septum and the middle of the occipital foramen. Additional horizontal line vertical to the perpendicular line and curvature to the condyle was built. The remoteness after the midline to the medial pole was restrained as d1 and d2 on the typical and ankylosed sides, correspondingly. The lateral poles were projected on the horizontal line and distance from the midline was measured as D1 and D2, on standard and ankylosed sides, separately. The difference between D1 and d1 denotes normal condylar width on the unaffected side. The difference between D2 and d2 gives the size of ankylosed mass. The length of the coronoid was measured by drawing a line passing tangent to the mandibular incisura. A group of three maxillofacial surgeons were randomly allocated cases for surgical management. All data were logged and convinced to the operating surgeon. The scores are given by the surgeon postoperatively for each case, affording to the expediency evaluation Proforma. The surgeon evaluates the usefulness of 3D-CT, considering the following perspectives: treatment planning, surgical approach, extent of difficulty, and anticipatory complications. Slashes of the practicality evaluation Proforma are as follows:0 - 3D-CT data were little or not useful 1 – Informative 2 – Useful 3 - Very useful. These scores were organized and deliberated.Study was to compare the preoperative clinical and radiological findings of joint ankylosis with those found at surgery and to evaluate the utility of 3D-CT in the diagnosis and treatment planning of TMJ ankylosis.



Method To Determine Width Of Ankylosis Mass

RESULTS

This study was conducted on 11 patients who reported to the Department of Oral and Maxillofacial Surgery and were diagnosed as unilateral TMJ ankylosis. They underwent clinical examination, routine radiographic examination, and in addition, 3D-CT examination.

Case no.	Age/sex	Cause	Affected side	Mouth opening (mm)	Ankylosis mass (mm)	Coronoid length (mm)	Surgeon's score
1	10/M	Trauma	Left	3	21.4	19.4	2
2	13/M	Trauma	Left	2	21.8	19.8	3
3	7/F	Infection	Right	6	22.7	19.7	2
4	8/F	Unknown	Left	8	20.9	19.3	3
5	9/M	Trauma	Right	4	22.8	19.8	2
6	8/M	Trauma	Left	3	23.6	26.5	3
7	20/F	Trauma	Left	4	23.2	20.9	1

The resulting information were placid and verified. In our study, trauma was key etiologic aspect for TMJ ankylosis, secretarial for 8 out of 11 patients. In our study on unilateral TMJ ankylosis, left side was more commonly involved accounting for 63.63% of the cases reported. Mouth opening ranged from 2 to 8 mm. The mean inter-incisal mouth opening was around 4.72 mm. 3D-CT confirmed the mandibular angle prominence and accentuation of the antegonial notch, together with reduced vertical height of the ramus. The mediolateral width of ankylosed build extended from 20.96 to 23.65 mm. The coronoid process span ranged from 19.27 to 27.63 mm. In two of our cases, 3D-CT dimensions exhibited extention of coronoid process and coronoid process was overhead the zygomatic arch in 3-D CT. The elongated coronoid process was confirmed at surgery and coronoidectomy was performed.

DISCUSSION

Temporomandibular disorders (TMD) constitute a complex set of specific entities with a reported prevalence of 5–12%. Toyama *et al*.[2] stress that imaging diagnosis is essential in differentiating and evaluating restricted mouth opening. Ankylosis causes pain and difficulties with speech, eating, and oral hygiene, which TMJ ankylosis in childhood[3] can impair mandibular growth and function, producing a severe facial deformity leading to "bird face." According to Sawhney[1] longstanding, early-onset ankylosis in childhood results in marked facial asymmetry, whereas the bony changes are minimal when the problem occurs during adolescence or the patient had early treatment. Ankylosis[4] is commonly associated with trauma (13–100%), local or systemic infection (0–53%), or systemic diseases such as ankylosing spondylitis, rheumatoid arthritis, or psoriasis. In our study, trauma (72.72%) was most common etiology. This was similar to the data of Schobel *et al*. and Behcet *et al*. The preoperative mouth opening oscillated from 3 to 9 mm. The mean value of mouth opening was 4.36 mm. Preoperative appraisal frequently involves of history, and physical and radiographic examination. Radiography is an essential diagnostic tool for TMJ ankylosis. Patient aligning is decisive in panoramic imaging of the condyles. If the head is tending posteriorly, the image of the condyle appears trampled and can feign the existence of an osteophyte. On the other hand, if the head is inclined anteriorly, the condyle may give the impression of sclerotic. This frequently requires numerous view, hence further radiation exposure to the patient. Ahlqvist *et al.'s* study revealed that thin bone separating the glenoid fossa from the middle cranial fossa and the external auditory canal/middle ear have an inclination to imaging planes used in TMJ radiography, making them highly susceptible to projection artifacts. Sanders *et al*. reported that conventional radiography underestimated the extent of the bony ankylosis that is found at the time of operation. CT is accurate in two dimensions. However, the surgeon has to construct a three dimensional image in his mind similar to the shape and form of the deformity. Multislice CT[7] represents a potential advancement in CT and allows obtaining thinner slices and high image quality in less acquisition time. This leads the way for development of faster and accurate three-dimensional imaging. The introduction of spiral CT is another major advancement in CT scanning, particularly considering the reduction in acquisition time and improvements in two-dimensional and three-dimensional reconstructions. In our study, the 3D-CT provided excellent visualization of the osseous components of the condylar process of the mandible and the glenoid process of temporal bone, as demonstrated by Kursunoglu *et al*. In cranial morphometry where anatomical measurements are made using images, quantification and accuracy are the principal concerns. In our learning, the dimension of coronoid length aided in the diagnosis of coronoid extension in two of our cases. The 3D-CT images clearly demonstrated hyperplastic coronoid process and joint surfaces, as reported by Akan and Mehreliyeva.[10]Complete in surgery and coronoidectomy was achieved to complete suitable mouth opening. The measurement of ankylosis mass helped in estimation of amounts of autogenous and alloplastic material required for gap arthroplasty prior to surgery. Detailed knowledge of the deformity and three-dimensional view of ankylosis mass resulted in accurate and expeditious procedures. 3D-CT not only revealed the relationship of ankylosis mass with adjacent vital structures, but also provided detailed view of condylar head, glenoid fossa, sphenoid, and temporal bone. Metwalli[5] in his study measured the distance between the internal carotid artery, the internal jugular vein, the maxillary artery, and the medial pole of the mandibular condyle, and found that this distance decreased on the ankylosed side compared with the normal. Concern about the possible risk of damage to any of these structures compromises the exposure necessary for adequate resection of the ankylosed segment and is often the most common cause of subsequent re-ankylosis. However, identification of these structures and prior measurement of width of ankylosis mass on the 3D-CT reformatted images aided in the resection of ankylosis build without instigating any impairment to these vital edifices, and therefore providing a decent breach among the mandibular remnant and the base of the skull. Hence, the incidence of recurrence decreased remarkably irrespective of whether the gap was reconstructed with a graft or not.

CONCLUSIONS

The active handling of TMJ ankylosis mandatory comprehensive preoperative assessment of the category and level of the abnormality. Since relapse is the key obstacle in the management of TMJ ankylosis, specific surgical treatment planning is needed to diminish the occurrence of recurrence. Plain and panoramic radiography does not provide acceptable information of the ankylosed build and its relation with together structures. The length of the coronoid process and the relation of vital structures including maxillary artery to the ankylosed mass also need to be analyzed before treatment planning, which is possible on a 3D-CT examination. The 3D-CT images not only help in planning of surgical approaches, but also guide in anticipatory complications. The importance of 3D-CT images in quantitative and qualitative analysis of the craniofacial complex is clearly recognized. 3D reformatted images can clearly determine hyperplastic coronoid process and joint surfaces. Measurement of ankylosed build also aids in preoperative measurement of the graft mandatory to reconstruct the defect following removal of the ankylosed mass. Detailed knowledge of the ankylosis resulted in accurate and precise surgical procedures. Our study accomplishes that 3D CT is a useful tool in the diagnosis and treatment planning of TMJ ankylosis.

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Application of Biodegradable Plates for Management of Pediatric Mandibular Fractures

Abstract

OBJECTIVE: We evaluated the clinical outcomes of a biodegradable plate system for the internal fixation of mandibular fractures in children, and applied the imaging structures of fracture healing and bone variations about the biodegradable plates and screws through follow-up.

PATIENTS AND METHODS: We join up 39 patients (22 male, 17 female, average age 4 years 10 months) with unalike mandibular fractures.We castoff 2.0-mm resorbable plates to reparation the fractures. Postoperative follow-up vacillated from 6 months to 5 years; usual follow-up was 1 year 2 months. The result procedures recognized and evaluated encompassed facial symmetry, mouth opening, occlusal relationship, infection, nonunion, malunion, and plate dehiscence..

RESULTS: The We secure 42 fractures with 43 resorbable plates; the fracture site of one patient (aged 11 years 3 months) was fixed with two plates. Two patients established small fistulous withers at the intraoral incision 2 months after surgery; the fistulas healed after 1 month without unusual treatment. In the other patients, the incision healed well, there was facial symmetry, mouth opening was >35 mm, and occlusion was good. Follow-up computed tomography scrutiny data were existing for 20 cases, and exposed dissimilar degrees of radiolucency representing that osteolysis had arose. Radiolucency was pragmatic everywhere the resorbable plates 1 month after the surgery. The degree and profundity of the radiolucent area were noticeable within 1 year of surgery. In the second year, there were understandable repairs, with the bony defect zones fetching narrower. After 2 years, the bony defect areas had nearly disappeared.

CONCLUSION: Biodegradable fixation devices are harmless and effectual for pay for pediatric mandibular fractures. Osteolysis usually follows biodegradable fixation of pediatric mandibular fractures, and has no antagonistic effect on fracture healing..

Keywords: Biodegradable plate Children Internal fixation Mandibular fracture Osteolysis PLGA

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INTRODUCTION

Mandibular fracture is one in all the foremost common varieties of medicine external body part trauma because the mandibular bone in kids is comparatively soft and has smart physical property, incomplete fractures square measure additional common; as there square measure adult tooth buds within the mandibular bone, the treatment of jaw fractures in kids is commonly conservative. Given the progress created in bone-repair materials and also the improvement of bone-repair technology, then proportion of kids with jaw fractures treated with open reduction and internal fixation(ORIF) has raised. Currently, Ti plates and screws square measure the quality for craniomaxillofacial rigid internal fixation, however these square measure subject to disadvantages like tangibleness, visibility, temperature sensitivity, interference with picture taking imaging, and excessive stress shielding. moreover, metal fixation could limit jaw growth in kids, and needs to be removed in a very second operation. perishable fixation doesn't need removal and can be absorbed bit by bit e appreciable benefits within the management of jaw fractures in kids. However, there square measure some disadvantages to perishable fixation. First, the length of the operation is

longer because the plate bending needs a heat supply, and resorbable screw placement needs screw-thread pretapping before screw insertion. Second, because of short strength of the fastened material, the plates could break and displacement and nonunionised may occur when surgery . Third foreign body reaction and complications could occur throughout the biodegradation and absorption of the plate and screws. during this paper, we tend to summarize and analyze the results of perishable fixation of medicine jaw fractures, and observe the imaging findings for fracture repair and bone changes round the perishable plates and screws throughout followup.

MATERIAL AND METHODS

Data were collected from thirty nine patients UN agency underwent ORIF with perishable plates at our department from July 2019 to December 2022. there have been twenty two male patients and seventeen feminine patients. The mean age was three years 01 months. Twelve patients were aged 0e3 years (30.8%), nineteen were aged 3e7 years (48.7%), seven were aged 7e12 years (17.9%), and one was >12 years recent (12 years nine months, 2.6%). The causes of fracture were injuries from falls (26 cases), of that ten were from high falls; and traffic accident injuries (13 cases). Among the cases, there have been ten cases of 1-site fracture, fifteen cases of 2-site fractures, thirteen cases of 3-site fractures, one case of a 4-site fracture, and eighty three fracture sites in total. there have been nineteen cases of symphysis fracture (19 sites),14 cases of parasymphysis fracture (15 sites), six cases of corpus fracture (six sites), 3 cases of angle fracture (four sites), and twenty six cases of process fracture (39 sites). Among the process fracture cases, there have been thirteen cases of unilateral fracture, thirteen cases of bilateral fracture, eighteen cases of intracapsular fracture (27 sites), and 9 cases of neck fracture (12 sites).All fractures were fastened employing a perishable plate fixation system of 85:15 poly(L-lactide-co-glycolide) (PLGA, PolyMax; Synthes, Oberdorf, Switzerland). The plates square measure out there within the style of 4-hole plates (1.0-mm thick). The screws for the system (2.0-mm diameter) square measure 4e10-mm long. The exclusion criteria were delayed and malunion fracture, bone defect fracture, infected fracture, and break.

Surgical Methods

All fractures were treated through intraoral tissue layer incision and therefore the fracture lines were exposed adequately. Steel wires were accustomed ligate 4e6 teeth on either side of the fracture line loosely ab initio. The fracture was reduced, the pre-injury occlusal relationship reestablished, so the wires were ligated tightly (Fig. 1).

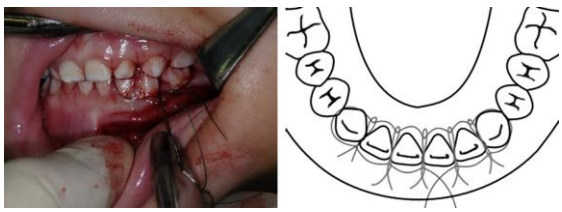

Figure no 1: Steel wires were used to ligate 4e6 teeth on both sides of the fracture line loosely initially. The fracture was first mobilized and the pre-injury occlusal relationship reestablished, then the fracture was reduced and the wires ligated tightly.

An assistant maintained an honest occlusal relationship, and intraoperative os fixation (MMF) wasn't needed. A 4-hole resorbable plate was command on the inferior border of the jaw and custom-made to the bone surface, with two screw holes on all sides of the fracture. The screw holes were trained and therefore the screws inserted once sound with a hand-held faucet to cut the screw threads (Fig. 2).Treatment Of process Fractures:All process fractures were treated cautiously. Soft occlusal splints were unreal for patients aged >3 years.

Figure no 2: An assistant maintaining a good occlusal relationship during surgery; the mandibular fracture was fixed with one resorbable plate along the lower margin of the mandible.

The patients wore the splints once surgery throughout the day for three months. within the initial month once surgery, the patients were needed to follow a spoon food and to perform mouth gap exercises two weeks once surgery.Patients were followed at one, 3, and six months, and one year once surgery. The ligating wires were removed one month once surgery. Clinical examination was performed to assess wound healing, facial symmetry, mouth gap, occlusal stability, infection, nonunion, malunion, and plate organic phenomenon. Fracture healing was assessed mistreatment picture taking examination.

Figure no 3: Children aged >3 years with condylar fractures wore soft occlusal splints for 1e3 months after surgery.

RESULTS

The We mounted forty two fractures with forty three resorbable plates. we tend to used nineteen plates for nineteen symphysis fractures; sixteen plates for fifteen parasymphysis fractures, 2 plates were accustomed fix

the fracture website in one patient (aged eleven years three months); six plates for 6 body fractures; and 2 plates for 2 angle fractures.Clinical Follow-Up:At one week once surgery, the injuries of all patients had well well and there have been no surgical complications. surgical follow-up ranged from vi months to five years; average follow-up was one year two months. In 2 cases of left parasymphysis fracture combined with right outgrowth fracture, little fistulas developed at the intraoral incision two months once surgery; the fistulas well once one month while not special treatment. The incisions of the opposite patients well well, there was facial symmetry, a decent occlusal relationship, and mouth gap was >35mm. There was no synovial joint anchylosis, nonunion, or osteitis.Imaging Findings:Twenty cases underwent one or a lot of CT (CT) examinations throughout the complete follow-up amount, that showed that the fracture lines well ordinarily. we tend to discovered radiolucency round the resorbable plates on the CT scans of of these twenty patients as early as one month once surgery, indicating that lysis had occurred. The extent and depth of the region was obvious inside one year once surgery, and also the bone underlying the plates was clearly irregular and depressed when put next with the adjacent bone. within the second year, there have been obvious repairs to the radiolucent region and also the bony defect space had become shallower. once two years, the bony defect areas had virtually disappeared. within the patient aged twelve years nine months, we tend to didn't observe lysis on CT at three months once surgery, however there was slight bone biological process at ten months once surgery; this persisted even once one.5 years. the opposite patients were aged seven months to ten years. process form within the outgrowth fractures was bit by bit fixed up once transforming. The bilateral outgrowth fractures were symmetrical; the unilateral outgrowth fractures were asymmetrical.

DISCUSSION

When treating medicine external body part fractures, factors like age and anatomical web site and quality of the fracture ought to be thought-about . In general, treatment of patients with undisplaced or incomplete articulator fracture ought to embody diet, shut observation, and regular follow-up. For displaced and mobile articulator fractures, monomandibular fixation will be performed victimization associate arch bar or acrylic splint; an alternate methodology is intermaxillary fixation. because the contour of the first dentition is lower, ligating the arch bar to the dentition is difficult,is that the same situation in mixed dentition, and circummandibular wires and a few type of skeletal suspension area unit usually needed. In youngsters, particularly younger youngsters, monomandibular fixation (MMF) cannot cut back fractures anatomically, and doesn't facilitate early recovery of articulator perform. moreover, as youngsters usually realize it troublesome to get together with the treatment conditions, conservative treatment is comparatively troublesome. ORIF reduces fractures anatomically, and kids will resume a standard diet as presently as doable, that ensures the nutrition needed for fracture repair and bone growth . It also can cut back the length of articulator immobilization, that is contributory to the recovery of joint perform . ORIF is that the normal treatment for displaced articulator fractures in youngsters , however problems relating to the appliance of metal fixation could arise, like allergies, stress shielding, corrosion, limitation of bone growth, and plate migration, necessitating a second operation to get rid of the metal plates. when thirty years of development, associate increasing variety of clinicians have bit by bit accepted the employment of perishable fixation for external body part fractures. within the field of craniomaxillofacial surgery, perishable fixation is especially used for oral and external body part trauma, orthognathic surgery, and bone vault modeling. additionally to the metal plating system, perishable fixation is another choice for external body part skeletal fixation. The perishable plating systems usually used area unit chiefly composed of polyglycolic acid (PGA), poly(L-lactic acid) (PLLA), and their copolymers . Generally, plate bending needs a heating device to cause the compound chains to bend and not break, and placement of the resorbable screws needs pretapping of the screw threads before screw insertion; consequently, the operation is additional sophisticated and additional long compared therewith for similar metal fixation systems . additionally, it's been reportable that articulator fractures are treated with ultrasonic-aided fixation of perishable implants .As the fractures heal, the absorbable materials area unit absorbed when a particular amount while not necessitating further surgery for removal, that may be a clear advantage once treating displaced and mobile medicine articulator fractures. Most of the patients during this study were aged 0e7 years recent (79.5%) and had primary and mixed dentition and adult tooth germs within the jawbone. we tend to placed a perishable plate on the lower margin of the jawbone, which might effectively avoid injuring the adult tooth germs. In deciduous and mixed dentition, the crowns of the teeth area unit short, associated fixing them with an arch bar is troublesome, thus we tend to ligated the teeth on either side of the fracture line, that was similar to tension band compensation fixation. This fixation methodology provides reliable stability for medicine articulator fractures, and plate organic phenomenon and nonunionized doesn't occur postoperatively. wherever temporary intermaxillary fixation couldn't be performed throughout the operation, associate assistant control and pushed up the jawbone to take care of traditional occlusion before plate fixation. Believed that this free-hand technique is fairly effective for maintaining smart centrical occlusion before fixation of isolated medicine articulator fractures. many clinical studies reportable that MMF was needed when surgery for medicine or adult articulator fractures involving perishable fixation . specially, MMF ranged from one to four weeks for combined articulator and appendage fractures . Of the thirty-nine cases of articulator fracture during this study, twenty six were combined with unilateral or bilateral appendage fracture. This cluster failed to endure intermaxillary fixation or traction throughout and when surgery. youngsters aged >3 years United Nations agency had appendage fractures wore fictitious soft occlusal splints. The splints guided and maintained traditional occlusion, that was contributory to appendage reworking and failed to have an effect on the mouth gap exercises. picture taking imaging at follow-up showed that despite intracapsular or neck fractures, the form of the process was smart and joint perform was traditional.This confirmed that conservative treatment of pediatric

condylar fractures (age <12 years) is stable and reliable, and surgery isn't required . Biodegradable fixation is conducive to early recovery of mandibular function. In children with combined mandibular and condylar fractures, joint ankylosis may be prevented with reliable biodegradable fixation and early postoperative joint function training. The biodegradable fixation system is employed for mandibular fractures and even condylar fractures in adults, and is stable and reliable. However, some researchers question its mechanical strength, even arguing that when the role played by resorbable plates is helping to take care of fracture reduction and alignment they ought to be in the course of additional approaches (e.g., wires, splints, and intermaxillary fixation). We believe that the retention force of biodegradable fixation could also be insufficient for mandibular fractures in older children and adults. Mechanical strength remains a key problem limiting the broader use of biodegradable fixation. The complications of biodegradable fixation are mucosal dehiscence, plate dehiscence, nonunion, malunion , and foreign body reaction. Foreign body reactions include local swelling, fistula formation, sterile abscess, and osteolysis . the foremost common foreign body reaction is aseptic abscess .Described four patients who underwent cranial vault modeling employing a standard resorbable plating system (PLLA) for fixation. They reported that the plates weren't absorbed after over 2 years, necessitating a second procedure for removal. At a 6-month followup, reported radiographically apparent local osteolysis 2 months after curettage subsided.Reported on 11 cases of anterior mandibular fracture in adult patients fixed with self-reinforced PLLA lag screws; one patient had osteolysis 6 weeks after surgery, which disappeared 6 months later. within the literature, osteolysis is rare when resorbable plates and screws were utilized in the oral and maxillofacial regions. This may be because osteolysis is extremely rare in itself. another excuse may be that the radiographic examinations at follow-up often involved plain films, like panoramic radiographs, and CT scans were relatively rare. Panoramic radiographs only disclose the change in screw hole density, but cannot reveal changes within the bone round the resorbable plates. during this study, no osteolysis occurred 3 months after surgery within the patient aged 12 years 9 months with mandibular body fracture; however, there was slight local osteolysis 10 months after surgery, which persisted 1.5 years after surgery. within the younger children, osteolysis appeared earlier and was more severe. Is osteolysis more common in children after using the resorbable plate system? Is osteolysis not obvious or relatively rare after biodegradable fixation of mandibular fracture in older children and adults? thanks to the dearth of clinical and imaging data from adult mandibular fractures fixed with resorbable plates, the answers to those questions aren't forthcoming. In many patients, the drill holes for screw insertion are visible on radiographs as persistent radiolucent areas . Some researchers believe that the screw holes may function a measure of degradation time therein once the screw hole isn't any longer visible, it may be assumed that the fabric has been resorbed. Observed that the screw holes of 85:15 PLGA reossified 24 months later, and people of 70:30 P (L/DL) LA reossified 36 months later.Screw hole reossification was subject to site-dependent variability, generally being more rapid at the mandibular angle and body as compared with the symphysis. Effect of PGA rods in 12 sheep with standardized osteochondral fractures of the medial femoral condyle fixed with PGA rods, and observed moderate to severeosteolysis at 4e6 weeks, with maximum changes at 12 weeks in 10 animals. The dissolved areas began to repair 6 months after surgery, and weren't fully repaired 2 years after surgery. We believe that biodegradable fixation absorption and osteolytic region repair aren't synchronous, and therefore the time from plate implantation to complete bone defect repair should include the time taken for absorption and for osteolytic region repair. From the observation data, osteolysis could have occurred 1 month after surgery, reaching the most range 1 year after surgery in most of the cases, and repair began thereafter. within the second year, the extent of osteolysis was reduced, and also the defects were distinctly repaired 2 years after surgery in most of the cases. This result was in keeping with the information from the manufacturer, which stated that absorption would span approximately 1 year, but that bone defect repair would span approximately 2 or more years after surgery. during this study, all fractures healed normally no matter the extent of osteolysis; in other words, osteolysis failed to affect fracture healing.

CONCLUSION

Biodegradable fixation devices restoration pediatric mandibular fractures carefully and efficiently. Osteolysis generally surveys biodegradable fixation of pediatric mandibular fractures, and is classically more Spartan in children aged less than 12 years. Initial osteolysis appears 1 month after surgery, but does not touch fracture healing.

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Prevalence of Partial Edentulism Based on Kennedy's Classification among the Patients Visited to a Government Dental Hospital, Kolkata, India – A Patient Survey

Abstract

BACKGROUND: A partially edentulous arch classification helps in identifying possible combinations of teeth to edentulous ridges, thus facilitating discussion, communication and comprehension of the indicated prosthetic treatment among dental professionals, students and technicians. Kennedy's classification provides immediate visualisation, recognition of prosthesis support and assessment of design features of rpd. Replacement of missing teeth is a common patient need and with increase in life expectancy of individuals the need for restoration of partially edentulous condition is increasing.

AIM: The purpose of this study was to evaluate prevalence of partial edentulism of maxillary and mandibular arch based on Kennedy's classification.

STUDY DESIGN: Cross sectional study.

METHODOLOGY: The study was carried out with a sample population of 1000 patients visiting the opd of Dr. R. Ahmed Dental College and Hospital between 2019 to 2020. Patients with one tooth missing (3rd molar excluded) and age range between 18 to 80yrs were given the opportunity to participate in this study .Subjects were informed about the aim of the survey and consent was taken. Patients with complete edentulism were not considered. A specific questionnaire was presented to the patients. Pattern of partial edentulism was recorded after doing thorough oral examination and recorded data was registered on to proforma. The data collected was analysed using appropriate techniques.

RESULTS: The study showed that there was significant association between age and partial edentulism based on Kennedy's classification($p<0.0001$). Test of proportion showed that proportion of Class-3 was significantly higher in group 1 (94.83%) and in group 2 (73. 23%) and Class-1 was significantly higher among the older aged patients i.e. group 3 (88.00%) ($Z=5.56$; $p<0.001$). There was no significant association (p value < 0.05) of different Kennedy's classes with gender.

CONCLUSION: Age had significant relationship with prevalence of partial edentulism. Kennedy's class 3 partially edentulous situation was found to be most common in both maxillary arch and mandibular arch. Gender had no significant relation with the prevalence of partial edentulism irrespective of age groups and dental arches

.Keywords: Kennedy's classification, partial edentulism, age, gender

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INTRODUCTION

Partial edentulousness is a situation in which one or more but not all natural teeth are missing in a dental arch [1]. Generally, it occurs to caries, periodontal problems, traumatic injuries, impactions, supernumerary teeth, and neoplastic and cystic lesions[1]. Various studies have reported caries as the main causative agent for tooth loss[2], [3, 4]. Dental caries and periodontal disease were the leading causes of tooth loss in early childhood and adolescence, according to Zaigham et al. (2010) [3] and Abdel Rahman et al. (2013) [4]. Age has been shown to have a positive correlation with partial edentulism in studies[5-7]. The loss of many teeth often reduces the quality of life and has a negative impact on the functional, social and psychological well-being of an individual [8].

Partial edentulism leads to several drawbacks for the subjects including clinical challenges and lifestyle compromises[1]. Clinically, partial edentulism results in drifting and tilting of adjacent teeth, supra eruption of opposing teeth, and altered speech, changes in facial appearance, and temporomandibular disorders. The difficulty of achieving an acceptable prosthesis in a partially edentulous patient will be influenced by the progressive degradation of the alveolar bone and supporting structures. Partial edentulism reduces masticatory efficiency which leads to restriction in dietary options and thus results in weight loss[1].

Partially edentulous arches have been classified by various methods [9]. The possible combinations of partial edentulism are more than 65,000 depending on their incidence in maxillary and mandibular arches[10]. The classification's main goal is to make it easier for students, dentists, and lab technicians to communicate about the relationship between missing teeth and edentulous ridges[11]. Among the various methods of classification like Kennedy, Applegates, Avant, Neurohar, Eichner, ACP (American College of Prosthodontics) etc, Kennedy's classification is widely accepted by the Dental community[10, 11]. Kennedy's categorization is frequently used because of the benefits of fast visibility, quick detection of partially edentulous arches, and recognition of prosthesis support, all of which aid treatment planning.[11].

Kennedy's classification was originally proposed by Dr. Edward Kennedy in 1925. Kennedy divided all edentulous situations into four basic classes[11]. Edentulous areas other than those determining the classification were designated as modification spaces.

Class I: Bilateral edentulous area located posterior to the natural teeth:

Class II: A unilateral edentulous area located posterior to the remaining natural teeth

Class III: A unilateral edentulous area with natural teeth remaining both anterior & posterior to it.

Class IV: A single, but bilateral (crossing the midline) edentulous area located anterior to the remaining natural teeth.

One of the most researched issues in dentistry is partial edentulism. The pattern of partial edentulism has been studied in a variety of populations from around the world[12-14]. In 2014 M Bharati et al[15] studied that Kennedy's class III was the most common classification encountered (62%) and was followed by Kennedy's class I (18%), class II (11%), and class IV (9%) in decreasing order. Partial edentulism is more common in the maxilla than in the mandible. In 2017 R A Devishree et al[16] in their study concluded that Kennedy class 3 is most common in both dental arches. Mandibular partial edentulism was found to be more common than a maxillary arch. In 2016 DR. Arivan Mahmood Hama et al[17] found that Kennedy's class III was the most dominant pattern in both dental arches, with a frequency of 53.2 percent for the maxilla and 44.7 percent for the mandible. Kennedy's class I (9.4%) was the least common in the maxilla, while Kennedy's class IV (9.8%) was the least common in the mandible. In 2013 According to Akbar Khalil et al.[18], partial edentulism in the maxillary arch was discovered in 20.8 percent of patients, while partial edentulism in the mandibular arch was identified in 26.9% of patients.. The remaining 52.17% of samples had missing teeth in both arches. Kennedy's class I was found to be most common in mandible while Kennedy's class IV in the maxilla. Prevalence of partial edentulism is more common in the mandibular arch than maxillary arch [19].

Several studies have analyzed the correlation between partial edentulism and its influencing factors like age, gender, and socio-economic parameters. In 2015 Vidhya Jeyapalan et. al studied that there was no gender correlation for partial edentulism [1] . Younger adults have more Class III and IV situations. Elders have more distal extension RPDs in Class I and II. In 2016 Mohammed M AL Moaleem[17] studied that the highest number of patients was in the age group (49-50) in both arches. Class III was the highest among all different age groups followed by class I in the group (20-29 yrs) and ≥ 60 yrs of the maxillary arch. In both arches, class IV was the highest in the group (50-59). In both arches, class I was the most common in females, whereas class III was most common in males. In 2017 Yasser A. Araby[24] concluded that with age, there was a statistically significant difference between the different age groups in the tendency to Class I & Class II and a statistically significant difference in the tendency to Class III; however, there was no statistically significant difference between the genders. In 2017 R A Devishree et al[16] in their study concluded that gender had no effect on the prevalence of various Kennedy classes, while age had a significant effect.

METHODOLOGY

Changing A cross-sectional study based on the patient's history, clinical examination, and questionnaire was carried out to evaluate the prevalence of partial

edentulism of the maxillary arch and mandibular arch based on Kennedy's classification. The study procedure was performed on the partially edentulous patients visiting the department of prosthodontics crown & bridge of Dr. R. Ahmed Dental College and Hospital, Kolkata ,India. A study population of 1000 patients satisfying the inclusion criteria was selected through a simple random sampling method between October 2019 to March 2020. Inclusion criteria of the study were adult population i.e. above 18 years (18 to 80 years) and a patient who is partially edentulous (missing at least one tooth). Exclusion criteria were no completely edentulous patients were not included and only missing 3rd molar was not included as a partially edentulous case.

The study was performed after approval by the Ethics Committee of Dr. R. Ahmed dental college & hospital. Each patient was explained thoroughly the purpose of the study and after receiving consent they were included in the study population.

A patient data record sheet was prepared. Then, a detailed history was taken from each patient to gather information about their personal details and their chief complaints. These included their name, age, sex, address etc. After taking history a thorough clinical examination was performed to evaluate a number of missing teeth, location of edentulous areas in maxillary arch & mandibular arch , any root sumps and periodontal health of remaining natural dentition. On the basis of history and clinical examination, the patients were screened in accordance with the inclusion and exclusion criteria. The study population was then divided into three age groups i.e. group 1 (18 - 44 YRS), group 2 (45- 64 YRS) and group 3 (65 - 80 YRS). This age group was classified based on age structure according to office of Registrar General & Census Commissioner India.

The subjects were divided into 3 groups according to their age.

Age group	Years
Group 1	18–44
Group 2	45-64
Group 3	65-80

The data obtained form the questionnaire were then tabulated.Statistical Analysis was performed with help of Epi Info (TM) 7.2.2.2 EPI INFO is a trademark of the Centres for Disease Control and Prevention (CDC).

RESULTS

Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (s.d.). Test of proportion was used to find the Standard Normal Deviate (Z) to compare the difference proportions and Chi-square (x^2) test was performed to find the associations between variables. $p<0.05$ was taken to be statistically significant.

Table1

Descriptive represents the distribution of different types of partial edentulous situations of both maxillary and mandibular arches in relation to three age groups .Here x^2 =21.81; p<0.0001 , S-significant . Chi-square (x^2) test showed that there was significant association between age and partial edentulism based on Kennedy's classification(p<0.0001). Test of proportion showed that proportion of Class-3 was significantly higher in group 1 (94.83%) and in group 2 (73. 23%) and Class-1 was significantly higher among the older aged patients i.e. group 3 (88.00%) (Z=5.56; p<0.001) .Prevalence of class 4 was 32.35 % , 16.61 % , 34.50 % in group 1, group 2 and group 3 respectively.**[Figure1**]

Table 1: Prevalence of partial edentulism of both maxillary mandibular arches based on Kennedy's classification in different age Group

AGE GROUP (YRS)			CLASS 1		CLASS 2		CLASS 3		CLASS 4		P value
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	
Group 1 (18-44)	445	100	50	11.23	81	18.20	422	94.83	144	32.35	
Group 2 (45-64)	355	100	138	38.87	186	52.39	260	73.23	59	16.61	
Group 3 (65-80)	200	100	176	88.00	161	80.50	134	67.00	69	34.50	<0.0001*
Total	1000	100	364	36.40	428	42.80	816	81.60	272	27.20	

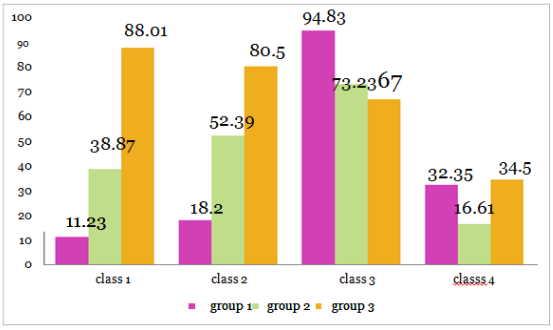

Figure 1. the bar diagram depicts the prevalence of different Kennedy's edentulous situations of both maxillary and mandibular arch in relation to different age groups .

Table 2 shows distribution of different Kennedy's edentulous situation of both maxillary and mandibular arches in relation to gender. There is no significant association (p value < 0.05) of different Kennedy's

classes with gender. In total 1000 population the prevalence of different Kennedy's edentulous spaces was class 1- 36.40 %, class 2- 42.48 %, class 3- 81.60% and class 4-27.20 %. Figure 2 shows the graphical representation of distribution of partial edentulism in maxillary and mandibular arch in relation to gender.

Table 2: Prevalence of partial edentulism of both maxillary and mandibular arch based on Kennedy's classification in different gender

Gender			Class 1		Class 2		Class 3		Class 4		P value
	No	%	No	%	No	%	No	%	No	%	
Male	508	100	184	36.22	202	39.76	421	82.87	141	27.75	
female	492	100	180	38.58	226	45.93	395	80.28	131	26.62	N S
Total	1000	100	364	36.40	428	42.80	816	81.60	272	27.20	

Figure 2. the bar diagram depicts the prevalence of different Kennedy's edentulous situations of both maxillary and mandibular arch in relation to different age groups.

DISCUSSION

An edentulous space in the dental arch has a direct impact on chewing efficiency, swallowing, food selection, nutritional status, and physical ability that may lead to an adverse impact on the quality of life of the subject [1] .The prevalence and extent of tooth loss have decreased significantly in many countries during recent decades due to increased availability and accessibility of prevention and control programs about oral diseases, as well as due to an increase in the awareness of the importance of oral health[2] .The prevalence of partial edentulism has been evaluated in many selected populations in different countries[4]. The relation between the incidence of partial edentulism and its influencing factors like socioeconomic parameters, age and gender have been analyzed by several studies.

There are also various studies on the prevalence of partial edentulism across different states of India. Studies on the incidence of partial edentulism based on Kennedy's Classification were conducted at Priyadarshini Dental College & Hospital in Tamilnadu, Saveetha Dental College & Hospital in Chennai, and other states in India. Similar assessments of patient knowledge of socioeconomic issues were conducted at Karnataka's Manipal College of Dental Sciences, Madhya Pradesh's Hitkarini Dental College & Hospital, and other locations. [25]

This study was carried out in accordance with the aforementioned standards to determine the prevalence of partial edentulism in patients in relation to age, gender, and socioeconomic characteristics in the people of West Bengal.The survey was conducted in the Department of Prosthodontics and crown and bridge, Dr. R. Ahmed Dental College and Hospital, Kolkata, West Bengal.

An edentulous space, which is a gap in the dental arch ordinarily inhabited by one or more teeth, indicates tooth loss[7]. The identification of the relationship between surviving teeth and edentulous ridges, as well as communication, debate, and understanding of the proposed prosthetic therapy among dentists, students, and technicians, are all aided by a classification of partially edentulous arches[3]. In our study, the total population (1000 patients) was divided into three age groups i.e. group 1 (18 – 44 yrs), group 2 (45 – 64 yrs) and group 3 (65- 80 yrs) . The scale was selected based on the age structure provided by the Registrar General & Census Commissioner, India.

V. T. Abdurrahiman et al (2013)[13] used a history questionnaire to collect information regarding patient's age , sex ,address , chief complaints and performed clinical examination to record the distribution of different Kennedy's edentulous situations. R. A. Devishree et al (2018) [16] in their study they also made study casts along with an oral examination to identify the incidence of different partially edentulous situations.

Hoshang Khalid Abdel-Rahman et al (2012)[4] their survey was based on visual examination by seating the patient on the dental chair and using the mouth mirror for determining the incidences of Kennedy's classification, modification areas, the locations (placement) of missing teeth, defining the cause of tooth loss, the types of RPDs manufactured (acrylic resin or metal), and the age and gender relationship. In the above studies, it was revealed that partial edentulous areas had a definite relation with age and gender and awareness varied among different socioeconomic strata. In this study also a survey-based analysis was carried out and the results were statistically analyzed and discussed here.

Table 1 represents the prevalence of partial edentulism of both maxillary arch and mandibular arch in relation to age . It can be observed from these tables that age has a

significant association (p< 0.0001) with different Kennedy's edentulous situations. Class 3 edentulous situation is most common in group 1 in both maxillary arches i.e. 45.61 % and also in mandibular arch i.e. 49.21% [Figure 1] .Class 1 and class 2 are most common in group 3 . In maxillary arch this is 41.50 % & 48.50 % respectively. In the mandibular arch, the prevalence is 47.00% & 32.00 %. Class 4 edentulous situation is most common in age group 1 in maxillary arch i.e. 17.52 % ,but in mandibular arch, this is most common in age group 3 i.e. 19.50 % .

Table 2 represents the prevalence of partial edentulism of the maxillary arch and mandibular arch respectively in relation to gender. Statistical analysis shows that there is no significant relationship between gender and the prevalence of partial edentulism (p >0.05) .

Zaigham AM et al (2010)[3] also showed a strong association of age with the distribution of partial edentulism. He concluded that Class I and Class II dental arch tendency increased with age, but Class III and Class IV dental arch tendency decreased. The distribution of rpd categorization has no significant connection with gender.

Yasser A. Araby (2017) [24] stated that a statistically significant difference between the different age groups. He concluded that Kennedy's Class III was the most commonly encountered pattern of partial edentulism in both upper and lower arches and Kennedy's Class IV was the least common pattern.

With age, there was a statistically significant difference between the different age groups in the tendency to Class I & Class II and a statistically significant difference in the tendency to Class III; however, there was no statistically significant difference between the genders. Kennedy's Class III was the most prevalent in both dental arches, according to R. A. Devishree et al (2018) [16]. Age had a substantial effect on the predominance of distinct Kennedy classes, whereas gender had no effect. The study discovered that mandibular partial edentulism is more prevalent than maxillary partial edentulism. VidhyaJeyapalan (2015) [1] also concluded that - there is no gender correlation for partial edentulismPartial edentulism is more prevalent in the mandibular arch than in the maxillary arch. RPDs of Class III and IV are more common in younger adults. RPDs Class I and II show higher distal extension in the elderly.

Bharathi M, Babu KRet al (2014) [15] they showed that Kennedy's class 3 is the most common class of partial edentulism both in male and female. Partial edentulism is more frequent in the maxilla than compared to the mandible. More number of male patients were reporting partial edentulism in all Kennedy's classes except class 2 . V. T. Abdurahiman et al (2013) [26] showed in their study that the incidence of partial edentulism among the surveyed group was 23% with no significant gender-based difference in the frequency of its occurrence. Men have a higher prevalence of partial edentulousness in the maxillary posterior region, while women have a higher prevalence of partial edentulousness in the mandibular posterior region.

CONCLUSION

Within the limitation of the study, the following conclusions can be drawn –

1. Age has significant relationship with prevalence of partial edentulism. Kennedy's class 3 partially edentulous situation is found to be most common in both maxillary arch and mandibular arch.
2. In age group 1 (18 – 44 yrs) class 3 and class 4 partially edentulous spaces are more common. Prevalence of class 1 & class 2 partially edentulous situations increases with increase of age groups.
3. Gender has no significant relation with the prevalence of partial edentulism irrespective of age groups and dental arches.

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Arnetts Soft Tissues Cephalometric Norms For the mithilanchal Population (Bihar): A Pilot Study

Abstract

OBJECTIVE: To compare the soft tissues norms among males and females of Mithilanchal population(Bihar).

MATERIALS AND METHODS: For analysislateral cephalograms of 50 samples (25 males and 25 females) were taken.Total 26 parameters were evaluated for soft tissue analysis. All subjects were taken from patients reported in our opd having the age group of 20-35 years.

RESULTS: There was no statistical difference observed between male and female dento-skeletal structures. While in soft tissue structure, upper lip thickness, lower lip thickness, Pogonion-Pogonion', Menton-Menton' and Nasolabial angle, statistical significance difference was observed. In facial length, Nasion-Menton', upper lip length, lower lip length, lower 1/3rd face, Maxillary exposure and Mandibular height statistical significance difference was observed between sexes. In projections to TVL only in G to A, statistical significance difference was observed.. Comparison among the gender with different soft tissue and dental structures were made using the Mann-Whitney U test. A Pvalue of <0.05 was considered statistically significant.

CONCLUSUION: Only significant differences were found in soft tissues and facial height. While planning for orthodontic treatment considering the skeletal and dental parameters alone isnot sufficient,soft tissue cephalometric norms should be considered.

KEYWORDS: Lateral cephalometric radiographs, Maxillary plane, mandibular plane,TVL.

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INTRODUCTION

Harmonious facial aesthetics have long been recognized as the most important goal of orthodontic treatment. Knowledge of the facial skeleton and its overlying soft tissues in determining facial harmony is essential1.Ricketts found numerous example of divine proportion in the faces of commercial models,well aligned dental arches and in measurements of both frontal and lateral head cephalographs,suggesting that esthetics can indeed be analysed scientifically.2 According to Angle the mouth is a most potent factor in making or marrying the beauty and character of the face.The modern society consider facial attractiveness as an important physical attribute and its preservation is a primary goal of orthodontic treatment.As a soft tissue norms serve as a guideline in calculating change,it has and executed orthognathicsurgery technique4.Since the inception of Orthodontics as aspecialty. Orthodontist have been interested with measurements. The greatest trust in this direction, evolved with the introduction of Cephalometric in 1934 by Hofrath in Germany and Broadbent in the united States and its application to clinical orthodontics.5

Cephalometric radiograph is used to evaluate dentofacial proportions and anatomic basis for malocclusion.Themost important clinical use of cephalometric is in recognizing and evaluating changes brought about by orthodontic treatment. Superimposition taken from serial cephalometric radiographs before, during and after treatment can be superimposed to study

changes in jaws and tooth position retrospectively. Facial harmony and balance are determined by the facial skeleton and its overlying soft tissue structures.

The methodology of cephalometric radiography led to the development of numerous cephalometric studies dealing with norms which provide useful guidelines in orthodontic diagnosis and treatment planning.Diagnosis by hard tissue cephalometric norms is unreliable .6These cephalometric analysis concentrate mainly on the measurement of hard tissues structures, which are not constantly related to the soft tissue of the face.

AIM

The aim of this study is to derive soft tissues norms for the Mithilanchal population.

OBJECTIVES

17. Establish the soft tissues norms for the Mithilanchal population.

18. Compare the soft tissues norms among males and females.

METHODOLOGY

The 50 patients were selected from the OPD of department of Orthodontics and Dentofacial Orthopedics and the department of Oral medicine and Radiology at Mithila Minority Dental College and Hospital, Darbhanga,including the patients from the nearby areas of the Mithilanchal and their lateral cephalogramswere collected for this study. The ethical clearance was obtained from the ethical committee of MithilaMinority Dental College and Hospital, Darbhanga.

The following is being followed during the selection of subjects:

Inclusion criteria:

1. Bilateral Angle class I molar relation with normal overjet and overbite upto 0-2 mm.
2. Class I skeletal jaw bases.
3. A full complement of teeth from permanent second molar of one side to the opposite side with normal alignment in dental arches.
4. The lip should be in relax position.

Exclusion criteria:

1. History Gross asymmetrical face on clinical examination.
2. History of previous orthodontic treatment or tooth extraction or any orofacial surgical intervention.
3. Evidence of mesial migration of first permanent molar on clinical examination.
4. History of any systemic disease.

METHODOLOGY:

For the recording of natural head position,the subjects were instructed to sit comfortably and relaxed on a stool. They were asked to look into their image of their eyes in a round mirror located at the same levelas the pupils of their eyes.The mirror had a diameter of 100 mm and was attached to the wall 170 cm in front of the original transmeatal axis of the cephalostat,in a plane parallel to this axis.The height from the centre of the mirror to the floor was indicated by a tape mark on the front posts of the cephalostat.Once the subjects were seated,the stool was raised to bring the interpupillary line to the level of the tape mark7.

The subjects will be first assessed clinically in natural head position with seated condylesand competent lip seal. Barium sulphate will be used with the help of tooth pick as metallicmarker. True Vertical Line is a line which is drawn through subnasale perpendicular to thenatural horizontal head position8. Structure to the right side of the TVL will be given apositive sign and those to the left will be given a negative sign.True vertical line will be established with the help of plumb hanged with string in front of the patient 2-3mm away from nasal tip. The string of the plumb will be dipped in barium sulphate solution for radioopacity.All the cephalograms of the patients will be taken in natural head position and subject will be asked to look in a mirror at his or her eye level with Vatech cephalostatmachine.All the lateral cephalometric films will be recorded by the same operator followed by tracing on transparent 0.003inch thickness and 8x10 size acetate matte tracing paper with 0.3mm pencil. All reference points will be first identified,located and marked.

The following parameters will be used for the study of soft tissues[9]

The soft tissue cephalometric parameters are divided into 4 groups:

1. Dentoskeletal factors.
2. Soft tissue structures.
3. Facial length.
4. Harmony values.

Dentoskeletal Factors:

I. Maxillary occlusal plane (MxOp) to TVL.
II. Maxillary central incisor tip(Mx1) to maxillary occlusal plane(MxOp)

III. Mandibular incisor tip(Md1) to mandibular occlusal plane(MdOp)
IV. Overjet(OJ)
V. Overbite(OB)

Soft Tissue Structures:

I. Upper lip thickness (Upper lip anterior ULA to Upper lip inside ULI)

II. Lower lip thickness(Lower lip anterior LLA to Lower lip superior LLS)

III. Pogonion-pogonion'(pog-pog')

IV. .Menton-Menton'(Me-Me')

V. Upper lip angle(SubnasaleSn-Upper lip anterior ULA to TVL)

VI. .Nasolabialangle(SubnasaleSn-Upper lip anterior ULA to SubnasaleSn-Columella)

Facial Length:

I. Facial height(Nasion' Na' to Menton' Me')

II. Upper lip length(Upper lip inferior ULI to SubnasaleSn)

III. Interlabialgap(ILG)

IV. Lower lip length(Lower lip superior LLS to Menton' Me')

V. Lower one third of face(SubnasaleSn to Menton' Me')

VI. Overbite (OB)

VII. Maxillary incisor tip (Mx 1) exposure

VIII. Maxillary height(SubnasaleSn to the tip of maxillary incisor Mx1)

IX. Mandibular height(Menton' Me' to the tip of mandibular incisor Md1)

Harmony Values:

A. Interjaw Relation

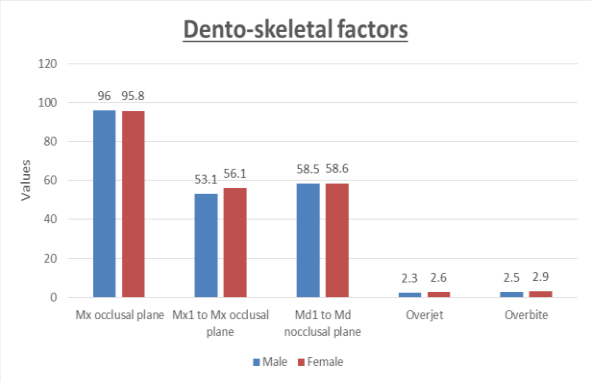
I. Subnasale SN to Pogonion'Pog'
II. A Point A' to B Point B'
III. Upper lip anterior ULA to Lower lip anterior LLA

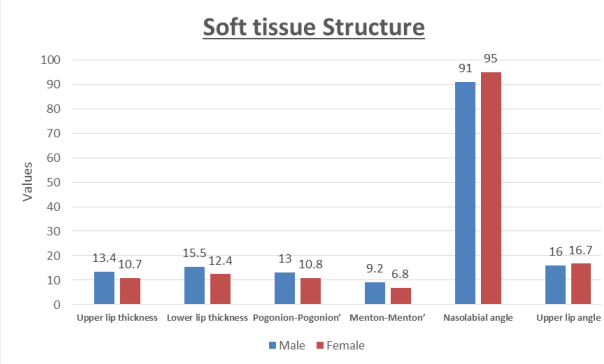
B. Full Facial Balance

I. Facial angle (Glabella'G' to Subnasale SN to Pogonion' Pog'
II. Glabella' G' to A' Point A'
III. Glebella'G' toPogonion' Pog'

RESULTS

Variables	Males(Mean ± SD)	Females(Mean ± SD)	p value
Dento-skeletal factors Mx occlusal plane	96.0 ± 3.4	95.8 ± 4.3	0.992
Mx1 to Mx occlusal plane	53.1± 6.2	56.1±6.4	0.132
Md1 to Md nocclusal plane	58.5± 6.8	58.6±5.6	0.992
Overjet	2.3± 0.5	2.6± 0.6	0.182
Overbite	2.5± 0.6	2.9 ± 0.8	0.124
Soft tissue structure Upper lip thickness	13.4 ± 1.7	10.7± 2.1	<0.001
Lower lip thickness	15.5 ± 1.5	12.4± 1.7	<0.001
Pogonion-Pogonion'	13.0 ± 2.3	10.8± 1.8	0.002
Menton-Menton'	9.2± 1.6	6.8± 1.2	<0.001
Nasolabial angle	91.0 ± 8.6	95.0±10.1	0.004
Upper lip angle	16.0 ± 5.1	16.7± 8.3	0.876
Facial length Nasion'-Menton'	120.6 ± 6.1	112.6 ± 4.5	<0.001
Upper lip length	21.2± 1.8	19.4± 2.3	0.004
Interlabial gap	0± 0	0 ± 0	.
Lower lip length	47.6± 4.2	42.7± 2.4	<0.001
Lower 1/3rd of face	68.8±5.4	61.7± 4.3	<0.001
Overbite	2.5± 0.6	2.9± 0.8	0.124
Mx1 exposure	1.9± 1.0	3.5± 1.3	<0.001
Maxillary height	23.1± 2.3	22.7± 2.2	0.389
Mandibular height	49.1± 3.7	42.4± 2.2	<0.001
Projections to TVL Sn to Pog	4.2± 3.2	4.3± 2.9	0.822
A to B	6.0± 2.8	4.8± 3.1	0.161
ULA to LLA	2.2± 1.4	2.1± 1.2	0.858
Facial angle G Sn Pog	169.8± 4.8	168.2± 5.4	0.307
G to A	6.9± 3.4	9.0± 2.7	0.018
G to Pog	5.8± 4.5	6.8± 3.9	0.263





DISCUSSION

Schiedmann et al 1980 [10] observed that females had equally prominent chins as males.They observed that the upper lip was slightly anterior,lower lip was just posterior and the chin was on average of 4.2-4.5mm posterior to the vertical reference line and suggested that more prominent lips,shallowlabiomental fold and prominent B point deemphasize chin prominence in females,creating an appearance of more recessive chin.

Holdaway R A 1983 [11] reported that facial esthetic in dentistry has gained great attention in recent times.The success of orthodontic treatment is frequently related to the improvement gained in patients facial appearance,which includes soft tissue profile and since there is a considerable variations in soft tissues covering, misleading conclusion can be produced if diagnosis and treatment planning is based on dental and skeletal measurement alone; therefore analysis of soft tissue profile is mandatory.

IshaA 2016 [12] reported that modern society considers facial attractiveness as an important physical attribute. The great variance in soft tissue drape of the human face complicate accurate assessement of the soft tissue profile and it is a known fact that the facial features of different ethnic groups differ significantly.

Parihar AV etal 2019 [13] studied soft tissue and dentoskeletal parameters for the young indian adults of gujrat state. The findings obtained revealed a preponderance of weak chin in Gujrat population. Overall facial length was lower with acute nasolabial angle and thinner lower lip with a decreased interlabial gap as well as decreased maxillary incisor exposure when compared to the white population.

CONCLUSION

- Significant differences are found among males and females in upper lip thickness, lower lip thickness, pogonion-pogonion', menton-menton', nasolabial angle, nasion'-menton', upper lip length, lower lip length, lower1/3 of face, maxillary exposure, mandibular height, G'-A'.

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Correlation Between Frontal Sinus Index, Mp3 And Cervical Vertebral Maturity Index As A Skeletal Maturity Indicator In Mithilanchal Population (Bihar): A Comparative Cephalometric Study

Abstract

OBJECTIVE: To determine whether the frontal sinus parameters – height, width and index could be correlated with skeletal maturation levels demonstrated by MP3 and CVMI.

MATERIALS AND METHODS: Eighty children (40 girls and 40 boys) belonging to the mixed dentition age group were selected for the study. A radiographic lateral cephalograms were analyzed for frontal sinus maturity. Maximum height, maximum width and height to width ratio of the sinus were calculated. The mean height to width ratio of the sinus at respective CVMI and MP3 stages were tabulated and subjected to statistical analysis to determine the correlation between them. Correlation at different stages between males and females were also determined. **RESULTS:** The Comparison of Frontal sinus index based on various stages of CVMI and MP3 was significant. For females, Frontal sinus index based on various stages of CVMI was found to be significant and for males, Frontal sinus index based on MP3 was found to be significant. Spearman correlation between Frontal sinus index and CVMI and Frontal sinus index and MP3 was found to be significant. **CONCLUSION:** vertebral analysis on lateral cephalogram is as valid as the hand wrist bone analysis with the advantage of reducing the radiation exposure of growing subjects.

Keywords: Lateral cephalometric radiographs, CVMI (cervical vertebrae maturity indicator), FSI (frontal sinus index)

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INTRODUCTION

The Clinical decisions in Orthodontics and Dentofacial Orthopedics regarding use of external forces, functional appliances, extraction versus non-extraction treatment or Orthognathic surgery are at least partially based on growth considerations[1]. One of the objectives of orthodontic treatment during adolescence, in cases with skeletal discrepancies is to take advantage of the patient's growth changes[2]

Skeletal maturation refers to the degree of development or ossification in bone. Size and maturation can vary independently of each other. During growth, every bone goes through a series of changes that can be observed radiologically[3].

Many skeletal maturity indicators have been proposed over the past decades. However in the current era of radiation awareness, use of epiphyseal development of the middle phalanx of the third finger (MP3) radiograph is advisable instead of hand and wrist radiographs for growth assessment[4].

The assessment of the degree of cervical vertebral maturation (CVM) is another method of assessing skeletal maturation. Lamparski studied the development of cervical vertebrae and demonstrated the efficacy of the CVM method in assessing skeletal age. The use of lead collar to protect thyroid gland may hinder full vision of

the cervical spine, therefore Hassel and Farman compiled a new method of CVM indicator (CVMI), which evaluated the visible lateral profiles of second, third and fourth cervical vertebrae[3].

Changing morphology of the frontal sinus during the adolescent growth spurt is a new method of assessing the developmental status. Ruf and Pancherz[5] evaluated frontal sinus morphology on lateral cephalogram and reported a well defined pubertal growth spurt in the enlargement of the frontal sinus[6].

AIM

To determine the association between frontal sinus index, MP3 and cervical vertebral maturity index as a skeletal maturity indicator in Mithilanchal population.

OBJECTIVES

19. To determine whether the frontal sinus parameters – height, width and index could be correlated with skeletal maturation levels demonstrated by MP3 and CVMI.
20. To assess the reliability of the frontal sinus index as a skeletal maturity indicator in males and females.

METHODOLOGY

80 subjects (40 males and 40 females) aged between 8 and 15 years, visiting the OPD of department of orthodontics and dentofacial orthopaedics and department of oral medicine and radiology at Mithila minority dental college and hospital, Darbhanga will be selected for this study and their lateral cephalograms and hand wrist radiographs will be collected. The ethical clearance will be taken from ethical committee of Mithila minority dental college and hospital, Darbhanga.

The lateral cephalograms will be manually traced on 0.3 acetate sheet with 0.3 mm pencil and divided into 6 groups based on the cervical vertebral maturity index (CVMI) stages. The frontal sinus height and width will be measured in the same lateral cephalograms and their sinus indices will be calculated for all the groups. Hand wrist radiographs will be examined separately for determination of the MP3 stages. Finally, a comparison will be done statistically based on the data obtained from the CVMI, MP3 and frontal sinus indices to determine their correlation. The ethical clearance was obtained from the ethical committee of Mithila Minority Dental College and Hospital, Darbhanga.

The following will be the criteria for this study:

Inclusion criteria:

4. Subjects should be between 8 and 15 years of age.
5. The subjects selected for the study will be from Mithilanchal population.
6. All patients should have standardized lateral cephalometric radiographs.

Exclusion criteria:

5. History of sinus related pathologies.
6. Any craniofacial anomaly, syndrome, trauma or surgery involving the frontal sinus or the cervical vertebrae.
7. Any systemic disease affecting growth and development.
8. Lateral cephalograms showing distinctness of structure in the image.

After informed consent from all subjects, following radiographs were taken with due precaution for radiation safety:

v. Lateral cephalogram for assessment of frontal sinus index
vi. Lateral cephalogram for assessment of cervical vertebrae maturation stages
vii. Handwrist radiographs of middle phalanx of middle finger of left hand for assessment of MP3 maturation.

Assessment of the frontal sinus morphology:

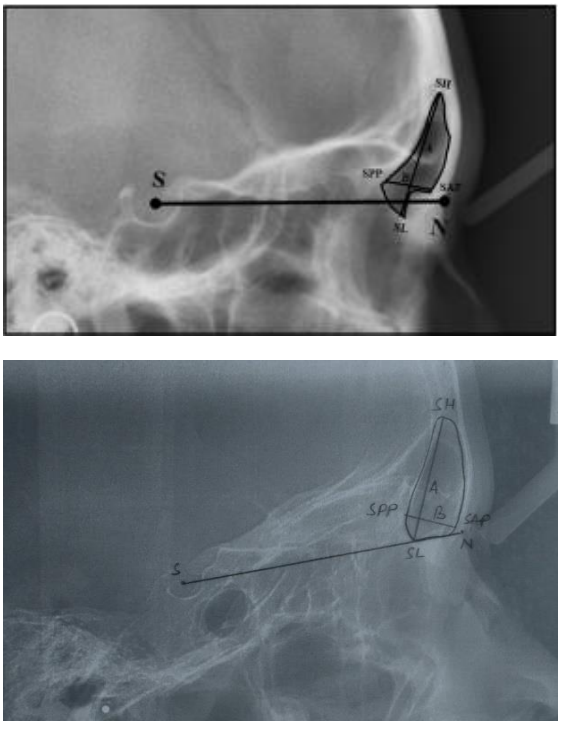


Figure no 1: Assessment of the frontal sinus morphology on a lateral cephalogram using the method of Ertuk[7]

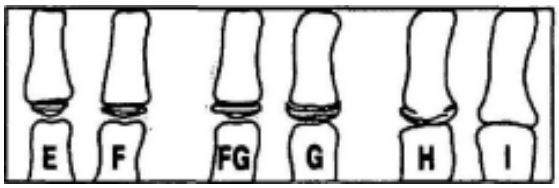
SH	The highest point on the frontal sinus

SL	The lowest point on the frontal sinus
A	Line joining SH and LH denoting maximum frontal sinus height
SPP	Posterior point on the frontal sinus
SAP	Anterior point on the frontal sinus
B	The line joining SPP and SAP denoting the maximum frontal sinus width perpendicular to line A
S	Anatomic center of sella turcia
N	Deepest point in the midline at the frontonasal suture

Table no 1: Assessment of the frontal sinus morphology on a lateral cephalogram using the method of Ertuk[7]

Assessment of skeletal maturation using MP3 radiograph as an indicator:

The five different stages of MP3 were evaluated from the radiographs as described by Hägg and Taranger8. The scores imparted were F, FG, G, H, and I corresponding to the relationship of the epiphysis to the metaphysis as seen on the MP3 radiograph.



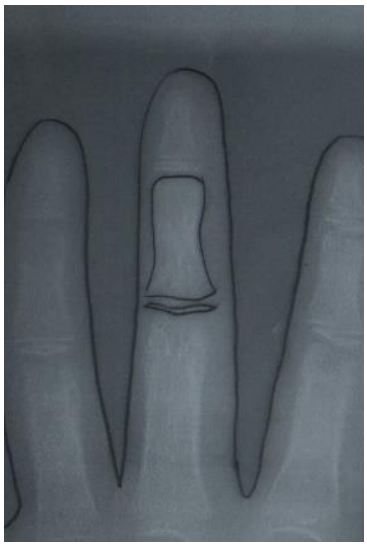


Figure no 2: Skeletal maturity stages of the middle phalanx of the third finger (MP3) in progressive order (Hagg and Taranger, 1980):

Stage F	The epiphysis is as wide as the metaphysis.
Stage FG	The epiphysis is as wide as the metaphysis and there is a distinct medial and/or lateral border of the epiphysis forming a line of demarcation at right angles to the distal border
Stage G	The sides of the epiphysis have thickened and also cap its metaphysis, forming a sharp edge distally at one or both sides.
Stage H	Fusion of epiphysis and metaphysis has begun.
Stage I	Fusion of epiphysis and metaphysis is completed.

Table 2: Skeletal maturity stages of the middle phalanx of the third finger (MP3) in progressive order (Hagg and Taranger, 1980)

Developmental stages of cervical vertebrae[9]:

CVMI 1 (Initiation): The inferior borders of C2, C3, and C4 are flat in this stage. The vertebrae are wedge shaped, and the superior vertebral borders are tapered from posterior to anterior. About 80%–100% of adolescent growth remains to be completed.

CVMI 2 (Acceleration): Concavities develop on the inferior borders of C2 and C3. The inferior border of C4 is flat. The bodies of C3 and C4 are nearly rectangular in shape. About 65%–85% of adolescent growth remains to be completed.

CVMI 3 (Transition): Distinct concavities are seen in the inferior borders of C2 and C3. A concavity is beginning to develop in the inferior border of C4. The bodies of C3 and C4 are rectangular in shape. About 25%–65% of adolescent growth remains to be completed.

CVMI 4 (Deceleration): Distinct concavities are seen in the inferior borders of C2, C3, and C4. The vertebral bodies of C3 and C4 are becoming squarer in shape. About 10%–25% of adolescent growth remains to be completed.

CVMI 5 (Maturation): More accentuated concavities are seen in the inferior borders of C2, C3, and C4. The bodies of C3 and C4 are square or nearly square in shape. About 5%–10% of adolescent growth remains to be completed.

CVMI 6 (Completion): Deep concavities are seen in the inferior borders of C2, C3, and C4. The bodies of C3 and C4 are square or have greater vertical dimension than horizontal dimension. Little or no adolescent growth remains to be completed.

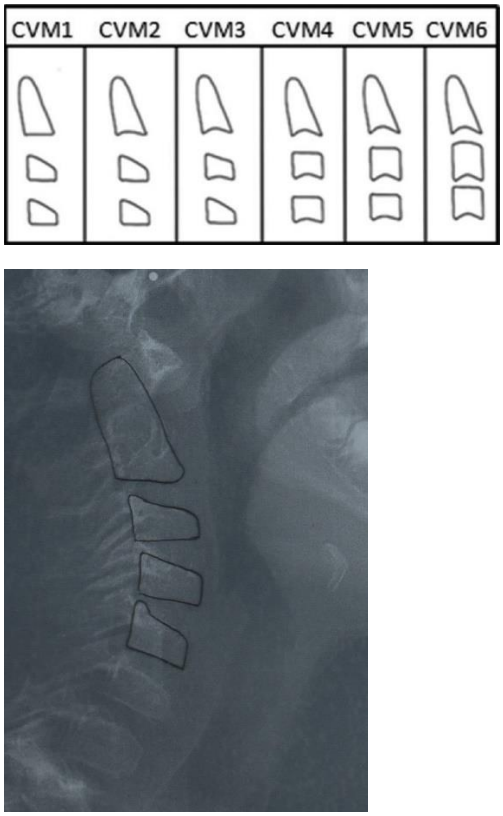


Figure no 3: Diagrammatic representation of the CVMI stages

RESULTS

Sample Distribution:

The sample size selected for the study consisted of 80 subjects with equal number of boys (40) and girls(40). The data were divided into 2 groups: Co-relation between frontal sinus index and CVMI and Co-relation between frontal sinus index and MP3.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 21, IBM Inc. Descriptive data was reported for each variable. Summarized data was presented using Tables and Graphs. Data was not normally distributed as tested using the Shaperio-Wilk W test (p-value was less than 0.05). One way anova was used for comparison of two or more groups. Coorelation was computed. A level of $p<0.05$ was considered statistically significant.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F value
					Lower Bound	Upper Bound			P value
Stage 1	14	2.8486	.89276	.23860	2.3331	3.3640	1.75	5.00	333.0 0.0001*, sig
Stage 2	21	2.8400	.69699	.14533	2.5386	3.1414	1.87	5.00	STAGE 5> STAGE 4,3,2,1
Stage 3	22	3.2164	.79050	.16854	2.8659	3.5669	1.87	4.50	
Stage 4	13	2.7792	.42539	.11798	2.5222	3.0363	2.20	3.42	
Stage 5	10	3.6230	.32018	.10125	3.3940	3.8520	3.10	4.23	

Table 3: Comparison of Frontal sinus index based on various stages of Cervical vertebral maturity index(CVMI)

One way anova, level of significance set at $p < 0.05$

Ns: non significant, sig: significant

The Comparison of Frontal sinus index based on various stages of Cervical vertebral maturity index(CVMI) was done using one way anova test, the difference reached the level of significance. On post hoc comparison was applicable, significant difference was seen between stage 5 and all other stages also.

Males

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F value
					Lower Bound	Upper Bound			P value
Stage 1	5	2.7840	1.42022	.63514	1.0206	4.5474	1.75	5.00	1.440, 0.541,ns
Stage 2	13	3.1838	.72145	.20009	2.7479	3.6198	2.33	5.00	
Stage 3	15	3.0880	.75630	.19528	2.6692	3.5068	2.00	4.50	
Stage 4	7	2.8457	.40224	.15203	2.4737	3.2177	2.33	3.42	

Table 4: Comparison of Frontal sinus index based on various stages of Cervical vertebral maturity index(CVMI)

One way anova, level of significance set at $p < 0.05$

Ns: non significant, sig: significant

The Comparison of Frontal sinus index based on various stages of Cervical vertebral maturity index(CVMI) was done using one way anova test, the difference failed to reach the level of significance. No post hoc comparison was applicable.

Females

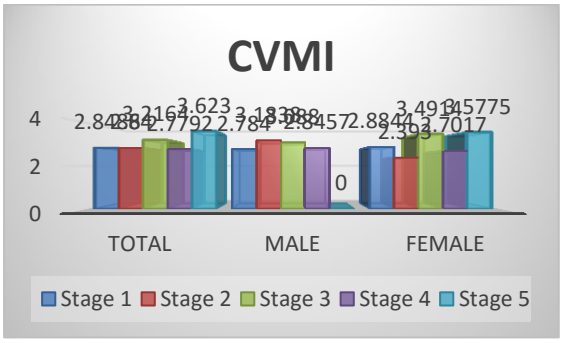
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F v
					Lower Bound	Upper Bound			P v
Stage 1	7	2.8844	.53158	.17719	2.4758	3.2931	2.14	4.00	8.3 0.0(SI
Stage 2	10	2.3930	.31735	.10036	2.1660	2.6200	1.87	3.00	STA 5 STA 4,3
Stage 3	9	3.4914	.85030	.32138	2.7050	4.2778	1.87	4.23	
Stage 4	6	2.7017	.47617	.19440	2.2020	3.2014	2.20	3.14	
Stage 5	8	3.5775	.26147	.09244	3.3589	3.7961	3.10	3.98	

Table 5: Comparison of Frontal sinus index based on various stages of Cervical vertebral maturity index(CVMI)

One way anova, level of significance set at $p < 0.05$

Ns: non significant, sig: significant

The Comparison of Frontal sinus index based on various stages of Cervical vertebral maturity index(CVMI) was done using one way anova test, the difference reached the level of significance. On post hoc comparison was applicable, significant difference was seen between stage 5 and all other stages also.



	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
F	12	2.5617	.55212	.15938	2.2109	2.9125	1.75	3.14
FG	12	2.7717	.45664	.13182	2.4815	3.0618	2.14	3.42
G	24	2.9504	.90365	.18446	2.5688	3.3320	1.87	5.00
H	24	3.4742	.54808	.10749	3.2529	3.6956	2.23	4.50
I	8	2.8975	.63921	.22600	2.3631	3.4319	2.20	3.75

Table 6: Comparison of Frontal sinus index based on various stages of MP3

One way anova, level of significance set at $p < 0.05$

Ns: non significant, sig: significant

The Comparison of Frontal sinus index based on various stages of MP3 was done using one way anova test, the difference reached the level of significance. On post hoc comparison was applicable, significant difference was seen between stage H and all other stages also.

Males

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F value
					Lower Bound	Upper Bound			P value
F	10	2.5617	.55212	.15938	2.2109	2.9125	1.75	3.14	4.899, 0.001*, SIG
FG	4	2.9150	.58312	.29156	1.9871	3.8429	2.41	3.42	H>F,FG, G
G	16	3.0981	.91513	.22878	2.6105	3.5858	2.25	5.00	
H	10	3.7190	.38179	.12073	3.4459	3.9921	3.20	4.50	

Table 7: Comparison of Frontal sinus index based on various stages of MP3

One way anova, level of significance set at $p < 0.05$

Ns: non significant, sig: significant

The Comparison of Frontal sinus index based on various stages of MP3 was done using one way anova test, the difference reached the level of significance. On post hoc comparison was applicable, significant difference was seen between stage H and all other stages also.

Females

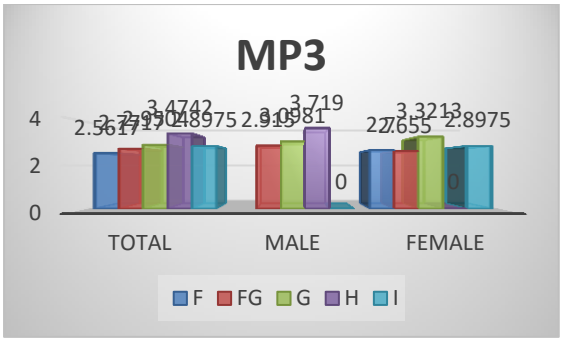
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F value
					Lower Bound	Upper Bound			P value
F	8	2.7	0.40539	0.14333	2.3611	3.0389	2.14	3.2	2.823, 0.052,NS
FG	8	2.655	0.85958	0.30391	1.9364	3.3736	1.87	4	
H	16	3.3213	0.59016	0.14754	3.0068	3.6357	2.23	4.23	
I	8	2.8975	0.63921	0.226	2.3631	3.4319	2.2	3.75	

Table 8: Comparison of Frontal sinus index based on various stages of MP3

One way anova, level of significance set at $p < 0.05$

Ns: non significant, sig: significant

The Comparison of Frontal sinus index based on various stages of MP3 was done using one way anova test, the difference failed to reach the level of significance. No post hoc comparison was applicable.



			CVMI	MP3
Spearman's rho	Frontal sinus index	Correlation Coefficient	.149	.339
		Sig. (2-tailed)	0.001*, SIG	0.014
		N	41	41

COORELATION

C**orrelation** is a bivariate analysis that measures the strength of association between two variables and the direction of the relationship. In terms of the strength of relationship, the value of the correlation coefficient varies between +1 and -1. A value of ± 1 indicates a perfect degree of association between the two variables. As the correlation coefficient value goes towards 0, the relationship between the two variables will be weaker. The direction of the relationship is indicated by the sign of the coefficient; a + sign indicates a positive relationship and a – sign indicates a negative relationship.

- **Exactly –1.** A perfect downhill (negative) linear relationship
- **–0.70.** A strong downhill (negative) linear relationship
- **–0.50.** A moderate downhill (negative) relationship
- **–0.30.** A weak downhill (negative) linear relationship
- **0.** No linear relationship
- **+0.30.** A weak uphill (positive) linear relationship
- **+0.50.** A moderate uphill (positive) relationship
- **+0.70.** A strong uphill (positive) linear relationship
- **Exactly +1.** A perfect uphill (positive) linear relationship

Spearman correlation between was found to be significant Frontal sinus index and CVMI AND Frontal sinus index and MP3

DISCUSSION

A number of indicators have been documented to assess skeletal growth. Abdel-Kader proposed MP3 radiograph alone on a dental film in order to reduce radiation exposure[10]. Ruf and Pancherz have shown that the enlargement in the width of the frontal sinus can be considered as one of the skeletal maturity indicators in males[11]. The frontal sinus starts to develop in the fourth or fifth week of gestation, continues its growth during childhood, and reaches its final size and form in early adulthood[12]. The present study; however, is conducted in both males and females using a single cephalogram available at the beginning of treatment alone. The maximum height of the frontal sinus along with the maximum width was taken into consideration, and the sinus index was calculated and compared to the CVMI and MP3 stage of each individual. To assess the level of skeletal maturity of a patient, frontal sinus morphologic variations were assessed using the sinus index, which was calculated by dividing frontal sinus height and width. This ratio was preferred rather than individually taking frontal sinus height and width, since the size of the frontal sinus may vary according to a patient's physical size and sex[13].

The present study; however, is conducted in both males and females using a single cephalogram available at the beginning of treatment alone. In agreement with several authors (Maresh[14], 1940; Siedband[15], 1966; Hajnis and Pozdenova[16], 1972; Brown et al[17]) the sinus size exhibited a large variation at the end of body height growth. The cause for this variation is however unknown. (Nanda[18], 1955; Hunter[19], 1966; Bergensen[20], 1972). The comparison of sinus enlargement with skeletal maturity stages revealed that in the majority of the cases sinus peak occurred during the skeletal stages MP3-H, while body height peak coincided with a less mature stage (MP3-F), (MP3-FG), (MP3-G). It is noticed that a significant correlation exists between the sinus index, MP3 stages and CVMI stages which by far is the most established skeletal maturity indicator.

CONCLUSION

4. All the parameters of frontal sinus analysis are significantly correlated with the individual stages of CVMI and MP3 development.
5. For routine pretreatment orthodontic diagnostic procedures the CVMI and MP3 can be a better choice for predicting skeletal maturity of an individual because of its simplicity and reliability.

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Original Article Journal of Oral and Dental Health

Holdaway Soft Tissue Analyses in Bengali Adult Population: An Original article

Abstract

OBJECTIVE: To : The aims and objectives of the present study is to interpret soft tissue profile in Bengali adult population of age group 18 to 25 years with normal occlusion using Holdaway analysis, to compare the soft tissue values of Bengali adult population with Holdaway norms and to check the applicability of Holdaway values to the Bengali population and to determine any sexual differences between the soft tissue facial profile of Bengali population. Materials and methods: Sixty subjects of 18-25 years age group were randomly selected irrespective of sex having class I molar relation with normal over-jet and overbite, well aligned maxillary and mandibular dental arches with minimal spacing or crowding. Holdaway soft tissue cephalometric analysis was carried out to measure different cephalometric parameters for each sample. The mean, standard deviation, minimum and maximum values of each measurement were tabulated and computed statistically.

Results: The results showed that Bengali population has slightly more skeletal profile convexity, less prominent nose, slightly decreased upper lip thickness hence increased upper lip strain, and slightly less soft tissue subnasale to H-line and upper sulcus depth as compared to the Holdaway norms. **Conclusions:** The results of the present study support the view that a single standard of facial soft tissue norms should not be applied to all racial and ethnic groups. A more extensive study with higher number of samples is necessary for clinical use in the future.

Key Words: Holdaway analysis, Cephalometric analysis, Soft tissue cephalometric analysis, Normal occlusion

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INTRODUCTION

The importance of facial esthetics and soft tissues in orthodontic treatment have been largely emphasized by Angle1. He believed that the harmony and the balance of the face depends largely on form.

When Broadbent[2] introduced his cephalometer in 1931, a new period began in orthodontics. The relationships of the dentofacial complex have been determined using cephalometric analyses routinely since Broadbent introduced his cephalometer in 1931. The changes associated with growth and orthodontic treatment can also be determined by cephalograms. The soft tissues have been emphasized more, both in diagnosis and treatment results as the treatment mechanics are becoming more advanced. Holdaway[3], Spradley4 et al, Bell5 et al, and Park6 and Burstone[7] are among many who stressed the importance of soft tissues in their diagnoses.

It has been shown that rigid adherence to the hard tissue norms results in neither facial balances and harmony, nor long term stability (Burstone[7], 1958). Balancing the position of the lips in relation to the nose and chin has a direct relationship to aesthetic preference (Ricketts8, 1968).

The teeth and jaws form a dentoskeletal framework which supports the soft tissue draping of the face. This dentoskeletal framework may be altered by orthodontic treatment which produces alteration in the soft tissue draping of the face. The three goals of corrective orthodontics are Utility, Beauty and Stability. These prime objectives in orthodontic treatment are directed towards (1) improvement in function (2) improvement in

esthetics (3) the maintenance of these improvements (Riedel[9], 1950).

In recent era, a paradigm shift has been experienced in orthodontic treatment to emphasize more on esthetics. Soft tissue profile is one of the most critical areas of interest in the development and selection of a potential orthodontic treatment. The soft tissue profile has been studied extensively in orthodontics, primarily from lateral cephalometric radiographs, under the assumption that the form of soft tissue outline largely determines the aesthetics of the face. (Holdaway[10], 1983).

Holdaway[10] emphasized that ‘‘understanding how important is the psychological development of young persons and how their social development is related to attractiveness and favorable self-image, hence it is very important to provide our patients the best possible balance and harmony of face.’’

Holdaway[11] stated that “Better treatment goals can be set if we quantitate the soft-tissue features which contribute to or detract from that ‘physical attractiveness stereotype’ which has been ingrained into our culture.”

In many studies, cephalometric norms have been established for different ethnic and racial groups. And it has been concluded that there are significant differences between the diverse ethnic and racial groups. Also many cephalometric standards have been developed for different ethnic groups. Thus these studies indicate that the normal measurements which is considered normal for one group should not be considered normal for other group.
Hence, the purpose of this study is to determine the soft tissue profile of Bengali adult population using Holdaway analysis.

AIMS AND OBJECTIVES

The aim of the present study is to interpret soft tissue profile in Bengali adult population of age group 18 to 25 years with normal occlusion using Holdaway analysis.
SPECIFIC OBJECTIVES OF THE STUDY

1) To study soft tissue facial profile for Bengali adult population with normal occlusion using Holdaway analysis.

2) To compare the soft tissue values of Bengali adult population with Holdaway norms and to check the applicability of Holdaway values to the Bengali population.

3) To determine any sexual differences between the soft tissue facial profile of Bengali population.

MATERIALS AND METHODS SAMPLE SELECTION:

The subjects for this study were selected from the Department of Orthodontics and Dentofacial Orthopaedics of Dr. R. Ahmed Dental College and Hospital, Kolkata. Subjects with esthetically pleasing and balanced face with normal occlusion were selected for this investigation.

Inclusion criteria:
A) Subjects will be adult population of 18-25 years irrespective of sex having Class I molar relation with normal over-jet and overbite, well aligned maxillary and mandibular arches with minimal spacing or crowding.
B) Have not undergone any Orthodontic Treatment.
C) Subjects having normal growth and development.
D) Subjects having full compliment of teeth (third molars will not be taken into account).

Exclusion Criteria:
A) Patients having Class II and Class III malocclusion
B) Patients having history of trauma or any congenital abnormality.
C) Having history of any Orthodontic treatment.
D) Subjects having fixed or removable partial denture.

STUDY PERIOD: Approximately two and a half years.
SAMPLE SIZE: 60 samples (age ranges from 18 to 25 years) were taken for this study.
STUDY DESIGN: Cross-sectional study.

MATERIALS USED FOR THE STUDY:

A) X-ray machine.
B) X-ray cassettes with Hi-speed intensifying screen.
C) 8 inch × 10 inch or 203mm × 254mm screen type x-ray film.
D) 0.003inch matte acetate tracing paper.
E) 3H hard pencil
F) Measuring ruler
G) Radiograph view box
H) Protractor: Camlin (for angular measurement up to 0.5° correction.)
I) Divider
J) Eraser

METHODS:

X-ray technique:

X-ray was taken for all subjects selected for this study. The subjects head was positioned in a roentgenographic cephalostat used in this study. A constant target film distance of 5 feet or 152.4 cm was maintained for all cephalograms obtained.

8 inch×10 inch screen type x-ray film was placed between Calcium tungstate coated hi-speed intensifying screen under safe light

.

All the recordings were performed with the subjects in natural head position(NHP) with mirror eye reference (external reference) or in other words the subjects’ head was positioned in such a way so that they can observe either their eyes in a mirror(20cm×20 cm) placed on the wall 180 cm in front of the ear rods.

All the subjects were instructed to have a relaxed posture; lips in habitual position and the teeth in centric occlusion when film exposure was done.

Exposure criterion as recommended by GOAZ and WHITE12, along with manufacturer's recommendation was strictly followed for obtaining each cephalograms.
80 KVP, 20 mA with an exposure time of 2. 5 seconds was standardized for this study. Developing and fixing procedures were done according to the recommendations given by GOAZ and WHITE[12].

Tracing

Lateral cephalograms were traced upon a 0.003inch matte acetate tracing paper with a 3H hard lead pencil. The values were measured by using protractor, corrected up to 0.5 degree. The mean, standard deviation, minimum and maximum values of each measurement were tabulated.
The mean, the standard deviation and 95% confidence levels were computed statistically. All the values of different parameters were collected, arranged properly and computed for statistical analysis.

Parameters to be studied:
(i) Soft tissue facial angle
(ii) H- Line Angle
(iii) Upper lip sulcus depth
(iv) Lower lip sulcus depth
(v) Upper lip thickness
(vi) Upper lip strain
(vii) Soft tissue subnasale to H-line
(viii) Skeletal profile convexity
(ix) Soft tissue chin thickness
(x) Nose prominence

The following measurements were used (Figs 1 and 2).
1.H line: tangent drawn from the tip of the chin to the upper lip.

2 . Soft tissue facial angle: the downward and inner angle formed at a point where the sella-nasion line crosses the soft tissue, and a line combining the suprapogonion with the Frankfort horizontal plane.

4. H angle: the angle formed between the soft tissue facial plane line and the H - line.

5. Soft tissue chin thickness: the distance between the hard and soft tissue facial planes at the level of suprapogonion.

6. Skeletal profile convexity: the dimension between point A and the facial line.

7. Nose prominence: the dimension between the tip of the nose and a perpendicular line drawn to the Frankfort plane from the vermilion.

8. Upper lip sulcus depth: the measurement between the upper lip sulcus and a perpendicular line drawn from the vermilion to the Frankfort plane.

9. Inferior sulcus to the H line (lower lip sulcus depth): the measurement at the
point of greatest convexity between the vermilion border of the lower lip and the H line.

10. Basic upper lip thickness: the dimension measured approximately 3 mm below point A and the drape of the upper lip.

11. Upper lip thickness: the dimension between the vermilion point and the labial surface of the maxillary incisor.

12. Upper lip strain measurement: the difference between the basic upper lip thickness and the upper lip thickness.

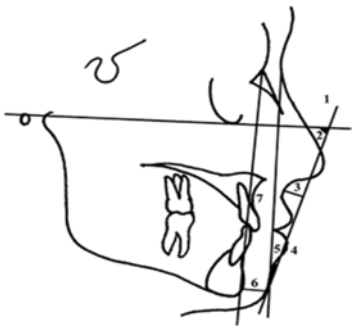

Fig 1. Cephalometric measurements: 1, H line; 2, soft tissue facial angle; 3, soft tissue subnasale to H line; 4, lower lip to H line; 5, H angle; 6, soft tissue chin thickness; 7, skeletal profile convexity.

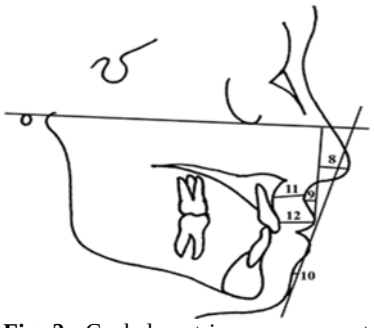

Fig 2. Cephalometric measurements: 8, nose prominence; 9, upper lip sulcus depth; 10, inferior sulcus to H line (lower lip sulcus depth); 11, basic upper lip thickness; 12, upper lip thickness.

RESULTS AND ANALYSIS

For statistical analysis, data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 10.0.1 and Graph Pad Prism version 5. Statistical Analysis was performed with help of Epi Info (TM) 3.5.3 which is a trademark of the Centers for Disease Control and Prevention (CDC).

Under descriptive statistics means with corresponding standard deviations (s.d.) were calculated. t-test was used
to compare the means of the two groups
.
Data have been summarized as mean and standard deviation for numerical variables, count and percentages for categorical variables. The median and range have been stated for numerical variables that are not normally

distributed. Student's independent sample's t-test was applied to compare normally distributed numerical variables between groups.

Once a t value is determined, a p-value can be found using a table of values from Student's t-distribution. If the calculated p-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favor of the alternative hypothesis. P-value ≤0.05 was statistically significant.

Table-1: Gender distribution of the patients

Gender	Number	%
Male	28	56.0%
Female	22	44.0%
Total	50	100.0%

Proportion of males (56.0%) was higher than that of female (44.0%) but it was not significant (Z=1.20; p=0.23).

Table-2: Comparison of means

Parameters	Holdaway norms		Bengali Adult Population			t-test	p-value
	Holdaway norms	Mean±S.d	Mean±S.d	Median	Range		
Soft tissue facial angle (in °)	91±7	87.31±8.64	90.18±2.53	91	85 – 95	2.23	0.0282*
H-line angle (in °)	7 to 15	13.75±3.01	13.94±2.11	14	11 - 20	0.35	0.7196
Soft tissue subnasale to H line (in mm)	3 to 7 mm (Ideal is 5mm)	5.07±1.63	5.60±0.56	5.5	5 - 7	11.32	<0.00001*
Lower sulcus depth (in mm)	5 mm	4.25±0.84	4.84±0.56	5	3 - 6	2.66	0.0425*
Upper lip thickness (in mm)	13 to 14 mm	13.06±2.10	13.16±0.71	12	12 – 14	2.02	0.0481*
Upper lip strain (in mm)	0 to 1mm	0.37±0.29	0.44±0.50	0	0 – 1	0.63	0.0297*
Upper lip sulcus depth (in mm)(upper lip curvature)	1 to 4 mm(Ideal is 3mm)	2.88±0.46	2.64±0.55	2.5	2 – 3	4.15	<0.00001*
Skeletal profile convexity (in mm)	0 to 2 mm	-0.21±2.31	1.32±1.26	1	0 – 5	4.11	<0.00001*
Soft tissue chin thickness (in mm)	10 to 12mm	12.96±2.05	12.76±1.54	12.5	10 – 15	0.55	0.5806
Nose prominence (in mm)	14 to 24mm	13.76±2.89	18.06±1.01	18	0 12	23.76	<0.00001*

* Statistically Significant

t-test showed that mean Soft tissue facial angle (in °), Lower sulcus depth (in mm), Skeletal profile convexity (in mm) and upper lip srain were significantly higher for Bengali adult population than that of Holdaway norms (p<0.01).

But the mean Upper lip thickness (in mm), soft tissue subnasale to H-line (in mm), Upper sulcus depth (in mm), and Nose prominence (in mm) were significantly lower for Bengali adult population than that of Holdaway norms (p<0.01).

However no significant difference was found for H- line angle (in °) and Soft tissue chin thickness(in mm) between Bengali adult population than that of Holdaway norms (p>0.05).

Table-3: Comparison of means for males

Parameters	Holdaway norms		Bengali Adult Population Female (n=28)			t test	p value
	Holdaway norms	Mean±S.d	Mean±S.d	Median	Range		
Soft tissue facial angle (in °)	91±7	88.14±2.42	88.18±1.93	88	85 - 90	0.008	0.99
H-line angle (in °)	7 to 15	13.18±2.09	13.50±0.67	14	12 - 14	0.53	0.5913
Soft tissue subnasale to H-line (in mm)	3 to 7 mm (Ideal is 5mm)	5.81±1.83	5.45±0.47	5.5	5 - 6	8.66	<0.00001*
Lower sulcus depth (in mm)	5 mm	4.81±2.16	4.81±0.79	5	4 - 6	0.69	0.4913
Upper lip thickness (in mm)	13 to 14 mm	12.28±2.30	12.90±0.29	13	12 - 13	0.75	0.4686
Upper lip strain (in mm)	0 to 1mm	2.72±2.49	0.31±0.47	0	0 - 1	5.03	<0.00001*
Upper lip sulcus depth(in mm)(upper lip curvature)	1 to 4 mm(Ideal is 3mm)	2.74±0.55	2.50±0.40	2.5	2 - 3	1.86	0.0683
Skeletal profile convexity (in mm)	0 to 2 mm	0.04±2.40	1.36±0.63	1.5	0.5 – 2.0	2.81	0.0082*
Soft tissue chin thickness (in mm)	10 to 12mm	12.78±1.93	12.05±1.78	12	11 - 15	1.35	0.1826
Nose prominence (in mm)	14 to 24mm	17.72±2.61	10.68±0.95	10	8 - 12	26.8	<0.00001*

* Statistically Significant

t-test showed that mean Soft tissue facial angle (in °), soft tissue subnasale to H-line(in mm) , and Skeletal profile convexity (in mm) were significantly higher for Bengali adult male population than that of Holdaway norms (p<0.01).

But the mean Upper lip thickness (in mm), Upper lip strain (in mm), Soft tissue chin thickness (in mm) and Nose prominence (in mm) were significantly lower for Bengali adult male population than that of Holdaway norms (p<0.01).

However no significant difference was found for H- line angle (in °), Lower sulcus depth (in mm), and Upper sulcus depth (in mm) between Bengali adult male population than that of Holdaway norms (p>0.05).

Table-4: Comparison of means for females

Parameters	Holdaway norms		Bengali Adult Population Female (n=28)			t-test	p-value
	Holdaway norms	Mean±S.d.	Mean±S.d.	Median	Range		
Soft tissue facial angle (in °)	91±7	90.14±0.42	90.18±1.93	90	85 - 90	0.008	0.99
H-line angle (in °)	7 to 15	13.18±3.09	13.50±0.67	14	12 - 14	0.53	0.5903
Soft tissue subnasale to H line (in mm)	3 to 7 mm (Ideal is 5mm)	5.81±1.62	5.52±0.42	5.5	5 6	8.56	<0.00001*
Lower sulcus depth (in mm)	5 mm	4.81±2.16	4.81±0.79	5	4 - 6	0.69	0.4913
Upper lip thickness (in mm)	13 to 14 mm	12.28±2.30	12.90±0.29	13	12 - 13	0.75	0.4686
Upper lip strain (in mm)	0 to 1mm	2.72±2.49	0.31±0.47	0	0 - 1	5.03	<0.00001*
Upper lip sulcus depth(in mm)(upper lip curvature)	1 to 4 mm(Ideal is 3mm)	2.74±0.55	2.50±0.40	2.5	2 - 3	1.86	0.0683
Skeletal profile convexity (in mm)	0 to 2 mm	0.04±2.40	1.36±0.63	1.5	0.5 – 2.0	2.81	0.0069*
Soft tissue chin thickness (in mm)	10 to 12mm	12.28±1.02	12.05±1.78	12	11 15	1.35	0.1826
Nose prominence (in mm)	14 to 24mm	17.72±2.61	10.68±0.95	10	8 - 12	25.8	<0.00001*

* Statistically Significant

t-test showed that mean soft tissue subnasale to H-line (in mm) and Skeletal profile convexity (in mm) were significantly higher for Bengali adult female population than that of Holdaway norms (p<0.01).

But the mean Upper lip strain (in mm) and Nose prominence (in mm) were significantly lower for Bengali adult female population than that of Holdaway norms (p<0.01).

However no significant difference was found for Soft tissue facial angle (in °), H- line angle (in °), Lower

sulcus depth (in mm), Upper lip thickness (in mm), Upper sulcus depth (in mm) and Soft tissue chin thickness (in mm) between Bengali adult female population than that of Holdaway norms (p>0.05).

Table-5: Comparison of means for males and females

Parameters	Bengali Adult Male Population (Mean±S.d.) (n=28)	Bengali Adult Female Population (Mean±S.d.) (n=22)	t-test	p-value
Soft tissue facial angle (in °)	91.78±1.64	88.19±1.93	7.10	<0.0001*
H- line angle (in °)	14.28±2.73	13.50±0.67	1.36	0.19
Soft tissue subnasale to H-line (in mm)	5.62±0.66	5.52±0.42	0.61	0.54
Lower sulcus depth (in mm)	4.59±0.93	4.81±0.79	1.66	0.10
Upper lip thickness (in mm)	13.35±0.86	12.90±0.25	2.34	0.02*
Upper lip strain (in mm)	0.23±0.50	0.31±0.47	1.58	0.12
Upper lip sulcus depth (in mm)(upper lip curvature)	5.75±0.75	5.50±0.48	2.70	0.0098*
Skeletal profile convexity (in mm)	1.28±1.60	1.36±0.85	0.22	0.82
Soft tissue chin thickness (in mm)	12.60±1.34	12.05±1.78	0.70	0.48
Nose prominence	12.00±1.84	10.63±0.95	5.48	<0.0001*

* Statistically Significant

Mean Soft tissue facial angle (in °), Upper lip sulcus depth (in mm) and Nose prominence (in mm) of males were significantly higher than that of females. No significant difference was found for other parameters of males and females (p>0.05).

DISCUSSION

Various studies have been carried out to define the cephalometric soft tissue norms of different population as for Americans (Bishara et al.1990; Bishara and Fernandez, 1985), Arabians (Hamdan and Rock, 2001; Al-Gunaid et al13, 2007), Turkish (Basciftci et al14, 2003; Erbay et al15, 2002; Sag˘lam and Gazilerli16, 2001), Asians and Europeans (Hwang et al17, 2002).

With the increasing number of Bengali population seeking professional advice, it has become important that there is a need to determine what constitutes a pleasing or normal face in the Bengali population. A comprehensive and accurate diagnostic assessment of any orthodontic patient involves the comparison of the patient's measured findings with the norms of his or her ethnic groups. Research studies indicate that the characteristic details of each group have its own standards within the same race, each sub group has its own norms.

The aim of this study is to determine the soft tissue norms of Bengali adult population using Holdaway analysis.
In this study, we used Holdaway analysis to assess facial esthetic and harmony because it accounts the soft tissue profile in details with simplicity and it is widely used for evaluation of soft tissue profiles.

Holdaway Analysis on Lateral Cephalograms

Soft-tissue facial angle: This is an angular measurement of a line drawn from soft-tissue nasion, where the sella-nasion line crosses the soft-tissue profile, to the soft-tissue chin at a point overlying the hard-tissue suprapogonion of Ricketts measured to the Frankfort horizontal plane. It is a realistic measurement of chin prominence in a face than the hard-tissue facial angle because of the wide range of variations that we find in the thickness of the soft-tissue chin. A measurement of 91 degrees is ideal, with an acceptable range of ±7 degrees.

An angle more than 91degrees suggests a protrusive mandible and an angle less than 91degrees suggests a recessive lower jaw.

In the present study, the mean soft tissue facial angle for Bengali adult population is 90.18±2.53 in degrees which is significantly higher than that of mean Holdaway norms10 (87.31±8.84). This value is found to be significantly higher for Bengali adult male population which is 91.78±1.64 in degrees than that of Holdaway norms10 and that of Bengali adult female population which is 88.19±1.93 in degrees.

The median value of Bengali adult population lies around 91 degrees which is similar to that of Holdaway norms10 (91 ± 7) degrees indicating good soft tissue chin position.
H- line angle: This is an angular measurement of the H line to the soft-tissue Na-Po line or soft-tissue facial plane. Ten degrees is ideal when the convexity measurement is 0 mm. However, measurements of 7 to 15 degrees are all in the best range as dictated by the convexity present. Ideally, as the skeletal convexity increases, the H angle must also increase if a harmonious drape of soft tissues is to be realized in varying degrees of profile convexity. These observations have been based on the patients predominantly of northern European ancestry.
The H-line angle measures either the degree of upper lip prominence or the amount of retrognathism of the soft tissue chin. Concave, straight or convex profiles may have soft tissues, which are in balance and harmony. These faces, however, bear a relationship between the skeletal convexity at point A and the H-line angle.

According to Holdaway10, there is no single H angle that can be set as an ideal for all types of faces, but it will increase proportionately as the skeletal convexity varies among individuals.

The mean value for H line angle is found to be 13.94±2.11 in degrees for Bengali adult population which is almost similar to that of Holdaway norms10 (13.75±3.01) indicating esthetically pleasing profiles.

There is no any significant difference between the mean values of males and females.

Skeletal profile convexity: This is a measurement from point A to the hard-tissue line Na-Pog or facial plane. This is not really a soft-tissue measurement, but convexity is directly interrelated to harmonious lip positions and, therefore, has a congruency needed to produce harmony of the features of the human face.

In this study the mean value for skeletal profile convexity was found to be 1.32±1.26 in mm which is higher than that of Holdaway norms10 (-0.21±2.31) mm indicating slightly increased convexity among Bengali adult population than the caucasians. This value was found to be significantly higher for Bengali adult male population (1.28±1.60) mm than that of Holdaway norms10 ($p<0.01$) and almost similar to that of Bengali adult female population (1.36±0.63) mm.

Soft tissue subnasale to H-line: Here the ideal is 5 mm., with a range of 3 to 7 mm. According to Holdaway10, with short and/or thin lips, 3 mm. will be adequate and in longer and/or thicker lips, 7 mm. may be in excellent balance.
This measurement is a very useful guide and is used routinely to visualize the best lip position for a case when a Visualized Treatment Objective (VTO) is constructed. The H line does follow the general line of the lower face. If this is out of proportion to the general convexity and type of face or if the lower lip fails to fall near it, then it is considered to be out of proportion. Both lips need their own adequate contour and this is especially true of the upper lip.

In this study its mean value is found to be 5.58±0.56 in mm which is significantly lower than that of Holdaway norms10 (mean value 5.97±1.53 in mm). The mean value for Bengali adult male population is found to be 5.62±0.66 in mm which is significantly lower than that of Holdaway norms10 and almost similar to that of Bengali adult female population (5.52±0.42) mm.

The median value of soft tissue subnasale to H-line among Bengali adult population is found to be 5.5mm which is in the very narrow range of 4 to 6 mm as described by Holdaway10 indicating a definite curl or form to the upper lip.

Upper lip sulcus depth: This parameter gives an idea of upper lip form or curl which is measured perpendicular to Frankfort horizontal plane and tangent to the vermilion border of the upper lip. A range of 1 to 4 mm. is acceptable in certain types of faces, with 3 mm. being ideal.

This measurement is especially useful in cases found to be on either extreme of facial convexity where a measurement to the H line (harmony line) is misleading because of the change in the cant of this line in highly convex or concave faces. This is a simple way to quantitate the actual curl of the upper lip. During orthodontic treatment or surgical orthodontic procedures, we should strive never to allow this measurement to become less than 1.5 mm. Faces with average lip thickness where there is a 3 mm. measurement are preferred. However, in cases of high skeletal convexity, especially associated with mandibles that have obtuse gonial angles and long lower face dimension, or in cases of very thin lips, it may be necessary to settle for a 1 mm. measurement. With less face height, more prominent chins, and longer or thicker upper lips, a measurement of up to 4 mm. may not be excessive.

Lack of upper sulcus depth is suggestive of lip strain. Excessive depth could be caused by lip redundancy or jaw overclosure.

In the present study the mean value for upper lip sulcus depth is found to be 2.64±0.35 in mm which is significantly lower than that of mean Holdaway norms10 (2.98±0.46)mm. . There is no any significant difference between the mean values of Bengali adult male population and Holdaway norms, and that between female population and Holdaway norms. The mean value for Bengali adult male population is found to be 2.75±0.25 in mm which is significantly higher than that of Bengali adult female population (2.50±0.40) mm.

This suggests that the actual curl of the upper lip of Bengali adult population is slightly different from that of the population studied by Holdaway10.

Lower lip sulcus depth: The contour in the inferior sulcus area should fall into harmonious lines with the superior sulcus form. This is measured at the point of greatest concavity between the vermilion border of the lower lip and the soft-tissue chin and is measured to the H line. It is an indicator of how to manage axial inclinations of the lower anterior teeth. Leveling procedures on round arch wires may cause a lingual tipping of the lower incisor roots with point B following and thus exaggerate an already excessive labiomental furrow and a prominent chin.
The mean value for lower sulcus depth in Bengali adult population is found to be 4.58±0.90 in mm which is significantly higher than that of Holdaway norms10 (4.22±0.84) mm. However no significant difference was found for Lower sulcus depth between Bengali adult male population and Holdaway norms10, between Bengali adult female population and Holdaway norms[10] nor any significant sex difference.

Upper lip thickness: This is near the base of the alveolar process, measured about 3 mm. below point A. It is at a level just below where the nasal structures influence the drape of the upper lip. This measurement is useful, when compared to the lip thickness overlying the incisor crowns at the level of the vermilion border, in determining the amount of lip strain or incompetency present as the patient closes his or her lips over protrusive teeth.

In the present study the mean value for upper lip thickness is found to be 13.16±0.71 mm which is significantly lower for Bengali adult population than that of Holdaway norms10 (13.96±2.70) mm. The mean value for Bengali adult female population is 12.90±0.29 in mm which is significantly lower than that of Bengali adult male population (13.35±0.86) mm. However no significant difference was found for Upper lip thickness between Bengali adult female population than that of Holdaway norms10 ($p>0.05$). But the mean Upper lip thickness (13.35±0.86 in mm) were significantly lower for Bengali adult male population than that of Holdaway norms10.

Upper lip strain: The usual thickness at the vermilion border level is 13 to 14 mm. Excessive taper is indicative of the thinning of the upper lip as it is stretched over protrusive teeth; also, excessive vertical height may produce more than 1 mm of taper due to lip stretching. When the lip thickness at the vermilion border is larger than the basic thickness measurement, this usually

identifies a lack of vertical growth of the lower face with a deep overbite and resulting lip redundancy.

In the present study no significant difference was found for the mean Upper lip strain (0.44±0.50 mm) between Bengali adult population than that of Holdaway norms10 ($p>0.05$) suggesting near to ideal incisor inclination. The mean Upper lip strain was found to be 0.53±0.50 mm which was significantly lower for Bengali adult male population than that of Holdaway norms10 (2.64±2.33)mm. The mean Upper lip strain (0.31±0.47 mm) was significantly lower for Bengali adult female population than that of Holdaway norms10 ($p<0.01$). No significant difference was found for upper lip strain between males and females ($p>0.05$).

Soft tissue chin thickness (10 to 12 mm. average): This is recorded as a horizontal measurement and is the distance between the two vertical lines representing the hard-tissue and soft-tissue facial planes at the level of pogonion. According to Holdaway10, large variations, such as 19 mm of thickness need to be recognized, and in such cases it is essential to leave the lower incisors and hence the upper incisors in a more anterior position and to avoid the tendency to take away needed lip support.

In the present study no significant difference was found for Soft tissue chin thickness (12.76±1.54 mm) between Bengali adult population than that of Holdaway norms10 ($p>0.05$), nor between for Bengali adult female population and Holdaway norms10 (13.64±2.00)mm.

The mean Soft tissue chin thickness (12.60±1.34 mm) values were significantly lower for Bengali adult male population than that of Holdaway norms10 (13.64±2.00)mm.

No significant difference was found for the mean soft tissue chin thickness between males and females ($p>0.05$).
Nose prominence: Nose prominence can be measured by means of a line perpendicular to Frankfort horizontal and running tangent to the vermilion border of the upper lip. Arbitrarily, those noses under 14 mm. are considered small, while those above 24 mm. are in the large or prominent range.

Although nose size is important to facial balance, lip balance and harmony generally contribute more to the total picture of facial balance and harmony.

The mean value for nose prominence in this study is found to be 10.96±1.91 in mm which is significantly lower than that of Holdaway norms10 (18.74±3.59) suggesting less prominent nose among Bengali population. The mean value for nose prominence among Bengali adult male population is found to be 12.00±1.84 in mm which is significantly lower than that of Holdaway norms10 (18.74±3.59) and higher than that of Bengali adult female population (10.63±0.95) suggesting men's noses more prominent than those of females.

SUMMARY AND CONCLUSION

The present study was undertaken to determine the Holdaway soft tissue norms for Bengali adult population. Soft tissue measurements were performed on lateral cephalograms of 50 subjects between the ages of 18-25 years.

Statistical analysis was performed using Microsoft excel spreadsheet and then analysed by SPSS 10.0.1 and Graph Pad Prism version 5.

Within the limitations of this study the following conclusions were drawn:

•Bengali population showed some significant differences in various soft tissue parameters such as soft tissue facial angle, skeletal profile convexity, soft tissue subnasale to H-line, upper sulcus depth, lower sulcus depth, upper lip thickness, upper lip strain and nose prominence.

•The results showed that Bengali population has slightly more skeletal profile convexity, less prominent nose, slightly decreased upper lip thickness hence increased upper lip strain, and slightly less soft tissue subnasale to H-line and upper sulcus depth as compared to the Holdaway norms.

•No any significant differences were found in H-line angle and soft tissue chin thickness.

•When comparisons were made between the sexes, some significant differences between males and females were noticed.
•Mean Soft tissue facial angle, Upper lip sulcus depth and Nose prominence of males were significantly higher than that of females.

• No significant difference was found for other parameters of males and females.
In view of the findings of the current study it is evident that even in the Bengali ethnic groups with well-balanced faces, there are some fundamental variations in the facial soft tissue structure when compared with that of Caucasian standard. These should be established to serve in the diagnosis and treatment planning of the Bengali patients.
The results of the present study also support the view that a single standard of facial soft tissue norms should not be applied to all racial and ethnic groups. A more extensive study with higher number of samples is necessary for clinical use in the future.

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Comparison of Efficiency of Rotary NiTi and Hand files Instrumentation System in root canal Debridement

Abstract

OBJECTIVE: To determine : The goal of this find out about used to be to examine the canal debridement abilities of single file systems (WaveOne) and K- files in oval- shaped canals.

MATERIALS AND METHODS: Thirty extracted human mandibular central incisors with oval- shaped root canals had been selected. A radiopaque distinction medium (Metapex) was introduced into the canal systems and the WaveOne, and K- files were used for the instrumentation of the canals. The proportion of removed distinction medium was calculated using pre- and post-operative radiographs.

RESULTS: An typical evaluation between the groups published that the hand file (HF) introduced the lowest share of eliminated distinction medium, whereas the WaveOne confirmed the highest .

Conclusions: None of the instruments was once in a position to put off the distinction medium completely. WaveOne performed extensively higher than other groups.

KEY WORDS: Metapex, root canal debridement, WaveOne.

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INTRODUCTION

One of the most important stages in root canal treatment is the proper debridement of the root canal system, which consists of the removal of necrotic tissue or debris or smear layers.

However, this stage is hard due to the complicated anatomy of the root canal system [1] . Various instrumentation techniques have been used to prepare different types of canals. However, the conventional hand files (HFs) and nickel- titanium (NiTi) rotary instruments leave parts of the root canal surface unprepared, in particular in the case of oval- shaped root canal(1,2,3)

The aim of this learn about used to be to examine the debridement capabilities of a WaveOne file and a hand- filling technique. The null speculation suggests that there is no difference between the strategies in the preparation of oval- shaped root canals.

MATERIALS AND METHOD:

Thirty freshly extracted intact human mandibular central incisors, each and every with a mature apex and a single oval canal had been used for the study. Canals with a buccolingual root canal dimension that was extra than twice the mesiodistal dimension were selected. Only straight roots or these with a canal curvature of had been included.

In this study, a method, which was once used in a previous study was modified for the contrast of root canal debridement.[8] For each tooth, Access cavity was prepared with the usage of high- speed diamond burs.
Gates Glidden drills #2 and #3 have been used in a low- speed contra- angle handpiece for the cause of coronal flaring under the cementoenamel junction. After preparation, irrigation was as soon as performed with 2.5% NaOCl using a 27- gauge needle and a two mL syringe. Root canals displaying a single oval orifice have been instrumented with #10 K- files till the tip was

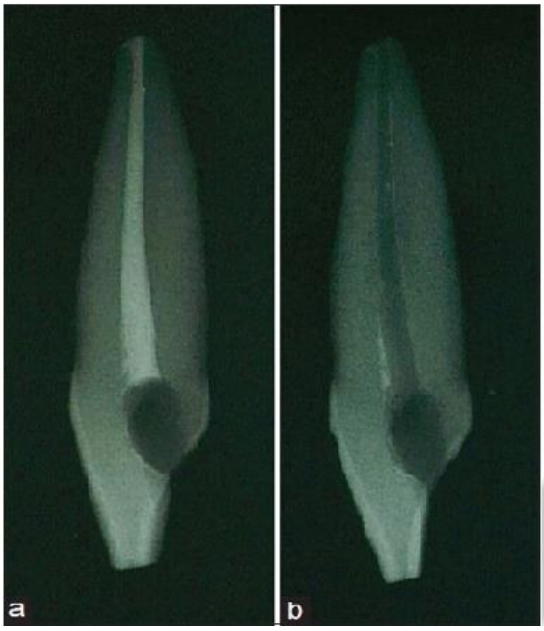
visible at the apex; the working measurement (WL) was once as soon as 0.5 mm quick of this length. Subsequently, a drift path was hooked up with 10, 15, and 20 K- files the utilization of a lubricant , as a lubricant, and 5 mL of 2.5% NaOCl was used to irrigate the canals between files. A final rinse of 5 mL sterile saline used to be then delivered. The canals were dried with paper points, and a radiopaque contrast medium (Metapex) was placed into the canal structures the use of a lentulo spiral. The teeth were numbered and a small groove was once positioned on the proximal flooring of all specimens to facilitate standardized positioning of the tooth for radiographic imaging. Radiographs were taken at buccolingual and mesiodistal projections to verify complete filling of the root canal system. If there have been any voids present, the contrast medium was once as soon as reintroduced and radiographs were taken until these canal spaces had been filled. Teeth have been randomly assigned to 2 groups (n = 15) according to the instrumentation technique used

Hand file

Stainless steel K- files had been used, and the canal was once enlarged to a closing apical measurement of #40.

WaveOne

Teeth were instrumented the utilization of WaveOne essential files 40/0.06 in accordance to the manufacturer's instructions . The instrument reached to the WL with three in- and out- pecking motions and a new instrument was once used for each tooth.



Thirty buccolingual radiographs had been taken after instrumentation, and the pre- and post- operative radiographs were transferred to the computer(Adobe Photoshop CS5) [Figure 1]. Pre- and post- operative radiopaque areas had been calculated from the apex to 10 mm for each and every tooth and the share of distinction medium eliminated used to be quantified.

One- way comparison of variance and Tukey's post- hoc tests were used to consider the proportion of distinction medium removed in all companies at a self assurance level of 95% (P = 0.05). All statistical analyses have been performed using IBM® SPSS® Statistics 20 software .

RESULTS

The share of contrast medium eliminated in all groups is shown in Figure 2 An average contrast between two groups revealed that the HF(75,19) presented the lowest share of eliminated distinction medium, whereas the WaveOne (95,47) group showed the highest. WaveOne eliminated extra contrast medium than HF files (P < 0.05).

Reduction in contrast media(%)	Instruments	
75,19	Hand file	
95,47	WaveOne	

Comparison of Hand file and WaveOne file in removal of contrast medium from oval-shaped root canals

DISCUSSION

The aim of this study about was to compare the canal debridement efficiency of single file systems(WaveOne), and K- files in oval- shaped canals. The results point out that none of the File system should remove the distinction medium completely. This finding is comparable to the findings in the preceding studies.[5- 7] Despite research reporting that HFs are higher than rotary documents in preparing oval root canals, the present study demonstrates that the HF group presented the most unprepared areas on the canal walls.[8] The consequences obtained in these preceding studies have been probably due to the reality that H- files have been used in the cleaning and shaping

In this study, the WaveOne files removed more radiopaque medium from oval root canals than the HFs. Albrecht et al. [9] evaluated a range of sizes and tapers of rotary files and reported that an expanded file taper leads to root canal debridement. In this study, WaveOne and HFs have been used with a taper of 40.08 and 40.02, respectively. The higher performances of WaveOne files in contrast to HFs may additionally have been due to the truth that their tapers had been higher. The WaveOne archives are produced with the M- Wire NiTi alloy, the use of a warmth procedure carried out at varying temperatures.(11,12) The WaveOne machine has a similar tip diameter to the ProTaper files, but WaveOne is used with a reciprocating motion, whereas ProTaper is used with a rotary motion.[13]

Hilaly Eid and Wanees Amin[8] endorse that the reciprocating action simulates a balanced force motion, and said that circumferential filing eliminates extra dentin than balanced pressure action in oval root canals. Despite this preceding study, the WaveOne crew eliminated more distinction medium in this Study about than the ProTaper technique (P >0.05); its higher taper

and reverse slicing blade plan may additionally explain this result.

In this study, Metapex used to be used as a contrast medium due to its radiopacity and ease of placement, which facilitated a two- dimensional evaluation of distinct file systems. Similarly, Ruckman et al. [4] in contrast the SAF file with hand and rotary documents using Vitapex as a contrast medium. Although, this study about obtained quantitative data, it is now not as accurate as the data provided with the aid of micro- computed tomography, which allows three- dimensional analyses.[14,15]

Pilot studies exhibit that sodium hypochlorite dissolves Metapex, and for this reason, sterile saline solution was used for irrigation purposes.[4]

Preparation of the root canal is one of the most essential tiers in root canal therapy, and in this study, oval- shaped canals were selected, which signify a mission to any training system.[10, 16-18] Within the limitations of this study, none of the filing systems used to be able to instrument all the root dentin partitions in the oval- shaped canals, and this end result fits the consequences of preceding studies.[9,7,19]

It can be concluded that the WaveOne exhibited higher performance than HFs in canal debridement in the oval- shaped root canals, with great variations between the groups. On this basis, the null hypothesis that there is no distinction between the methods in the preparation of oval- shaped root canals ought to be rejected. Micro- computed tomography research are recommended to examine similarly the effectiveness of these units in root canal debridement.

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Mouth Breathing - A Troublesome Pathway

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Abstract

AIM: This review article aims to know the adverse effect of mouth breathing.

INTRODUCTION: The Mouth breathing as an alternative to nose breathing is discussed in detail and the consequences it might lead to are mentioned in this review article. This review article also contains the effect mouth breathing has on the skeletal structure, dentition, face, speech, gingiva, etc. This review is written to create awareness that might be of help in the early diagnosis of the condition.

MATERIALS AND METHODS: This review article is drafted based on the source of literature accessible online. A thorough search was made on Pubmed and other reliable sources and then this review is formed.

CONCLUSION: vertebral Early recognition of facial patterns can be used to identify compromised respirators individuals who are more likely to develop malocclusion because of mouth breathing. Thus, the multidisciplinary team of pedodontists, orthodontists, ENT specialists, and Pediatricians should collectively work on the proper mouth breathing habit treatment and finally reduce the continuing harmful effects of breathing -defects on facial features.

Keywords: Mouth breathing, Habit, Dentofacial, Respiration, Sleep Apnoea.

INTRODUCTION

The oral cavity exhibits numerous physiological diversions like speech, sucking, respiration, swallowing, and mastication. All these physiological functions are balanced in the oral cavity. And even a slight disturbance in these physiological functions may result in mild to severe consequences. The outcome of these consequences can be abnormal growth and abnormal development of bony and soft tissue structures of the craniofacial complex.[1]

Skeletal Breathing is the process of inhaling and exhaling through the nose and human beings on a general basis are considered to be nose breathers. Regularly, there is no such contribution of mouth in respiration, however, if there is an increased discomfort and struggle of the passing of air through the nasal cavity, an individual opts for mouth breathing naturally and this can be considered to be one of the main reasons of mouth breathing.[2] Although respiration through both the oral and nasal cavities provides oxygen to the lungs but the effects of oxygen coming from two different pathways have exceptionally diverse effects on the human body as the levels of oxygen supplied to the lungs from two different pathways are completely dissimilar.[3]

Klein J.C 1986 did a study and concluded that the relevance of mouth breathing in children can range from 5 to 75%.[4]

Sleep apnoea and oral breathing:- Sleep apnea is a serious sleep disorder in which breathing continuously stops and starts. Feeling tired even after a full night's sleep (with loud snoring) is a possibility that an individual might be suffering from sleep apnoea.

Oral breathing can lead to obstructive sleep apnea (OSA) or worsen it by increasing airway collapse and nasal resistance. Hence, it turns into a deadly cycle as the more the patient breaths orally, the more nasal congestion occurs leading to increased problems with sleep apnea.

Lagomarsino K in 2018 did a study and concluded that reduced oxygen flow to the brain disrupts restorative sleep, which is a critical period in a young child's brain development. These disturbances due to inappropriate sleep create problems in areas of the brain that control babies' and toddlers' ability to be attentive, control behavior, and regulate emotions and they experience increased hyperactivity.

CLASSIFICATION

Sim and Finn (1987) classified mouth breathers into the following three categories according to their etiology:

Obstructive: Children who have an increased resistance to or a complete obstruction of the normal flow of air through the nasal passages. The child is forced by sheer necessity to breathe through the mouth.

Habitual: Habitual mouth breather is a child who continually breathes through his mouth by force of habit, although the abnormal obstruction has been removed.

Anatomical: The anatomic mouth breather is the one whose short upper lip does not permit closure without undue effort.

Total Blockage: The nasal passages are completely blocked.

Partial Blockage: The nasal passages are partially blocked. (Figure 1).

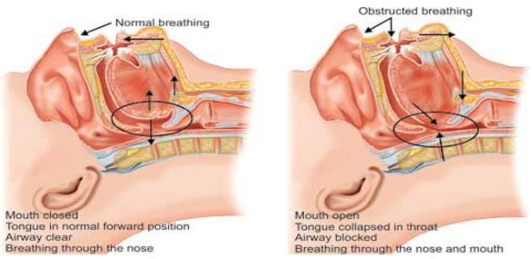

Fig. 1: Difference between normal and obstructed breathing

ETIOLOGY

The causative factors of mouth breathing are various. The most basic causative factor of mouth breathing is when the nasal obstruction is present. Sometimes, congenital or post natal causative factors can lead to amplification of resistance to airflow and debilitated sucking-swallowing responses as a consequence of nasal obstruction which can further lead to higher risks of aspiration or something more severe and distressful respiratory conditions. Furthermore, obstruction of the nasal cavity can alter the 'trophic' flow of sensory information toward the olfactory brain.

ENLARGED TURBINATE

Causes of enlarged turbinate are:-

- Air pollution.
- Hot and dry climatic conditions.
- Atrophic rhinitis**.**
- Chronic infections of a mucous membrane.
- Allergy.
- Enlargement of the pharyngeal tonsils or adenoids.
- If an individual suffers infection of the lymphoid tissue multiple times, the lymphoid masses overgrow and as a consequence of the overgrowth of the lymphoid masses, the posterior nare gets blocked which further influences mouth breathing.

ALLERGIC RHINITIS

The tissue may become highly sensitive causing an allergic reaction because of repeated infections and the toxicity of the bacteria.

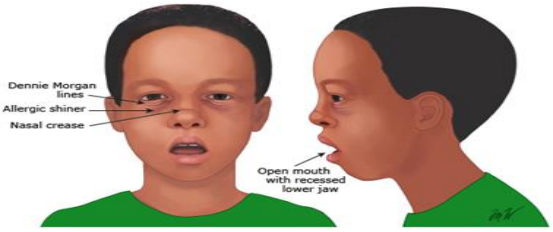

Figure: Child with allergies

INTRANASAL DEFECTS

Various intranasal defects which may be a causative factor for mouth breathing are:-

- Deviation of the nasal septum.
- Subluxation of septum.
- When septum gets thicker**.**
- Bony spurs.
- Nasal polyps.

The hot and dry climatic condition

Dryness of mucous sheet of the nasal cavity during hot and dry climatic conditions can lead to nasal congestion and mucosal engorgement due to low humidity which further leads to mechanical obstruction of the nasal cavity.

CLINICAL FEATURES OF MOUTH BREATHING

Mouth breathing can lead to various intra-oral and extra-oral changes. Aronson between 1970 and 1980 reported how mouth breathing and the appearance of the craniofacial region are interconnected. The various inter-connection mentioned are:-

Effect on skeletal

Some postural and morphological changes during long-term adaptation to oral respiration are provoked. Opening of the bite with a lowered postural position of the mandible, reduction of upper arch width, downward and

backward rotation of the mandible, increased lower facial height, and changes in the inclination of the lower and upper incisors can be the consequences of long term mouth breathing.

The malposition of the tongue creates a disturbance in the normal muscular forces in the areas around. The malpositioned tongue along with various other factors due to mouth breathing can lead to some severe effects on the growth of the facial skeleton and occlusion of teeth because of the displacement of normal lateral, buccal and lingual muscular forces.

Effect on face

Various Continuous mouth breathing can lead to adenoid faces causing:-

- Incompetent lips.
- Short upper lip.
- Everted lower lip.
- Proclination of teeth.
- Spacing of teeth of teeth.
- Suspension of the tongue between the upper and lower arches can result in constriction of the buccal segment increasing mandibular plane angle.
- Retrognathic maxilla and mandible.

Figure: Adenoid faces

Effect on lip

The effect of continuous mouth breathing on lips are:-

- Lip apart posture.
- Short and thick incompetent upper lip.
- Gummy smile.
- Voluminous curl over the lower lip.

Figure: Open mouth posture

Effect on occlusion of teeth

The effect of long term mouth breathing on the occlusion of teeth are:-

- The interposition of the hypertonic lower lip between mandibular and maxillary incisors provokes the labial proclination of the maxillary incisors.
- Posterior crossbite.
- Anterior open bite.
- Distal relation of mandible to maxilla.

Figure: Effects of mouth breathing on teeth

Effect on Gingiva

Continuous exposure of air to the gingiva may lead to dryness of the gingiva causing gingival irritation. This can further lead to an increase in bacterial accumulation due to the collection of debris.

Effect on speech

Abnormal oral and nasal structures due to extreme mouth breathing can result in highly compromised speech performance. The presence of nasal tone in an individual's voice might be present.

DIAGNOSIS

Abnormal oral and nasal structures due to extreme mouth breathing can result in highly compromised speech performance. The presence of nasal tone in an individual's voice might be present.

- Development of the habit of mouth breathing.
- Frequency.
- Duration.
- Associated symptoms.
- Nasal stiffness.
- Nasal discharge.
- Sore throat.
- Any repeated attacks of cold.

After taking a proper and detailed case history, a proper clinical examination should be done with various diagnostic tests. To confirm the diagnosis of mouth breathing, the following diagnostic tests are performed.[10]

Mirror Test or Fog Test

In the mirror or fog test, the clinician takes a double-sided mirror and holds it between the nose and the mouth. If fogging occurs on the nasal side, it indicates nasal breathing and if the fogging is present on the oral side it indicates mouth breathing.

Massler's water-holding Test

In the Massler's breathing test, an individual is asked to hold water in his mouth. If the individual is a mouth breather, he/she cannot retain water for long in the mouth as it interferes with their breathing.[6]

Massler and Zwemer Butterfly Test / Cotton Test

A butterfly-shaped cotton strand is taken and placed in between the upper lip and the nostrils. If the fibers of the cotton flicker downwards on exhalation the individual is a nasal breather and if the cotton fibers flicker upwards, the individual is a mouth breather.[6]

Inductive Plethysmography (rhinometry)

Devices such as flow meters and pressure gauges help in calculating the percentage of nasal airflow. The total percentage of airflow through the nose and mouth can be calculated using plethysmography.[6]

Cephalometrics

A Recording cephalometrics from various angles helps to know the skeletal patterns of the patient. This can also help to calculate the amount of nasopharyngeal space and size of adenoids.[11]

TREATMENT OF MOUTH BREATHING

Treatment consideration[8]

The various factors to be considered during the treatment of mouth breathing are:-

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Age of the child: Once the patient hits puberty, the chances of mouth breathing being self-corrected get higher. This can be a consequence of the increased size of nasal passages which further relieves the obstruction caused due to enlarged adenoids.

ENT examination: The ENT examination reveals if there is the presence of any treatable abnormality in tonsils, nasal septum, or adenoids which can be a contributing factor in mouth breathing. If any abnormality is found, it should be treated and if the mouth breathing habit continues even after the removal of the causative factor, it is habitual.

Prevention and Interception: Fabrication of oral screen can be done to prevent mouth breathing.[6-7]

Treatment according to symptoms: Mouth breathing habit is associated with various symptoms. The treatment under different symptoms is further divided into the following factors:-

Remove the cause: First and foremost the causative factor should be removed. The presence of nasal or pharyngeal obstruction should be treated with surgery or medication.

Intercept the habit: Once the etiological factor is removed but the habit continues, it should be corrected.

CORRECTIVE MEASURES FOR MOUTH BREATHING

Various methods of exercises

Exercises such as:-

- Holding a sheet of paper in the middle of the lips has been seen to correct the breathing practice.
- The minor hypotonic upper lip of the patient should be stretched to maintain lip seal or should be stretched in a downward direction towards the chin.
- Another method is the **Button Pulling Exercise** where a button of 1½" diameter is taken and a thread is passed through the button hole, the patient is then asked to put the button behind the lip and pull the thread, restricting it from being pulled out using lip pressure. .
- Another way is the **Tug of war exercise** which includes two buttons, one of which is placed behind the lips while another button is held by someone else to pull the thread. The patient is asked to blow under the upper lip and hold slowly under tension and to the count of 4 and it should be repeated 25 times a day. The upper lip should be drawn over upper incisors and held under tension for a count of 10.

Maxillothorax Myotherapy

Macaray 1960 implemented this therapy. Macaray developed an activator made up of aluminum which corrects the development of the dental arches and dental base relationship simultaneously reassuring mouth breathing. The patient is asked to hold the activator in the oral cavity and simultaneously carry out 10 exercises with both right and left arms. This should be repeated 3 times a day.[6-7]

Oral Screen

Newell in 1912 introduced the oral screen. It is a type of myofunctional device that is simple and easy to construct and wear. Both force application and force elimination principles are used in this appliance.

Macaray Principle of Oral Screen: It is a functional device that produces effect by redirecting muscle pressure and the soft-tissue covering of the cheeks and lips. It works on the principle of both the application of force and the abolition of force. For example, the inclination of the anterior teeth can be corrected by using the principle of application of force. The screen meets the proclined teeth so that forces are transmitted directly from the lip through the screen. The correction of the posterior crossbite can be done by using the principle of force elimination by providing spacers between the teeth screen.

Rapid Maxillary Expansion (RME)

Benefits the patients with narrow and constricted maxillary arches to widen the arc from RME processes. This increases nasal airflow and reduces nasal air resistance. The increase in the intranasal space is caused by the outer walls of the nasal cavity separation.

DISCUSSIONS

Cattoni et al said that children with this habit exhibit pathological adaptation concerning postural and morphological features of the stomatognathic system.12 Thus, early diagnosis and proper intervention of mouth breathing are suggested to avoid the occurrence of future orofacial abnormalities.

According to Fujimoto et al. mouth breathing is a repercussion of any kind of interruption in breathing through the nose.[13] This blockage can happen for a variety of causative reasons such as any anatomical susceptibility or a few problems acquired during development like allergy problems, adenoid hypertrophy, turbinate hypertrophy, tonsil hypertrophy, nasal polyposis, tumors of the nasal cavity and rhinopharynx, nasal trauma, abnormal oral habits, generalized muscular hypotonicity, and others. Amongst various obstacles that exist in proper nasal breathing, the main one is caused by allergic rhinitis which produces a feeling of restlessness and difficulty breathing through the nose, later leading to breathing through the oral route.[14]

In the study conducted by Bhayya et al. mouth breathing habit was found as the second most prevalent habit with an incidence rate of 17%.[15] Guaba et al and Kharbanda et al. studied the prevalence of malocclusion and oral habits in the North India area and reported that tongue thrusting and mouth breathing were the most prevalent habits.[16-17]

Benefits the patients with narrow and constricted maxillary arches to widen the arc from RME processes. This increases nasal airflow and reduces nasal air resistance. The increase in the intranasal space is caused by the outer walls of the nasal cavity separation.

CONCLUSION

Newell Many habits can be considered normal up to a certain stage of the child's development. Guardians must be aware of the common habit and they should be able to distinguish between normal and abnormal for that specific age group so that adverse complications can be dealt with in a better way. A multidisciplinary team should work for early diagnosis and give a proper treatment plan, preventing consequent disorders of chronic mouth breathing. If the upper airway is obstructed, this can cause an obstacle to the normal dentofacial evolution, so mouth-breathing children should get immediate attention before proceeding with development irrevocably. Early recognition of such facial patterns can be used to identify compromised respirators individuals who are more likely to develop these types of malocclusion. Thus, the multidisciplinary team of pedodontists, orthodontists, ENT specialists, and Pediatricians should collectively work on the proper mouth breathing habit treatment and finally reduce the continuing harmful effects of breathing -defects on facial features.

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Review Article Journal of Oral and Dental Health

Mucormycosis: An Epidemic Following A Global Emerging Threat-A Review Study

Abstract

novel human coronavirus diseases 2019 also termed as COVID-19, turned out to be a global emerging threat, paralyzing the developing nation. In December 2019, the disease was first identified in the Wuhan, Hubei province of China and turned out to be a pandemic disease within short period of time. This pandemic caused by novel corona virus spared no individual and communities, resulting in large scale mortality and morbidity. Simultaneously with the ongoing serious disease, large number of opportunistic fungal and bacterial infections has found to be associated. A serious fungal infection, mucormycosis has been increasingly found in recovered covid 19 patients. Vernacularly, known by the name of "black fungus", usually causes necrosis in head and neck region including orbit, paranasal sinuses, nose and with possible intracranial spread. Acidic environment, high glucose levels, low oxygen, acidic medium, increased ferritin levels along with decreased phagocytic activity, prolonged hospitalization with or without mechanical ventilators have been considered as the main risk factors. Thus, the main objective of the article is to review about the causes, types, methods for prevention and treatment modalities of the comorditiy associated with covid-19. **"THE MUCORMYCOSIS."**

Keywords: Covid-19, Low Oxygen, Mucormycosis, Risk Factors, Steriods.

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INTRODUCTION

coronavirus disease (COVID-19) caused by severe acute respiratory syndrome has found to be associated with wide range of symptoms ranging from dry cough, fever, myalgias, joint pain, dyspnea, fatigue, anosmia and gastrointestinal symptoms. Though lungs are the first organs to be targeted by COVID-19 infection, evidence indicate that virus may exhibit infection in different organs, including blood vessel, heart, gut, kidney, eyes, oral cavity and even brain.[1] Myriad of opportunistic diseases including fungal, bacterial and viral co-infection have been found in patients recovered with COVID-19.[2] Since the beginning of the pandemic, large number of studies has emphasized on quick diagnosis, advancement and redirection of newer treatment plans. Mostly it was found that SARS-CoV-2 was something significantly more than a respiratory disorder. Huge levels of endogenous substances delivered considering the aggravations achieved by this disease are capable of producing changes and disturbance impacting the target tissues. They even go past the hindrance of protection of the inborn immunity, reaching the systemic level through hematogenous transmission.[3] Constant inflammatory

process associated with signaling animates of immunity cells usually leads to loss of function, pulmonary fibrosis, impaired oxygenation, pulmonary degeneration, leading to a state of pulmonary fibrosis, anoxemia, hypoxemia and ultimately death. Patients with metabolic co-morbidities, autoimmune diseases, cardiopulmonary diseases, or patients undergoing any treatment might compromise their immunity and have a higher risk of death.[4] Aside from conditions like arrhythmias; acute cardiac injury, thrombo-embolic complications and strokes, opportunistic infections including black and white fungus are much more prevalent.

MUCORMYCOSIS

Skeletal **R.D Baker** an American pathologist coined the term mucormycosis in 1957. It is defined as an insidious infection caused by the members of fungal family of mucorales and zygomycotic species. These are also known by the name of zygomycosis. Mucormycotina, the common saprobes originate from the rotten matter or soil. German pathologist **Paltauf** was the first to reported mucormycosis in 1885 and termed it as Mycosis Mucorina. **Roden et al** reported an increased in rates of mucormycosis in immune-compromised individuals during the years 1980 and 1990.[5] Mucormycosis belonged to the order Mucorales, are divided into six families, all of which were known to cause deep cutaneous infection. Infections with mucorales are categorized by rapid progression. **Julie Djordjevic,** incharge and head of the fungal pathogenesis group at the institute for medical research, potrayed mucormycosis as a "**NATURAL DECAYER**".[6]

CAUSATIVE AGENTS

The Mucorales order comprises of 261 species within 55 genera, and 38 of them are found to be associated with human infections. Due to molecular phylogenetic studies, the taxonomy of mucormycosis has changed widely and, inevitably with several changed names.[7]

Table 1: Current nomenclature of medically important mucoralean species according to updated taxonomy[7]

S.No	Current Species Names	Previous Names/Synonyms
1	Lichtheimiacorymbifera	Absidiacorymbifera, Mycocladuscorymbifer
2	Lichtheimiaornata	Absidiaornata
3	Lichtheimiaramosa	Absidiaramosa, Mycocladusramosus
4	Mucorardhlaengiktus	Mucorellipsoideus, Mucorcircinelloides f. circinelloides
5	Mucorcircinelloides	Rhizomucorregularior, Rhizomucorvariabilis var. regularior
6	Mucorgriseocyanus	Mucorcircinelloides f. griseocyanus
7	Mucorirregularis	Rhizomucorvariabilis
8	Mucorjanssenii	Mucorcircinelloides f. janssenii
9	Mucorlusitanicus	Mucorcircinelloides f. lusitanicus
10	Rhizopusarrhizus (incl. var. delemar)	Rhizopusoryzae
11	Rhizopusmicrosporus	Rhizopusmicrosporus var. azygosporus, var. chinensis, var. oligosporus, var. rhizopodiformis, var. tuberosus

PATHOGENESIS: Mucorales are well known for assaulting deep tissues by mean of ingestion or inhalation of spores and percutaneous infusion of spores. As soon as the spores penetrate cutaneous tissues or lungs the first line of defense gets activated and destroys the spores via cationic peptides and/or oxidative metabolites. The most common risk factors include steroid use, extreme of age, uncontrolled diabetes (diabetic ketoacidosis), neutropenia, haematological malignancies, renal insufficiencies, skin trauma, iron overload, broad-spectrum antibiotics, intravenous drug and malnutrition.[5]

1. **FUNGAL ENDOTHELIAL INTERACTION:** Mucorales a characteristic feature of mucormycosis infection is virtually uniform presence of extensive angio-invasion with resultant tissue necrosis and thrombosis. The angio-invasion is usually associated with the ability of microorganism to disseminate hematogenously from the original site to the distant target organs. Consequently, damage and penetration through endothelial cells lining

blood vessels is logical and a critical step in the organism pathogenetic strategy.[6] A higher concentration of ACE-2 is usually present on the surface of endothelial cells including oral and nasal cavities, the intestinal tract and lungs. Coronavirus enter the cell mostly through endocytosis, which depends mainly upon the binding and recognisation of the S protein present on coronavirus to ACE-2 present on the endothelial cell and leading to initiation of S protein by host protease. Translation, replication and direct endothelial cell induced injury and apoptosis is caused once the virus enters the endothelial cell.[8] Apart from this, a higher levels of adhesion molecules (VCAM-1, P-selectin, ICAM-1), inflammatory cytokines, interleukin 6, 10 and tumor necrosis factor were found in severely infected with Covid-19 which inturn is an important factor leading to lymphocytic depletion and a decrease in number of CD4+T lymphocytes. This may weaken the immune response to SARS-CoV-2 infection, and even aggravate inflammation by down regulating inflammation.[9]

2. **ROLE OF IRON:** factors a higher susceptibility to mucormycosis has been found in patients with higher serum iron levels. Deferoxamine, an iron chelator is utilized by Rhizopus species as a siderophore to supply unavailable iron to fungus. Rhizopus sp. accumulate around 8-40 fold greater amounts of iron supplied by deferoxamine, thus exhibiting a linear correlation with its growth in serum patient.[10] Patients with diabetic ketoacidosis are found to be at higher risk of developing rhinocerebral mucormycosis due to an increase in the levels of serum iron available.[11]

3. **HOST DEFENCE:** factors phagocytes are the major and most important defense mechanism against mucormycosis apart from monocytes. Neutropenic patients and patients with dysfunctional phagocytes are found to be at greater risk of developing mucormycosis. Coticosteriod treatment affects the ability of broncho-alveolar macrophages to prevent the germination of spores.[12] Hyperglycemia and acidosis are also known to impair the ability of phagocytes to opsonise and kill the organisms by both oxidative and non-oxidative mechanism.[11]

CLINICAL PRESENTATION: Changing invasion of blood vessels with subsequent thrombosis leading to tissue necrosis are the hallmarks of mucormycosis invasion. Depending upon the site of infection and condition of the host, mortality rates can vary. Death rates are estimated to range from 40-70%. Infection in humans usually occurs in two forms, either superficial and visceral or localized and disseminated. The characteristic visceral forms are manifested as pulmonary, gastrointestinal and rhino cerebral types. On the other hand superficial forms are seen on finger nails, skin and external ear.[13] The mucorales enter either through respiratory or cutaneous routes. The challenge associated with diagnosis is not only a reason for high mortality rates but makes it difficult to determine the exact incidence of diseases.[14] Classification of mucormycosis is based on the anatomic site of infection reflecting the pathway in human body. Disease is usually presented as:

Pulmonary mucormycosis presents similar clinical manifestations as that of pulmonary aspergillosis. Significant predictors of the disease are nodules and micronodules which appear during chest radiographs and CT scan. Sinus involvement with general symptoms of cough and fever along with pleuritic chest pain and dyspnoea are usually seen. In cases where pathogen invade the blood vessels, massive hemoptysis can be seen along with the systemic dissemination of the

disease.[6] **Cutaneous mucormycosis** is more prevalent in patients where there is disruption of protective cutaneous barrier in the form of burns, traumatic injuries, in diabetes and immune-compromised patients the site of injection or catheter insertion, and contaminated surgical dressing. These cutaneous diseases can be invasive and penetrate from cutaneous to subcutaneous tissues into the adjacent fat, fascia, muscle and even bone and may lead to necrotizing fasciitis which increases the mortality rate to 80%.[15] **Gastrointestinal manifestation** are usually caused by the uptake of contaminated beverages or food, although relatively uncommon. In many of the cases, use of adulterated homoeopathic and herbal medicines can be linked to gastrointestinal development. Stomach is most commonly affected with the symptoms of abdominal pain along with vomiting and nausea.[16] **Disseminated** form of mucormycosis, originates from any primary site of infection and can be seen along with cerebral, cutaneous and pulmonary disease. Generally, dissemination is found to occur from lungs, but alimentary tract or wounds can also be the cause.[5] **Rhino-orbital –cerebral mucormycosis** accounts for one third and one half of all the cases of mucormycosis and is the most commonest form of the diseases. About 70% of the cases are diabetic with high ketoacidosis and more rarely in hematopoietic stem cell transplantation, neutropenic, corticosteroid using patients. It usually originates in the paranasal sinuses during the inspiration of spores and possible extension into brain. Subsequently, nose, eyes, sinuses and brain are affected. Nasal decongestion, sinus pain, fever, soft tissue swelling and headache along with nasal ulcerations are the most common symptoms.[6] Continuation of diseases can be rapid if not treated can result in extension to neighboring tissue, necrosis, thrombosis, painful black eschar of the palate and the nasal mucosa. Blurred or even complete loss of vision can occur due to extension into the eye from where it progresses to the central nervous system resulting in cranial neuropathies, altered consciousness and even cerebral abscess.[5]

DIAGNOSIS

To Early diagnosis of this disease is highly important, as it may improve outcome. Different studies have shown that it improves survival rate, and may also reduce the necessity for extent of surgical resection, disfigurement and suffering. The exact time for the presentation of mucormycosis in covid patient is usually around third week of onset of the symptoms. As the disease is rare, the high index of suspicion is important and diagnostic part consists of early use of imaging modalities, recognition of risk factors, assessment of clinical manifestations, and early initiation of diagnostic methods based on histopathology, cultures and advanced molecular techniques.

- **Clinical Diagnosis:** A Necrotic cutaneous lesions in immune-compromised patients may be due to mucormycosis, but the differential diagnosis includes other pathogens, such as Aspergillus, Fusarium, Pseudallescheria and Scedosporium species[17]. Patient with sinusitis and diabetes should be minutely inspected for possible mucormycosis. **Corzo-Leon et al**.[18] proposed a set of rules for diagnosis and management of rhino-orbito-cerebral mucormycosis in patients with medical history of diabetes mellitus. The “red flags also known as warning signs” in this regard are cranial nerve palsy, sinus pain, diplopia, proptosis, periorbital swelling, orbital apex syndrome and palatine ulcer. The finding of signs should enhance further testing, including blood tests; imaging, endoscopic revision and initiation of antifungal treatment.[19] Non responding prolonged fever, non-productive cough, along with hemoptysis, dyspnea and pleuritic chest pain are common.[20] Various findings indicates that mucormycosis is the reverse halo sign (RHS) on computerized tomography scan giving a strong indication of pulmonary mucormycosis.[21] Other imaging technique include, positron emission tomography-computed tomography with [18F]-fluorode-oxyglucose.

- **Histopathology:** A significant diagnosis is based on presentation of fungal hyphae which is typical for mucormycetes in biopsies of affected tissues, or broncho-alveolar lavage in patients with pulmonary mucormycosis. It is a very important diagnostic tool as it differentiates the presence of the fungus as a pathogen in the specimen from a culture contaminant and is essential to define the blood vessel invasion. Mucorales genera are non-pigmented, wide (5–20 μm), ribbon-like hyphae, thin-walled and branching at right angle. With regular hematoxylin and eosin stains only the presence of cell wall with no structures inside, or occasionally degenerated hyphae can be seen. Stains that can help highlight the fungal wall include Grocott methenamine-silver (GMS) and periodic acid-Schiff PAS stains.[22,23]

- **Direct Microscopy:** A Wet mounts of potassium hydroxide (KOH) can be used for tentative diagnosis of this disease through direct microscopy. Commonly using fluorescent brightners i.e. blank ophor and Calcofluor which in-turn improves the clarification of the characteristic fungal hyphae. This technique along with histopathology is highly recommended by different experts from **European Confederation of Medical Mycology and Mycoses Study Group Education and Research Consortium** (ECMM/MSG ERC)[17,24]

- **Culture:** A positive culture from a sterile site confirms the diagnosis but it should be combined with clinical and radiological data to establish a probable diagnosis.[25]

- **Applied and Emerging Molecular Methods:** These methods have emerged as a beneficial tool to identify the infection and confirm the strains involved. This method thus accurately identifies the species level strains that have already grown in cultures, and also helps to detect mucormycetes in tissues.[25] The methods use pan-fungal primers which target the ITS genomic region by using various primers targeting a restricted number of mucorale in species. Molecular tests not only target the 18S ribosomal RNA genes, but other targets have also been investigated, some of which include mitochondrial gene rnl, 28S rDNA, Mucorales-specific CotH gene.[26] In samples with the characteristic hyphae of Mucorales upon histopathological examination, the application of molecular methods confirms the diagnosis, and is therefore highly recommended.[25]

- **Molecular:** Polymerase chain reaction has shown to be authentic tool for the diagnosing the invasive mucormycosis (IM) in immune-compromised patients. **Millon et al.** in a study used three qPCR on sera of mucormycosis patients and concluded that this method was highly sensitive, had a low detection level and could detect infection 3–68 days earlier than the routine conventional methods.[27]

- **Serology:** No commercially available antigen markers are present to detect Mucorales, as in case of Aspergillus (galactomannan). However galactomannan testing in blood or patients with compatible chest CT imaging results may be used to decrease the likelihood of mucormycosis.[25]

- **Metabolomics-Breath Test:** A **Koshy et al.** in his findings concluded that Mucorales species

had distinct breath profiles of the volatile metabolite sesquiterpene, which thus could be used to recognize these infections. These profiles, therefore has the potential to diagnose fungal infection non-invasively, and perhaps monitor response to therapy. Moreover, it could be used in a high risk population such as neutropenic patients or that undergoing hematopoietic cell transplantation. This method appears to be very appealing and promising, but it needs further evaluation.[28]

PREVENTION AND TREATMENT

Proper oral and hand hygiene, wearing of face shields and masks with regular replacement, avoiding unnecessary visits to crowded and dirty environments are main prevention goals in preventing any co-morbidity related to covid-19. For prevention of mucormycosis along with covid, it is most important to control hyperglycemia with regular monitoring, discontinuation of any immune-modulating drug and judicious use of steroids with correct dosage, timing and duration.[29]

Maintainenance of systemic hydration using normal saline (IV) infusions followed by amphotericin B for atleast 4-6 weeks should be done. Central venous catheter or peripherally inserted catheters can be placed at the site of infection for proper drainage. Antifungal therapy including liposomal Amphotericin B, the drug of choice, 5mg/kg/day, diluted in 200cc 5% dextrose for 2 to 3 hours infusion is recommended. If the cost and availability of liposomal Amphotericin B is an issue, Amphotericin B deoxycholate 1mg/kg/day in 5% dextrose with slow infusion for about 6 to 8 hours at a rate of 0.08m/kg/hour can be an alternative. Monitoring of renal function and potassium levels while treating with antifungal drugs should be considered. Tablet or IV Posaconazole 300mg twice a day or Isavuconazole 200mg three times daily on the very first day followed by a single dose can be an alternative.[30]

Medical management alone isn't effective due to poor drug delivery to the site of infection because of extensive vascular thrombosis. Invasive control of the underlying disease with intrusive debridement are needed. Once physiologically stable, patients must undergo a resection-type debridement. The subsequent wound if irrigated properly can then be obturated with a removable prosthesis to support speech and feeding[31]. Early aggressive wide surgical debridement of the infected craniofacial tissues is the foundation of successful treatment of Rhinocerebral or rhino-orbitocerebral mucormycosis. The management involves resection of affected tissue of the face, any skin of the nose, maxillary and ethmoid sinuses, temporal area and infratemporal fossa, and orbital exenteration. Removal of Orbit may be life-saving when an active fungal invasion is seemed. It can be considered beneficial for an engaged orbit with a blind or immobile eye due to mucormycosis even after intracranial spread has occurred. Surgical management of orbital mucormycosis is the most difficult decision due to removal of orbit which inturn may represent a life-saving measure obtained at the cost of permanent mutilation[32]. Wide surgical debridement enhances survival rate to 78% as compared to 57.5% in patients without wide surgical debridement. **Pillsbury and Fischer** reported an average 85% long-term survival rate in patients who were treated with early, aggressive wide surgical debridement and amphotericin B. **Blitzer et al**. in his study also found the survival rate of 89% in diabetics treated with radical surgery and amphotericin B. Thus, surgical debridement removes a focus of infection that cannot be treated adequately by systemic medication alone[33].

CONCLUSION

covid-19, has been found to be associated with an increase incidence of secondary infections most probably due to immune dysfunction. Significant use of broad spectrum antibiotic, monoclonal antibodies steroids usually lead to the development of opportunistic infections. Use of medication should thus be monitored to achieve the effect at the lowest dose and shortest possible duration for maximizing the efficacy. Thus, it becomes a prime responsibility of the concern authority for the judicious use of drugs, inturn reducing the major outbreak.

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Smart Materials: A Modern Era In Dentistry

Abstract

As the quest for an "ideal restorative material" continues, a newer generation of materials was announced. These are termed "smart'' as these materials support the remaining tooth structure to the extent that more conservative cavity preparation can be carried out. Material is 'smart' when sensing some stimulus from the surrounding environment and reacts in a useful and mostly reversible manner. These materials can be changed in a certain way by the presence of stimuli. A most important feature is the ability to return to its original state once the stimulus is abolished. Some of these materials used are resin-modified glass ionomers, amorphous calcium phosphate releasing pit and fissure sealants, smart composites, smart ceramics, compomers, orthodontic shape-memory alloys, smart impression materials, smart sutures, smart burs, smart endodontic files, etc. An important aspect of smart materials used in various areas of dentistry is their excellent biocompatibilities which have marked the beginning of the modern era in dentistry.

Keywords: Dentistry, Smart Materials, Dental Materials, Biocompatible

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INTRODUCTION

Dentistry is evolving in recent decades and this stride is accelerating. There is a revolutionary change in materials, equipment and techniques to ease dental treatment procedures which helps in the prevalence of clinical success. Some of these are also "biomimetic" in nature as their properties can mimic natural tooth structures such as enamel or dentin. The term smart materials came from the United States and begin in the 1980s. Many of these smart materials were developed by government agencies working on military and aerospace projects but in recent years their use has been transferred into the civil sector. In World War I first smart material application started with magnetostrictive technologies that involved the use of nickel as a sonar source to find German U-boats by Allied forces [(1)].

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The current dental materials were improvised making them smarter. Smart materials are the materials that act with shape or property change upon application of externally applied driving forces(electrical, magnetic, and thermal). An important feature of these materials includes an ability to return to an original state after the stimulus has been removed [(2)].

McCabe et al. defined "Smart materials" as materials whose properties may be altered in a controlled fashion by stimuli, such as stress, temperature, moisture, pH, and electric or magnetic field[(3)]. Different types of smart materials used in the field of dentistry are piezoelectric materials, ph-sensitive polymers, magnetostrictive materials, shape memory alloys, halochromic materials, photomechanical materials, and self-healing materials. These materials can easily sense a change in the oral environment and respond to it[(4)].

CLASSIFICATION

Smart materials can be mainly classified into:

- **Passive materials-** Passive materials respond to external change without external control. They also possess self-repairing characteristics. e.g. Resin-modified glass ionomer, Compomer, Dental composites

- **Active materials-** Active materials sense a change in the environment and respond to them[(5)]. e.g. Smart composites, Smart ceramics.

There are certain smart materials used in different fields of dentistry which are listed below:

Restorative Materials	Types
Pediatric and Preventive Dentistry	Fluoride-releasing pit and fissure sealants, ACP releasing pit, and fissure sealants
Orthodontics	Shape Memory Alloys
Prosthodontics	Smart impression material
Dental Materials	Smart ceramics Smart composites
Periodontics	Smart antimicrobial peptide
Conservative Dentistry and Endodontics	Ni-Ti rotary instruments Smart prep burs
Oral Surgery	Smart Sutures
Laser Dentistry	Smart fibers

PROPERTIES

Smart materials are also called 'Responsive materials' as these materials are highly responsive and have a high capacity to sense and respond to oral environment changes.

These properties are –

- **Piezoelectric materials:** These materials can convert mechanical energy into electrical energy and vice versa[6]. Some popular materials are - Quartz, Aluminium nitride, Barium titanate, Gallium phosphate, lead
- **Shape Memory alloy:** A shape memory alloy is an alloy that remembers its original shape when heated. Super elastic behavior in high temperature.e.g- Nickel, Titanium [7]
- **Magnetostrictive materials:** These materials exhibit changes in shape under the influence of magnetic field and also exhibit changes in their magnetization e.g- Cobalt, Terfenol-D
- **ph-sensitive polymers:** ph-sensitive polymers are materials that change in volume when the ph of the surrounding gets altered. There are two kinds of ph sensitive materials: acidic group (-COOH,-S03H) [8]
- **Halochromic materials:** These materials are commonly used materials that change their result of changing ph. Halochromic substances may be used as indicators to determine the pH of solutions of unknown ph.
- A Photomechanical materials are materials that change their shape when they are exposed to light. The photochemical effect was first documented by Alexander Graham Bell in 1880.
- **Biofilm formation:** These The presence of biofilm on the surface of material alters the interaction of the surface with the environment [9]

APPLICATIONS

Fluoride Releasing Pit and Fissure Sealants- Pit and fissure sealants can be used effectively as a preventive approach to caries prevention. The two major types of pit and fissure sealant materials are available:resin-based sealants and glass ionomer cement [10].

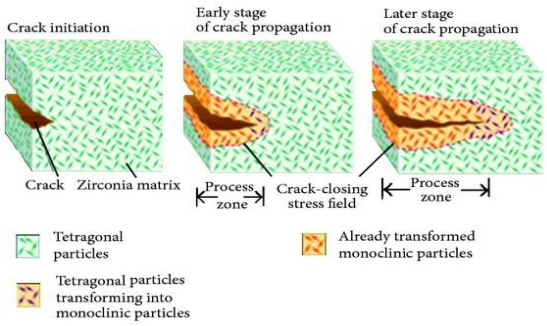
ACP Releasing Pits and Fissure Sealants: Amorphous Calcium Phosphate (ACP) has shown anti-cariogenic properties with remineralization potential [11].

Shape memory alloys- Metals with the ability to recover original shape/length when it goes under thermomechanical load. These alloys have properties like super elasticity, shape memory and good fatigue resistance, and excellent biocompatibility. Hence, it is extensively used in orthodontics[12]

Smart Impression materials- These materials show a more hydrophilic nature to get the void- free impression and shape memory during elastic recovery to prevent distortion for accurate impression and toughness resists tearing [13]

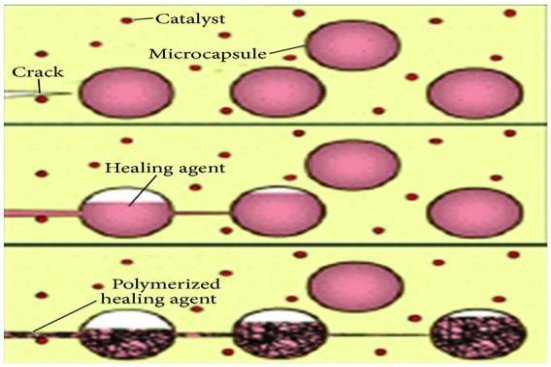
Smart Ceramics- Smart Ceramics delivers excellent aesthetics without any compromise. These are metal-free and biocompatible[14]. In pediatric dentistry, they discover use in making porcelain facade altering and full cast or porcelain converged to metal crown recuperation.

Zirconia is polycrystalline ceramics that don't contain glass. The fracture toughness and flexural strength of zirconia are higher in comparison to alumina or any other currently available ceramic.



Smart Composite-These are alkaline, nano-filled glass restorative materials and activated. When intra-oral pH drops below 5.5, calcium, fluoride, and hydroxyl ions are released. These materials can be used in class 1 & 2 cavities in deciduous as well as permanent teeth to a depth of 4mm [11]

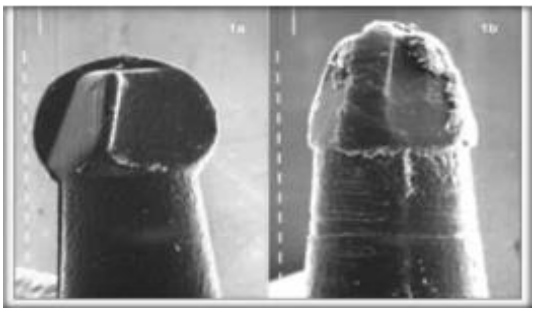
Self-healing Composite- It is first reported self-repairing or self-healing synthetic materials which effectively shows few similarities to resin-based dental materials. It was an epoxy system that contained resin-filled microcapsules. If a crack occurs in the epoxy composite material, some of the microcapsules are destroyed near the crack and release the resin. The resin afterward fills the crack and reacts with a Grubbs catalyst dispersed in the epoxy composite, resulting in the polymerization of the resin and a repair of the crack[15].



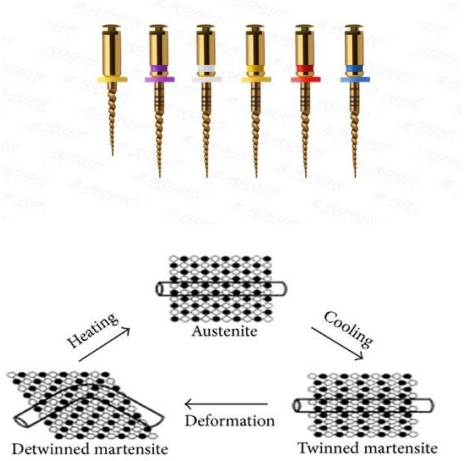
Smart GIC- Smart material property of GIC was first observed by Davidson[16].GICs have a coefficient of thermal expansions similar to dental hard tissues. GIC shows minimal/no changes in presence of moisture/heat; but in the dry condition, it shows contraction due to the movement of water which is similar to human dentin. This makes GIC a smart material.

Smart antimicrobial peptide-These are targeted against Streptococcus mutans (causative micro- organism of dental caries). These antimicrobial peptides are an amphipathic mixture of alpha- helical and beta-sheet structures with a cationic charge[17].

Smart Prep Burs- These techniques are used in caries removal including mechanical rotary or non-rotatory instruments, chemomechanical techniques, and lasers. Non-invasive techniques include air abrasion, air polishing, and ultrasonic and sonic abrasions[18].



Ni-Ti Rotary Instruments- In Endodontics, 55wt% Ni and 45wt% Ti are commonly used, referred to as -55 NiTiNOL. Nitinol exists in two phases. The low-temperature phase is called the martensitic or daughter phase (a body-centered cubic lattice) and the high-temperature phase is called the austenitic or parent phase (hexagonal lattice). This lattice organization can be changed either by stress or temperature [11].



Smart Sutures- These are made up of thermoplastic polymers that have both shape memory and biodegradable properties. They are applied loosely in their temporary shape and the ends of the suture were fixed. When the temperature is increased the thermal transition temperature, the suture would shrink and tighten the knot, which leads to optimum force. Smart sutures made of plastic or silk threads are covered with temperature sensors and micro-heaters can detect infections[19].

Smart fibers for Laser Dentistry- Laser radiation of high fluency can be delivered by hollow- core photonic fibers. These fibers are for the delivery of high fluence laser radiation capable of ablating tooth enamel. These fibers are not only to transport the high-power laser pulse to the tooth surface but can be used for detection and optical diagnosis[20].

Smartseal Obturation Syatem- Obturation of root canals ought to prevent reinfection of the canal space and ultimately prevent periradicular disease. This objective was achieved by three- dimensional filling of the instrumented canal, accessory canals, and dead spaces. The C Point system (EndoTechnologies, LLC, Shrewsbury, MA, USA) is a point-and-paste root canal filling technique that consists of premade, hydrophilic endodontic points and an accompanying sealer. The deformable endodontic point (C Point) is usable in aberrant tip sizes and tapers. It is designed to expand laterally without expanding axially, by absorbing residual water from the instrumented canal space and that from naturally-occurring intraarticular moisture[21].

CONCLUSION

In the 21st century, science and technology are heavily dependent on the development of new materials that are expected to respond the environmental changes. Smart materials are an answer to this requirement of environment-friendly and responsive materials, which alter change properties to perform specific functions. The benefit for the patient and the quality of dental therapy will undergo a significant improvement if such materials are developed and introduced.

This technology promises optimum responses to highly complex problems by providing enhancements to many products it could provide better control by minimizing distortion and increasing precision. It could also enhance preventive maintenance of systems and thus improve their performance. The numerous applications of smart materials have revolutionized many areas of dentistry Dental practitioners should use these materials in day- to-day practice and ease clinical success.

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Review Article Journal of Oral and Dental Health

Periodontal Microsurgery

Abstract

Surgical refinement in different clinical procedures to meet both the biologic and esthetic demands of patients is seen in today's periodontal practice. Successful periodontal treatment procedures consistently demand clinical expertise that challenges the technical skills of periodontists to the limit beyond the range of visual acuity. Microsurgery in general is not an independent procedure discipline, but a technique that can be applied to execute different surgical disciplines. Periodontal microsurgery improves end results of the basic periodontal surgical procedures by enhancing normal vision through magnification along with favorable lightening systems. Enhanced outcomes which are not possible with traditional macrosurgery in terms of passive wound closure and reduced tissue trauma. The aim of this review is to provide brief knowledge of periodontal microsurgery: the role of magnification, microsurgical instrumentation and applications of microsurgery.

Keywords: Later Magnification loupes, Microsurgery, Microsurgical instruments, periodontal plastic surgery, Ergonomics, Surgical microscope

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INTRODUCTION

Dental sciences have gone through a various changes both in concepts and techniques in the past few decades[1]. Conventional macrosurgery is performed using normal vision without any visual assistance[2]. The use of loupes and surgical operating microscopes to achieve magnification to perform various procedures in different disciplines of medical and surgical field widely acclaimed.[1]

Microsurgery is broadly defined as the surgery performed under an operating microscope. Here the operating procedures are carried out under magnification beyond the range of simple loupes. This procedure is far beyond the normal range of unaided human capacities and requires a special training and equipments.[2]

This article provides a review of applications of periodontal microsurgery for the procedures ranging from mucogingival surgeries to the regenerative procedures and implant dentistry. Guided tissue regeneration, cosmetic crown lengthening, gingival augmentation procedures, soft and hard tissue augmentation procedures, osseous resection and dental implants demand clinical expertise that challenges the technical skills of periodontists to the limits of and beyond the range of visual acuity and unaided human capacity.[2]

HISTORY

Daniel defined microsurgery in broad terms as surgery performed under magnification by the microscope.[3] Sera fin described microsurgery as a methodology – modification and refinement of existing surgical techniques using magnification to improve visualization, with applications to all specialties.[4]

Apotheker and Jako first introduced commercial operating microscope to dentistry in 1981.[5] Microsurgery was introduced to the field of periodontics in 1992.[6] A continuation educational course was subsequently conferred by Shanelec and Tibbetts on periodontal microsurgery at the annual meeting of the American Academy of Periodontology held in 1993.[7]

CONCEPTS IN MICROSURGERY

The Operating microscope renders three specific elements, magnification, illumination, and increased precision in delivery of surgical skills, collectively known as microsurgical triad.[1] Without any one of these, microsurgery is not possible. Illumination achieved through fiber optic technology has improved the methods of focusing light on specific areas and is a classic feature of surgical operating microscopes.

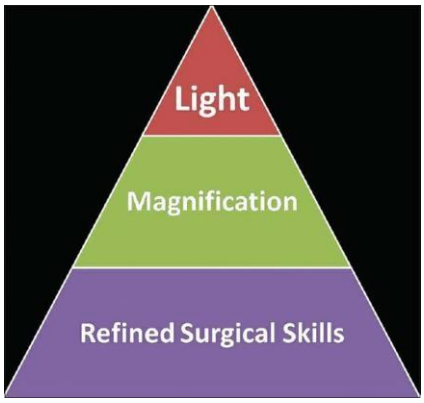


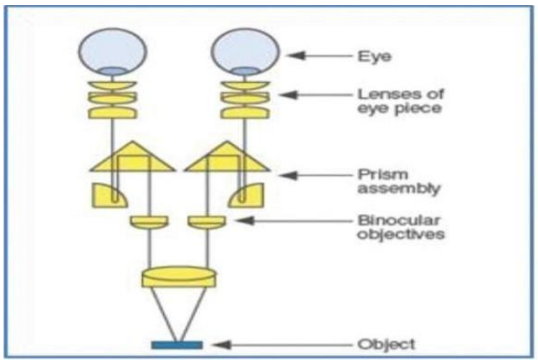
Figure 1: Microsurgical triad

Magnification, the second component of the microsurgical triad, is a key stone in periodontal therapy and can be achieved through the use of the loupes and the operating microscope.[5] Optical magnification of both types has their own advantages and limitations. Wide ranges of simple and complex magnifying systems are available nowadays which allows improvement in the accuracy of their clinical skills. There are two types of optical magnifications for dentists:

9. Magnification loupes
10. The operating microscope

The most common system of optical magnification used in periodontics are dental loupes. Loups are dual monocular telescopes with side by side lenses. It is based on the Keplerian optical system.

The magnified image formed has stereoscopic properties of their convergence. Three types of Keplerian loupes used in periodontics include simple or single element loupes, compound loupes, and prism telescopic loupes.



SIMPLE LOUPES:

It consists of pair of single meniscus lenses. Each lens has two refracting surfaces. The magnification can be increased by increasing lens diameter and its thickness. Size and weight constraints make them impractical for magnification beyond simple loupes for magnification beyond 1.5×. They are greatly affected by spherical and chromatic aberration, thus distorts image shape and color of the objects viewed[6].

COMPOUND LOUPES

They utilize multi element lenses with intervening air spaces to gain additional refracting surfaces. Magnification of compound loupes can be increased by increasing the distance between lenses, thus avoiding excessive size and weight. Compound lenses can be acromatic and produces a color corrected image. Compound loupes however become optically inefficient at magnification above 3×.

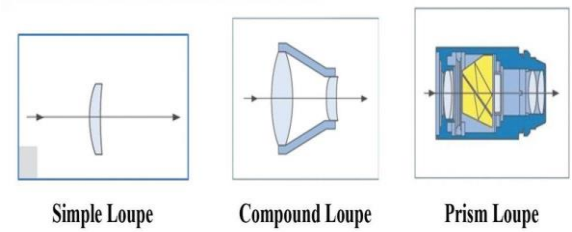


Figure 2: Types of loupes.

PRISM TELESCOPIC LOUPES

The prism telescopic loupes are the most advanced. They use Schmidt or rooftop prisms and lengthen the light path through a series of switch back mirrors between the lenses. The magnification is increased up to 4×. Inclusion of coaxial fiber optic lighting has improved properties of illumination.

SURGICAL MICROSCOPE

Surgical microscopes uses Galilean optics, which have binocular eyepieces joined by offset prisms stereoscopic vision without eye convergence or eyestrain. They have high optical resolution. The characters like Depth of focus and field of view are greatly enhanced. Under magnification of ×20, the preciseness of hand movement approaches 10µm and visual resolution approaches 1µm. Proprioceptive guidance is therefore of little value under the microscope.[8]
Inhanced precision in the delivery of microsurgical triad, causing the synergistic result of illumination and magnification.

Figure 3: Surgical Microscope

ERGONOMICS IN MICROSURGERY

Surgeon working must have a relaxed state of mind, optimal body comfort and posture. To accomplish precise controlled movements of digits, the ulnar surface of the forearm and wrist can be supported by resting on a flat surface, angled in a dorsiflexion position.[3]

The operating surgeon must be seated upright with both feet flat on the floor so that the thighs are parallel to the floor. All the movements should be efficient enough to produce purposeful, deliberate motions during treatment procedures.[4]

The most commonly used precision grip for microsurgical procedure is the pen grip or internal precision grip, which provides a greater stability than any other hand grip due to tripod formed by the fingers. Thus ergonomics benefits in the form of diminished shoulder, reduced eye fatigue.[3]

MICROSURGICAL INSTRUMENTS

Small instruments can be used with more precision because of improved visual acuity. To aid in proper handling and for a high – precision movement, microsurgical instruments should be slightly top heavy, circular in cross section, and about 18cm in length.

Figure 4: Comparison between conventional and microsurgical instuments

Different manufacturers provide sets of periodontal microsurgical instruments made- up of stainless steel or titanium. Titanium made microsurgical instruments are stronger, lighter and non-magnetized in comparison to stainless steel instrument but are expensive and get readily distorted, if not properly cared.

A basic set of microsurgical instruments comprises a micro scalpel holder, needle holder, micro scissors, micro forceps and elevators. Different types of blades used in ophthalmic surgeries can be used for periodontal microsurgery.

PERIODONTAL MICROSURGICAL KNIVES

Figure 5: Microsurgical knives

To minimize the tissue trauma, the sharpest needles, spatula needle 6.6mm long with micro tips, or reverse cutting needles with precision tips are preferred[10]. For microsurgical periodontal procedure, 3/8" circular needle usually provide better results. As far as length is concerned it should be, 13-15mm long needles in posterior areas and 5-8mm long needles are suitable for approximating vertical incisions.[9]

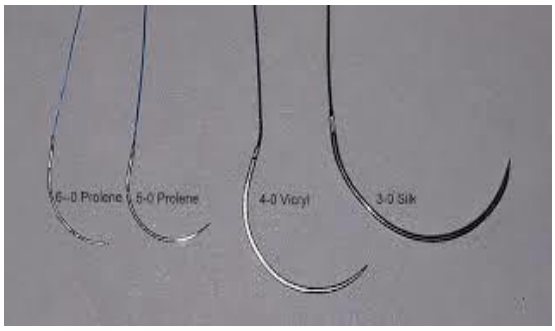


Figure 6: Comparison between microsurgical needles and conventional needles

Most periodontal microsurgical suturing is done with sutures ranging from 6-0 to 9-0. Among the different suture materials available, monofilament non-absorbable sutures are more preferable, but should be removed as earliest as possible.

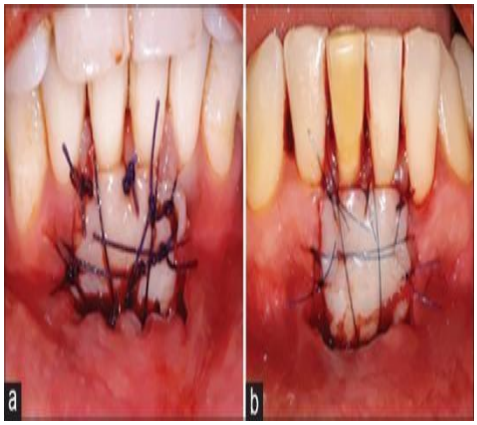


Figure 7: Free gingival graft sutured with (a) 4-0 (b) 6-0 suture

The combined use of small sized needles and sutures under magnification provides wound closure with sufficient tension and least possible dead space.

MICROSURGICAL SUTURING

Suturing techniques in microsurgery differ from conventional surgery. In microsurgical procedures, the needle should perpendicular to the tissues and exit at equal distances. Suture bite should be approx. 1.5 times the tissue thickness to gain proper wound margin approximation.[7]

The two basic knots employed in microsurgeries are the square knot or reef knot. The reef knot is composed of two single loops thrown in opposite direction. When tied properly it lies flat and is best for passive wound approximation. The surgeon's knot is composed of two double loops thrown in opposite direction. The first double throw is less likely to loosen when performing the second throw, making it easier to control tissue apposition.

CLINICAL APPLICATIONS

Periodontal microsurgery being the descendent of conventional periodontal surgery in an attempt to reduce the surgical trauma and thus enables for better patient care.

1. **Root surface debridement :** Concavities Several authors have emphasized that thoroughness of root surface debridement is more crucial for the improved outcome of periodontal treatment rather than the choice of grafting modality. Root preparation can also be done with micro-ultrasonic instruments. The smaller size and variable power settings. Magnification improves the root surface debridement by enhancing the clinician's ability to differentiate between the calculus and tooth surface.

2. **Periodontal regeneration:** Several authors have proposed the use of microsurgical approach for the treatment of isolated or multiple intrabony defects[8]. The advantage of microsurgical approach in regenerative therapy relate to improved illumination and magnification of the surgical field that provides proper access to and debridement of the intrabony defect with an increased accuracy and minimal trauma.

3. **Minimal Invasive Surgery (MIS) for regeneration l regeneration:** Minimally invasive surgery was introduced in 1999 by Harrel. The salient difference between the minimally invasive approach and more traditional approaches for regeneration is in the use of much smaller incisions to gain surgical access and debride the periodontal defect before placing the bone graft and membrane[7]. Contraindications of MIS are generalized horizontal bone loss or multiple interconnected vertical defects[9].

MICROSURGERY IN IMPLANT THERAPY

All phases of implant therapy can be performed with the help of a microscope. The most novel applications of microsurgery is the sinus lift procedures. The surgical microscope can aid in visualization of the sinus membrane. Magnification achieved by the surgical microscope is instrumental in implant site development and placement.

FUTURE OF MICROSURGERY

Periodontal microsurgery is still in beginning state but the scope for it in future is enormous. This technique requires the skills and a great practice to achieve proficiency of the highest level. The miniature world of microsurgery presents special challenges in dexterity and perception which when mastered increases the innovative methods of treatment for better results.[2] The execution of this technique is quite sensitive and is comparatively more demanding than the conventional periodontal techniques. As the benefits of the microscopes are realized, it will be applied more universally. As the awareness of this technique increases, the conventional surgical approach with much more extensive incisions will be less acceptable.

CONCLUSION

Microsurgery offers new knowledge and technology for periodontists that can dramatically improve the therapeutics results of many periodontal procedures like improved cosmetic results, rapid healing, and minimal

discomfort and enhance patient acceptance. Future of dentistry will include increasing use of magnification in majority areas of practice, including periodontics. Microsurgery will shift the method of periodontal procedures from a macro to a micro field, thus gaining precise results with this form of technique.

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Importance of Interceptive Orthodontics and It`s Methodology

Abstract

Prevention is better than cure but what if matter goes beyond the level of prevention? What if the disease initiated nevertheless? So the best step we can take is to interrupt the maturation of disease by scrutinizing the aetiology hastily and plan the treatment appropriately to control further exaggeration. So, interceptive orthodontics is that part of orthodontics which deals with the prevention of progressing malocclusion which has been already started and now further ignorance would embark severity. Intercept means to stop or to divert or to interrupt an ongoing condition.

KEY WORDS: TMJ (Tempromandibular joint), TMD (Temporomandibular Disease), TPA (Transpalatal Arch), Malocclusion, Space Regainingon lateral cephalogram is as valid as the hand wrist bone analysis with the advantage of reducing the radiation exposure of growing subjects.

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INTRODUCTION

According to American association of orthodontics (1996) interceptive orthodontics as that phase of science and art of orthodontics employed to recognize and eliminate the potential irregularities and malposition in the developing dento-facial complex[1].
Typically, interceptive orthodontics is performed between the ages of 7 and 11 years old. When interceptive orthodontics is performed between ages 7-11, the first set of permanent molars are usually in and the teeth, jaw and gums are extremely pliable[2]

.

PREVENTIVE	INTERCEPTIVE	CORRECTIVE
Prevent initiation of diseases	Prevent progression of diseases	Fully bloomed diseases

Disease not begin yet	Reversible	Irreversible
Age - 2 to 6 years	Age- 6 to 9 years	Age -beyond growth period
Deciduous dentition	Decicuous and mixed dentition	Permanent dentition
Awareness, Education Supervision of malocclusion	Early treatment	Final treatment
Examples- 1. Educating parents 2. Controlling dental caries 3. Taking care of primary dentition 4. Management of dental ankylosis 5. Extraction of supernumerary teeth 6. Correction of developing oral habits 7. Taking care of occlusion 8. Space maintenance 9. Elimination of abnormal frenal attachment 10. Correcting deeply locked permanent molars	Examples- 1. Serial extraction 2. Correction of developing cross bite a) anterior b) posterior 3. to control abnormally developed habits 4. space regaining 5. Muscles exercise 6. Interception of developing mal-relation 7. Removal of soft tissue or bony hurdle to enable teeth eruption	Surgical treatments like orthodontic surgeries Cosmetic surgeries Correction of cleft lip and cleft palate Surgical assisted rapid maxillary expansion Placement of braces (metal, ceramic, self-lining, clear aligners etc.)

1. CROSS BITE MANAGEMENT

- Malocclusion in transverse plane.
- According to GRABER cross bite is a condition where one or more teeth may be abnormally malposed bucally or lingually or labially with reference to the opposing tooth or teeth3.

- Reverse over jet (normal over jet= 2 to 4 mm) in which the maxilla or the maxillary tooth/ teeth are locked in the mandible or mandibular tooth/teeth depending upon whether the origin of cross bite.

- Best time to treat cross bite is when it is first observed.

CLASSIFICATION

On the basis of location

1. Anterior cross bite
   - Single tooth
   - Segmental

2. Posterior cross bite-
   - Unilateral
   - Bilateral

Fig:1 Posterior Crossbite


Fig:2 Anterior crossbite

On the basis of nature

1. Skeletal cross bite
2. Dental cross bite
3. Functional cross bite

- Posterior cross bite is seen when the buccal cusp of mandibular posterior teeth occlude buccal to maxillary buccal cusp instead of occluding in central fossa of maxillary posterior teeth.

- It can be Buccal non occlusion (scissor bite), Lingual non occlusion, unilateral or bilateral.

- **Anterior cross bite is noted when maxillary anterior** tooth/teeth is in lingual relation to the mandibular anterior teeth.

- Both anterior and posterior cross bite could be either skeletal or dental or in combination of both.

- Skeletal cross bite occurs when either maxilla is smaller than the mandible or the maxilla is normal and the mandible`s growth exceeded or both in combination which perhaps influenced by genetic factors or developmental deformities.

- It involves class III malocclusion. In the growth period face mask (reverse head gear) is given in retroclined maxilla and proclined mandible is treated with chin cup. Rapid maxillary fixation is also helpful in skeletal cross bite where splitting of mid palatal suture is done
.
- Dental cross bite is the defect of dental alignment where bones are in absolutely normal condition.

➢ Because of crowding, retained deciduous teeth or lack of space leading to retroclination of maxillary teeth/tooth or proclination of mandibular teeth/ tooth or both.

➢ It involves class I malocclusion.

➢ Anterior crossbite can be managed by tongue blade, Catalan`s appliance, double cantilever (z spring), and also by fixed appliances like by multilooped arch wire or nickel titanium arch wire and appliances used for overcoming posterior crossbite are coffin spring, crossbite elastics, quad helix, incorporation of midline jack screw, high pull head gear and fixed orthodontic treatment.


Fig:3 Catalan`s Appliance

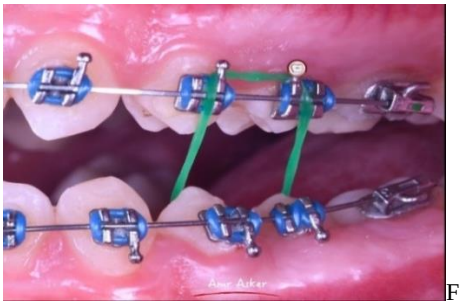
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Fig:4 Crossbite Elastic

- ➢ Functional crossbite- when the mandible is position forward (psedo class III) intentionally for occluding in centric occlusion may results into anterior crossbite.

CONSEQUENCES

Whatever crossbite it is, once it is seen it should be treated immediately because it is not only hazardous for the dentition although also harmful for gingival and periodontal health. Teeth being in crossbite relation with the opposing dentition leads to ill distribution of force while occluding and also during mastication which cause worn down of countered teeth. Due to malrelation appropriate cleansing of teeth is hindered and that enhances the chance of dental caries. Other than this it can also mimic gingival inflammation, gingival bleeding, bone loss, tooth mobility or may be tooth loss.

If the crossbite is left untreated then it`s exaggerated effect may disturb the other body parts. It can evoke jaw pain, facial pain (myofacial pain dysfunction syndrome), headache, neck and shoulder pain.

2. TO CONTROL ABNORMAL HABITS

Sigmund Freud (founder of psychoanalysis) explained in his theory (PSYCHOSEXUAL THEORY) that every child goes through different phases of psychological development (oral phases- birth to 1st year, Anal phase- 1st to 3rd years, Phallic stage- 3rd to 6th years, Latent phase- 6th years to puberty, Genital phases) in which mouth is considered as an oro-erotic zone in oral phase which simply means that child is prone to take things into their oral cavity. And as this is a natural phenomenon preventing his activity in that stage would lead the child to choose another supplementary habit and causes emotional insecurities. Now the question is that, what is the appropriate age lest which the habit is not a matter of worry? There are massive diversities of habit in folks at various stages depending upon their ongoing situations and previous experiences, take for example nail biting is very common in people facing anxious conditions or a habit of doing exercise diligently and many more but confining to the habits that affect our Dento-alveolar complex there are some classifications[4];

1. Useful and harmful habit by James William(1923)
2. Empty and meaningful habit by Klein(1921)
3. Pressure non pressure and biting habit by Morris and Bohanna
4. Compulsory and non-compulsory habit by Finn
5. Kingsley classification

According to **Moyer,** 'Habits are learned pattern of muscular contraction which is complex in nature'. Oral habits like Thumb sucking, Tongue thrusting, Mouth breathing, Bruxism, Lip biting all depends upon some factors to calculate it`s severity1.

There is a trident of factor like DURATION OF THE HABIT PER DAY, DEGREE and INTENSITY OF HABIT. And there are three phases (Normal and sub-clinically significant phase- up to 1st year of life, Clinically significant phase – 3 to 6 1/2 years and Intractable sucking phase – 4th or 5th years) to estimate when the habit is normal and when the child needs to see a doctor.

THUMB SUCKING HABIT

Subtelny`s classification of Thumb sucking:-

Type A- this type is characterized by the entire digit placed inside the mouth with the pad of he thumb pressing against the palate. The thumb is in contact with the maxillary and mandibular anteriors.

Type B- thumb inserted with in the mouth almost up to the first joint. It rests against the palate surface of the maxillary anteiors and not against the palate. The thumb is in contact with the maxillary and mandibular anteriors.

Type C- major part of thumb is inserted within the mouth just beyond the first joint. It rests against the palatal surface of the maxillary anteriors. The lower incisors do not touch the thumb.

Type D- the thumb is not fully inserted into the mouth. The lower incisor makes contact at the approximate level of the thumbnail.

DIAGNOSIS

- Identify the correct etiology
- Checking on emotional status of child (parent's devotion towards child, feeding habit etc.).
- Inspection on the trident of thumb sucking (Duration, Frequency and intensity) to parents
- .
- Intra oral examination- thorough examination of maxilla, maxillary teeth, mandibular teeth, upper and lower lip, tongue, intra arch relationship, thumb

TREATMENT

1. **Counseling:** Counseling of parents is basically the initiation of treatment because most commonly children who lack parents attention adopts this habit so once parents will rectify their part then the basic etiology will be already corrected.

once the child start cooperating this habit can be intercepted successfully, all you need to study the nature of child and choose the method one by one to make them aquatinted with the consequences.

a) Friendly discussion and motivation by dentist and parents.

b) Show photographs and study models illustrating the horrific effect of thumb sucking.

c) Promise to give reward once the habit is overthrown.

d) Apply Beta hypothesis given by Dunlop which is highly effective in which child should be asked to sit in front of mirror and asked to suck his thumb observing himself as he indulge in the habit

.

2. **Reminding aids**: thermoplastic thumb guards, bandaging the elbow to avoid flexing of hand, Putting the child into long sleeved gown.

1) Mechanical Appliances

a) Flat crib thumb sucking appliance

b) Vertical crib thumb sucking appliance

Fig: 5. Vertical rake Appliances

Fig :6. Blue Grass Appliance

2) Chemical Method

Painting the nail with pepper dissolved in volatile medium, quinine, asafetida and other bitter or foul tasting liquid.

CONSEQUENCES IF LEFT UNTREATED

- Constricted maxilla
- Increased SNA angle
- V shaped palate
- Posterior crossbite
- Spacing of maxillary anterior teeth
- Increased maxillary arch length
- Hypotonic upper lip
- Hypertonic lower lip
- Hyperactive mentalis
- Lip incompetency
- Retroclined mandibular anterior
- Open bite
- Decrease over bite
- Increase over jet
- Increase chance of tongue thrust
- Presence of clean nail and callus on finger

TONGUE THRUSTING

During swallowing if the tongue contact with any teeth anterior to molars then it is called as Tongue thrusting.
Aetiology- genetic factors, improper bottle feeding, prolong thumb sucking, persistent infantile swallow, macroglossia, narrow dental arch, neurological problems and psychological problems etc.

INFANTILE SWALLOW- an autonomic reflex in human being to up to approx. 6 months to prevent chocking as anything other than milk in mouth can be pushed out by the tongue, and persistent infantile swallow is denoted as tongue thrusting.

CLASSIFICATION OF TONGUE THRUST BY JAMES AND HOLT

TYPE I- Non deforming tongue thrust
TYPE II- Deforming anterior tongue thrust
Sub group 1: Anterior open bite
Sub group 2: Anterior proclination
Sub group 3: posterior crossbite

TYPE III- Deforming lateral tongue thrust
Sub group 1posterior open bite
Sub group 2 posterior crossbite
Sub group 3 deep overbite

TYPE IV- deforming anterior and lateral tongue thrust
Sub group 1: Anterior and posterior open bite
Sub group 2: Proclination of anterior teeth
Subgroup 3: Posterior cross bite
Simple classification of tongue thrust:
Simple tongue thrust
Complex tongue thrust

CLINICAL FEATURES:

- Anterior open bite
- Posterior open bite
- Posterior crossbite
- Bimaxillay protrusion
- Proclined anterior teeth

MANAGEMENT

- Identify the etiological cause
- Counseling of parents and child
- Habit breaking appliances used if thumb sucking is the etiology
- Treatment of infection if there is any tonsillar or upper respiratory infection

- Rectify the pattern of swallowing
- Correction of malocclusion in case of open bite, crossbite, protrusion of anterior teeth

MOUTH BREATHING

There are two natural passages leading to our lungs- nose and mouth although we can breathe from both, in fact we can consume abundant of oxygen while breathing from mouth but it is only normal when you are having nasal obstruction where it is rhinitis or a tumor or infection/ inflammation in the nasal area or perhaps during heavy exercise it will be accounted normal but even after the rectification of above reasons if someone choose to breath from mouth then slowly excruciating effects will start appearing that will not only spoil your appearance but also disturb normal functions and mimic problems such as longing and narrowing of face, lowering of mandible, lowering of tongue, atrophied nasal passage, short and flaccid upper lips, expressionless face, contracted upper arch maybe leading to posterior crossbite, anterior marginal gingivitis, xerostomia, prone for caries, anterior open bite etc5.

CLASSIFICATION

1. **Obstructive-** nasal polyps, deviation of nasal septum, obstructive adenoids, rhinitis, localized tumor, inflammation of nasal mucosa etc.

2. **Habituated-** a person who chooses to breathe through mouth even after the removal of nasal obstruction
3. **Anatomic-** short upper lip

DIAGNOSIS

- Identify the key factor
- Take an appropriate history
- Do thorough clinical examination seeking clinical feature
- Cephalometrics analysis to check long face, nasopharyngeal space, size of adenoid
- Rinomanometry
- Breathing tests-

1. **Water retention test-** place water in the patient`s mouth (15 ml of water) and ask him/her to keep it for 3 minutes.

2. **Grated mirror test-** after the second output of air on the mirror, mark the halo area with a marker (low nasal flow; up to 30 mm; average nasal flow 30 to 60mm; high nasal flow above 60mm)

3. **Lip seal test-** seal the patient`s mouth with a masking tape for 3 minutes.

Management of mouth breathing is a multidisciplinary approach involving dentist, pediatrician, physician, orthodontist, ENT specialist1.

TREATMENT

- Removal of etiology
- ENT specialist can treat swollen adenoid or perform tonsillectomy if needed
- Using vestibular screen
- Rapid maxillary expansion is used to widen the constricted maxillary arch.
- Appliance- Quad- helix.

BRUXISM

Bruxism is defined as an unconscious oral habit of rhythmical, nonfunctional clenching, grinding and making chewy sounds with the teeth while making movements that are not part of the masticatory function and that lead to occlusal trauma. Nocturnal grinding is termed ads BRUXISM, and grinding during day time is called as BRUXOMANIA.

Both during day and night grinding of teeth is common but at night it is not noticed by the individual, though people around that person inform about the weird noise coming from his mouth regularly during sleeping.

You can also notice some change like attrision of teeth or pain in jaw or face etc. without any other reason.
Clenching of teeth needs to be intercepted before it`s too late.

AETIOLOGY- Teething، pain in ear، stress، improper sleep، bad nutrition، cerebral palsy، drugs

CONSEQUENCES

- Fracture of teeth، Dental restoration، Crown، Bridge، Denture

- Mobility of teeth

- Facial muscle hypertrophy
- Worn off countering teeth (worn off of teeth is seen in many other conditions, like due to consumption of acidic food (erosion) so always check the counter teeth which is also worn or not)

- Attrition leads to sensitivity

- Pain in jaw

- TMD

- Pain in muscles of mastication

- Headache

TREATMENT

1. Periodontal Treatment
2. Muscle Relaxant
3. Analgesic
4. Anti-depressant
5. Botox injection

6. Night guard
7. Bite guard
8. Splint

NATURAL COMPENSATION OF SPACE IN DENTAL ARCH

It is crystal clear that sets of primary teeth contain 20 teeth and there are 32 teeth in permanent dentition, so for the accommodation of rest 12 teeth some more space will be needed and that are physiological space or developmental space present in deciduous dentition.

Now various conditions of deciduous dentition and their consequences on permanent dentition:-

1) Adequate interdental Spacing/ open dentition (approx. 6mm) – appropriate permanent dentition

2) Less or no spacing (close dentition) – marked crowding in permanent dentition

3) Crowding – severe crowding

WHEN AND HOW COMPENSATORY SPACES ARE UTILIZED

In each quadrant space available mesial to canine in maxilla and distal to canine in mandible in deciduous dentition is called as **Primate Space / Simians space/ Anthropoid space.**

The combined mesio-distal width of the permanent canine and premolar is usually less than that of the deciduous canine and molar is called as Leeway space of Nance (Maxilla- 0.9mm and Mandible- 1.7mm per quadrant)
Mixed dentition is divided into 3 phases:-

1. First transition phase (age 6- 8 years) - in this phase first permanent molar erupt and deciduous incisor exchanges with permanent incisor.

EARLY MESIAL SHIFT- Utilization of primate space occurs when mandibular 1st molar initially shifts in mesial direction.

LATE MESIAL SHIFT- utilization of leeway space occurs when mandibular 1st molar later on shift mesially after loss of second primary molar

2. Inter transition phase (age 8 to 10 years)- also called as period of Quiescence or Lull period. No active eruption noted in this phase.

3. Second transition phase (age 10 to 12 years)- in this phase eruption of premolar permanent canine and second molar occurs

Now what to do if the space is lost?

4. SPACE REGAINING

Exfoliation of deciduous dentition at its optimum age, free from any pathologic condition is natural and the space obtained from the loss of teeth will be overcome by successor teeth(permanent teeth)before the deterioration of space, without creating any deleterious effect on proximal dentition, arch length, occlusion but what if the space is lost because of carious deciduous teeth(interproximal caries), dental impaction, ectopic eruption of teeth, ankylosed primary molar, rotated or tipped teeth, congenitally missing teeth, improper eruption sequences, loss of primary molars without appropriate space management, abnormal root resorption of deciduous molar etc. in such cases we need space regaining.

The space regaining procedures are preferable undertaken at an early age prior to the eruption of the second molar.

Methods of gaining space

a) Proximal stripping/Slenderization/Disking/ Proximal Slicing/ Reproximation-

When the tooth material is excess but we can avoid extraction here by slicing or striping the excess tooth material from both sides to reduce the mesio-distal width of teeth, this process is called as proximal striping.

- According to Sheridan 0.4 mm reduction per each surface of posterior teeth and 0.25mm in the anterior teeth can be performed there by gaining in total about 8.9mm.
- proximal stripping can only reduce enamel thickness up to 50%.

Fig: 7.Disking

Armamentarium- Diamond interproximal strip
Carbide bur
Diamond discs
Thickness gauges/ leaf gauges

Indication

- Carey's Analysis- A tooth material excess of 0-2.5mm over the arch length.
- Bolton's Analysis- having excess of tooth material in both arches
- When class I molar and canine relationship is hindered by excess tooth size.
- For optimizing over jet and over bite.

Contraindication

- young patient due to large pulp chamber
- high caries index
- poor oral hygiene
- Microdontia
- high bacterial plaque index

    - **Post Disking tooth become prone to caries so application of fluoride is necessary.**

b) DISTALIZATION

In mixed dentition before eruption of second permanent molar distalization was also introduced to avoid extraction.

Molars are being moved in distal direction to gain space
.

Indications-

1. Straight profile
2. Healthy TMJ
3. Deep over bite
4. Mild to moderate skeletal or dentoalveolar protrusion
5. Moderate arch length deficiencies

ContraIndication-

1. Severe protrusion
2. High mandibular plane angle.
3. Anterior open bites
4. Severe crowding

Methods:

Extra oral
Cervical head gear, Occipital headgear

Intra oral
Sagital appliance, Pendulum appliance, Hilgers pendex, T-Rex Appliance, Hilgers appliance, Oral magnets, Open coil, spring, Jones jig, The distal Jet, ACCO appliance, Fast Back appliance,
TPA Fixed functional appliance

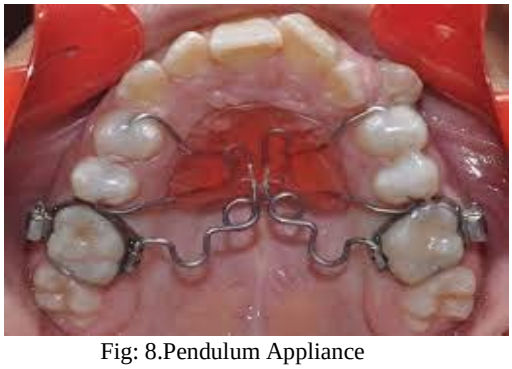

Fig: 8.Pendulum Appliance

Fig: 9. T Rex appliance

c) SERIAL EXTRACTION

Term coined by KJELLGREN in 1929
Father of Serial extraction is HAYES NANCE
A procedure of interceptive orthodontics mostly done in mixed dentition phase in which we inspect and predict the worsening of abnormalities in dentofacial complex and plan extraction of few deciduous as well as permanent teeth following particular sequences to improve the cclusal alignment of permanent teeth is called as serial extraction[6].

DIAGNOSIS- TWO BASIC PRINCIPLES FOR DETECTING THE NEED FOR SERIAL EXTRACTION

1. Arch length-tooth material discrepancy- arch length< tooth material (reduction of tooth material suggested which accounts disking, serial extraction as per the requirement)

MODEL ANALYSIS OF MIXED DENTITION

I. MOYER`S ANALYSIS
II. TANAKA JONSTON ANALYSIS
III. HIXON AND OLD FATHER ANALYSIS
IV. STALEY KERBER ANALYSIS
V. HUCKABA`S ANALYSIS
VI. BALLARD WILLIE ANALYSIS

2. Physiological tooth movement- utilizing the natural drifting of teeth in desirable direction post extraction of few teeth.

METHODS OF SERIAL EXTRACTION:-

1. **Dewel`s method7-** sequence

a) Extraction of deciduous canine create space for permanent incisor at the age of 8-9 years

b) Extraction of deciduous first molar after 1 year for creating space for first premolar.

c) Extraction of first premolar to allow the eruption of permanent canine.

2. **Tweed`s method**- sequence- Deciduous 1st molar, premolar, deciduous canine

3. **Nance method** – sequence – Deciduous 1st molar, premolar, deciduous canine

INDICATIONS

1. Class I with skeletal and muscular harmony
2. Arch length insufficiency comparing to tooth material

- Absence or inadequacy of physiological space
- Early exfoliation of deciduous canine
- Ectopic eruption of tooth
- Impacted lateral incisor
- Crowding in maxillary and mandibular arch
- Localized gingival recession
- Ankylosis of tooth

3. Straight profile and alluring appearance.
4. When the discrepancy is more than the growth potential

.

CONTRAINDICATION

1. Class II and III malocclusion with skeletal and muscular abnormalities
2. Spacing
3. Open bite and over bite
4. Midline Diastema
5. Developmental abnormalities
6. Excessive carious teeth
7. Mild discrepancies between arch length and tooth material

EXPANSION

• Approximately at the age of 14- 15 years maxillary suture become completely fused and no further expansion is allowed. So, gaining of space by Expansion is workable only before 14 years. This noninvasive method of gaining space can be Rapid and Slow, depending upon the discrepancy, whether it is skeletal or dento alveolar we choose one of them.

• Skeletal expansion is done by splitting off mid palatine suture while there is no or very little splitting seen in dento alveolar expansion[8]

Difference between Rapid and Slow maxillary expansion:

RAPID EXPANSION	SLOW EXPANSION
Skeletal expansion	Dento alveolar expansion mostly
Late mixed dentition Correction of transverse maxillary malocclusion between 13-15 years of age.	Early mixed dentition
Splitting of mid palatine suture	No splitting done
Force - approx. 100 N	Force- approx. 20N
Duration of treatment 1-2 weeks	Duration of treatment 2-5 months
Diastema is seen during expansion	No diastema is seen during expansion
More tissue trauma and hemorrhage	Less tissue trauma and haemorrhage
90 degree turn both in morning and in evening	Quarter turn per week
Less stable and greater chances of relapse	More stable and Lesser chances of relapse

Rapid Expansion appliances -

1. Removable - a split acrylic plate with midline screw
2. Fixed
   - Tooth tissue borne- Derichsweiler type,Hass type
   - Tooth borne- Issacson type, Hyrax type

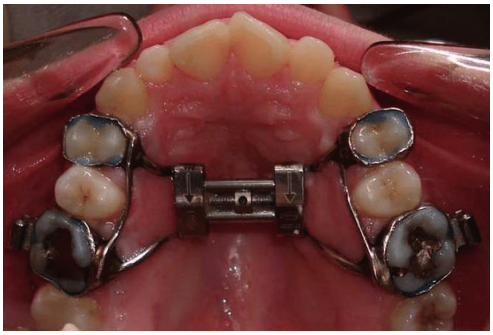

Fig: 10. Hyrax Appliance

Slow expansion appliances-

Screw used for slow maxillary expansion is of small pitch than those used in rapid maxillary expansion

.

Appliances-

Coffin spring, W arch, Quad helix

Fixed mechanotherapy- Expansion niti aarch wire, Use of quad helix or TPA, Use of auxiliary arches, Niti expanders

e) UPRIGHTING OF MOLAR

Early exfoliation of second deciduous molar or extraction of second premolar allows tipping of molar mesially (uncontrolled tipping) to utilize the proximal space. To avoid the consumption of more space by tipped molars uprighting should be done.

f) DETERIORATION OF POSTERIOR TEETH

Rotated teeth take more space than normally aligned teeth.

Method- use of spring or elastic with force couple.

g) PROCLINATION OF ANTERIOR TEETH

Proclining retruded anterior tooth helps in gaining space on a condition where soft tissues are not going to be sabotaged.

4 INTERCEPTION OF SKELETAL MALOCCLUSION

In case of early detection of Class II or class III skeletal malocclusion, it can be easily intercepted and thus provide ease in normalizing future dentition.

CLASS III MALOCCLUSION- Dentofacial deformity related to growth with maxillary prognathism in relation to the mandible.

CLASS II Skeletal Malocclusion

a) Excess maxillary growth
b) Deficient mandibular growth
c) Combination of both

Treatment -

Excess Maxillary Growth- Occipital Head Gear, Cervical Head Gear

Fig: 11.High pull Head Gear

Mandibular deficiency
Myofunctional appliance – activator, Frankel Functional regulator

At the end of the growth period fixed functional appliance are used like Jasper jumper، Herbst appliance.

CLASS III MALOCCLUSION- Dentofacial deformity related to growth with mandibular prognathism in relation to the maxilla or cranial base.

CLASS III Skeletal Malocclusion

a) Excess mandibular
b) Deficient maxillary growth
c) Combination of both

Treatment

Excess mandibular growth- Chin Cup with Head Gear restricts mandibular growth, Deficient maxillary growth- Frankle III، Face mask

Fig: 12.Chin cup

Fig: 13. Face mask

5. REMOVAL OF SOFT TISSUE AND BONY BARRIER.

Delayed eruption of tooth is often caused by encountering some hindrance in the eruptive pathway maybe a retained deciduous tooth، ankylosis، supernumerary teeth etc. So surgically removal of those hindrances (soft tissue or bone) and making a pathway slightly larger than the diameter of teeth has to be performed to clear the hassle in the way.

Fig: 14.

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Root Coverage For Single Recession By Modified Coronally Advanced Flap With Amniotic Membrane - A Case Report

Abstract

BACKGROUND: Marginal gingival recession can cause many functional and esthetic problems. Coronally advanced flap are the predictable technique for root coverage combining with regenerative techniques.

OBJECTIVE: To ascertain the potential benefits of amniotic membrane with modified coronally advanced flap for the treatment of gingival recession.

MATERIALS AND METHODS: 36 year old patient with Miller's class 1 recession w.r.t 23. We treated the patient with MCAF combining amniotic membrane and recalled the patient after 15 days, 1 and 3 months and 6 months for recording the parameters like recession depth, colour of gingiva and thickness of gingival tissue.

RESULTS: All the three parameters were improved significantly from baseline to 1, 3 and 6th months.

CONCLUSION: Benefits of combined technique was seen along with good oral hygiene.

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INTRODUCTION

Gingival recession is the display of root surface of the tooth characterized by displacement of the gingival margin apically from the cemento-enamel junction. Recession is leading to many esthetic and functional problems, including poor esthetic, root caries, tooth hypersensitivity and pulp hyperemia. Over the years, various recession coverage technique have evolved including various graft technique and regenerative materials.[1]

The amnion is membrane building the amniotic sac that surround and protect an embryo. The amniotic membrane is a tissue of fetal origin and is composed of three layers: epithelial layer, a thick basement membrane and an avascular mesenchyme. It can easily separate from underlying chorion. Amniotic membrane was 1st used for the transplantation of skin in 1910. Recently, this

multipurpose tissue has found application in the field of periodontics.[2] Velez analysed the effects of cryopreserved amniotic membrane on periodontal tissue healing. Gurinsky demonstrated that the processed allograft amnion may provide an effective alternative to autograft tissue in the treatment of recession defects[3].

Case Report

A 36 years old male patient reported to the department of periodontology with the chief complaint of sensitivity. Patient's dental, medical and family history was taken. Patient had no medical history.

Figure 1: Clinical examination- Miller's class 1 recession was seen and 23

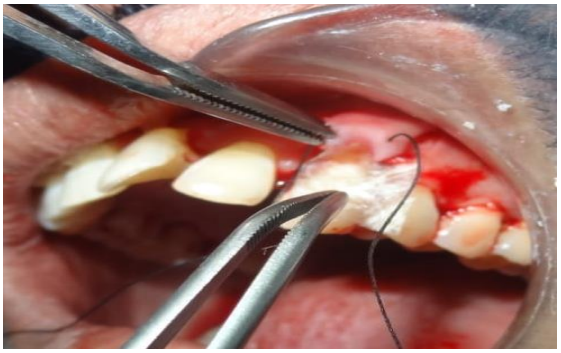
Recession depth was 3mm vertically. The patient had thin gingival biotype (3mm) thick measured with UNC 15 probe, Moderate amount of calculus was present.

We decided to place an amniotic membrane (Tata memorial hospital, India) in conjunction with a modified coronally advanced flap (Figure- 2).

Patient was asked to get all the blood investigation done and phase 1 therapy was done along with oral hygiene instructions and proper brushing technique. Patient was asked to come back with all the blood reports after 21 days for surgery.

Clinical Procedure- Patient came for surgery with good oral hygiene. All the blood investigations were normal. After giving anesthesia, oblique incision was given leaving the papilla intact and then full thickness mucoperiosteal flap was reflected wrt 23 without giving vertical incision. (Fig-3)

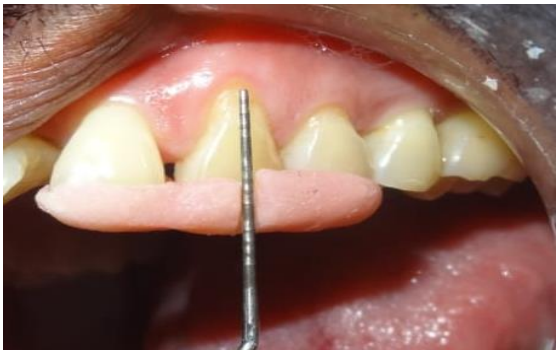
Beneath the full thickness flap partial thickness flap incision was given at the level of MGJ. Amniotic membrane was cut into proper size, placed on the exposed area and then flap was pulled down and sutured. (Fig-4)



Patient was given medications, 625mg amoxicillin with Clavulanic acid, Megaflam AC pain killer and Clohex ADS mouthwash and recalled after 15 days.

RESULTS

Patient came back after 15 days with slight inflammation at the surgery site but recession coverage was almost 85-90%. Oral hygiene was good. Again, patient recalled after 1 month , 3 month and 6 month with almost 90% root coverage, good gingival biotype (4mm) at 1 month and (6mm) at 3rd month and 6 month compared to baseline, colour of gingiva was also lighter than before. (Figure 5)



DISCUSSION

Amniotic membrane is an allograft with many unique properties that make it a promising new substitute in the field of periodontics. It contains a variety of proteins such as fibronectin, laminin, proteoglycans, glycosaminoglycans and collagen type 4, 5 and 7 4. It provides cellular migration, proliferation and promotes wound healing also. It contains large number of cytokines including TGF (Transforming growth factor),

EGF (Epithelial growth factor), PDGF (platelet derived growth factor) and FGF5 (Fibroblast growth factor).

Complete and stable root coverage is the ultimate goal of any root coverage[6]. In this case, we observed that amniotic membrane combined with MCAF resulted in 90% root coverage. MCAF has advantage over CAF because in this procedure no vertical incision is given, so, blood supply remains intact leading to good wound healing[7,8]. The results were stable for 3 and 6th months post-treatment and no recurrence of recession was observed. Another interesting finding was enhancement of gingival biotype. All the optimum desired results as an allograft for root coverage were achieved by amnion allograft combined with MCAF.

CONCLUSION

The result is encouraging the use of amniotic membrane combined with MCA for recession coverage. Patient's oral hygiene is also an important factor for achieving good recession coverage. This report paves a way for future studies that may investigate amniotic membrane application in other fields of periodontal and oral surgery[9].

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Case Report Journal of Oral and Dental Health

Auto Transplantation – Two Case Reports

Abstract

Autogenous transplantation is a viable, time saving and economical option for the treatment of non-restorable tooth when a suitable donor tooth is available. Autogenous Tooth Transplantation(ATT) is the surgical movement of a maturely or immaturely formed tooth from its original site to another extraction site or a surgically prepared socket in the same individual. The most important factor in the healing process after auto transplantation is the presence of intact and viable periodontal ligament cells, which have the ability to differentiate into osteoblasts and enable bone production. The purpose of this case report is to describe methods used for auto transplantation and to show successful healing at 6months follow-up with bone formation around the transplanted teeth.

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INTRODUCTION

Autotransplantation is an alternative to dental implant asit can conserve time, provide rapid healing, restore function and esthetics. Moreover, it also hasan added advantage of maintaining proprioception of the tissue by establishing a distinctive sensory systemby promoting proper healing of the periodontal tissue [1]. Tooth transplantation can be classified into autogenous (where a tooth/tooth bud from one socket is inserted into another socket in the same person), homogenous (if the donation is performed by a person of the same specie of the receptor), and heterogeneous (if the donor is from a different specie of the receptor) [2].

Autogenous tooth transplantation is the surgical transposition of a vital or endodontically treated embedded, impacted or erupted tooth from its site at the oral cavity to another site, i.e., the tooth to be transplanted is submitted to an avulsion from its site of origin and transplanted to another natural or surgically prepared socket. [3,4] Transplantation is mainly indicated reimplantation), indication for tooth extractions, and if the prosthetic treatment is unaffordable based on socioeconomic grounds. [5]

Successful autotransplantation can offer many advantages in a growing patient, including a normally functioning periodontium, proprioception and preservation of alveolar bone volume[6].The cytological success ofautotransplantation depends on the potential of periodontal ligament cells to differentiate and induce dentine and cementum formation. PDL cells have the ability to differentiate into osteoblasts and are able to induce bone formation. Andreasen et al. showed that the presence of intact and viable periodontal ligament cells is considered to be the most important factor to have a successful healing process after autotransplantation [8].

The purpose of this article was to report two cases of successful autotransplantation for replacing lost teeth. The first case is transplantation of the third molar to replace adjacent grossly decayed tooth in the mandible. The second case is transplantation of the impacted canineto replace missing central incisors in the mandible.

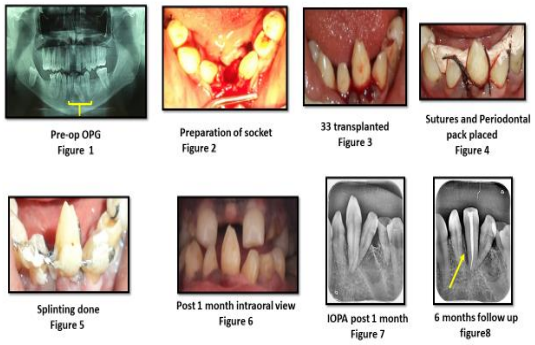
CASE REPORT 1

A 34year old male visited the Department of Conservative Dentistry and Endodontics with chief complaint of mobility of teeth in lower anterior tooth region.However, the clinical and radiographic (OPG) [Figure 1] examination revealed presence of mandibular deciduous central incisors which had grade 3 mobility with missing permanent central incisors and an impacted left mandibular canine was present. A single implant installation after extraction was one of the treatment options.

However, considering the opinion of the patient and economic constraints, autotransplantation of mandibular impacted canine was planned. Under local anesthesia using 2% lidocaine with 1:100,000 epinephrine, the retained deciduous teeth were extracted following which the impacted mandibular left canine was extracted. The tooth roots were wrapped with gauze soaked in coconut water. The recipient site was prepared with a round bur under copious sterile saline irrigation [Figure 2]. After fitting of the mandibular left canine into the prepared recipient site[Figure 3], it was stabilized with 4-0 silk sutures [Figure 4] and a semi-rigid resin wire splint was placed [Figure 5].

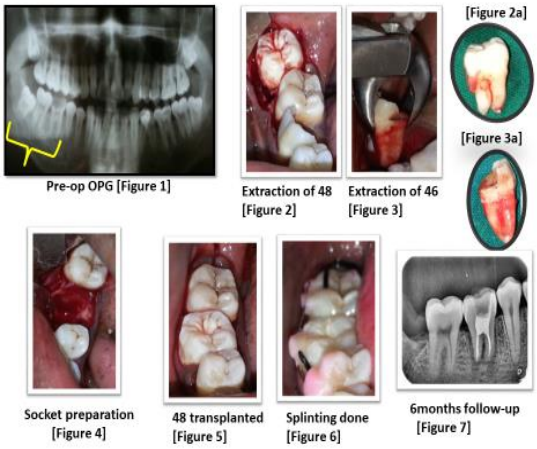
The extra-oral time from extraction of the mandibular left impacted canine to transplantation was 15 minutes. Amoxicillin 500 mg three times a day and Ibuprofen 400 mg three times a day were prescribed for a week, and a 0.1% chlorhexidine rinse was used for 7 days. Stich removal was done after 1 week. The root canal therapy was started at 4 weeks. After the calcium hydroxide dressing was maintained for 2 weeks, root canal therapy completed at 6 weeks. Satisfactory healing was noted both clinically and radiographically at post 1 month follow-up. [Figure6 & 7].At the 6 month follow up, the transplanted tooth was asymptomatic and periodontally healthy. In addition, new bone formation on the distal side of the tooth was observed and periodontal pocket depth is normal.[Figure 8]

CASE REPORT 2



A 20 year old male visited the department of conservative dentistry and endodontics with a chief complaint ofdiscomfort and pain in the lower right molar area while biting. The clinical and radiographic examination [OPG] [Figure 1] revealed that the mandibular right first molar was agrossly decayed tooth with chronic apical periodontitis. Considering the financial difficulty of the patient, autotransplantation was preferred to implant installation.The mandibular third molar was healthy and was used for autotransplantation. Under local anesthesia, mandibular right third molar was extracted [Figure 2,2a] following whichthe mandibular right first molar was extracted [Figure 3,3a]. The tooth roots were wrapped with gauze soaked in coconut water. The recipient site was prepared with a round bur [Figure 4] and transplantation was carried out [Figure 5] and it was stabilized with 4-0 silk sutures and a semi-rigid resin wire splint was placed [Figure 6].

The extra-oral time from extraction of the maxillary right second molar to transplantation was 11 minutes. Amoxicillin 500 mg three times a day and Ibuprofen 400 mg three times a day were prescribed for a week, and a 0.1% chlorhexidine rinse was used for 7 days. The root canal therapy was initiated at 2 weeks. After the calcium hydroxide dressing was maintained for 2 weeks, root canal therapy was completed at 4 weeks after the surgery. At the 6 month follow up,[Figure 7] there was no clinical symptom or radiographic signs of root resorption and bony healing was present around the implanted tooth . The autotransplanted tooth will be restored with a full crown.



DISCUSSION

The history of tooth transplantation dates back to the Incas and Egyptian civilization where the slaves were exacted to give their teeth to their pharaohs.[3] The dental surgical intervention of this type was first documented by Abulcassis in 1050; however, the first recorded surgery with details about tooth bud transplantation was performed by the French dentist Ambroise Pare in 1564.

Exodontia of teeth are mostly carried out in most of the cases due to complexities in restorability of grossly decayed tooth structure. The first permanent molars are most often affected because of early eruption and the complex anatomy of the occlusal surface and needs early replacement as it plays a crucial role in the establishment of normal occlusion [9]. Notably, mandibular first permanent molars are the earliest permanent teeth to erupt and remain in the mouth for a long period, thus the risk of caries and root fracture is high, and they have a high possibility of early loss.
The factors affecting the prognosis of autotransplantation are donor tooth, recipient site, the duration and method of splinting after surgery, and the timing of endodontic treatment of the transplanted tooth.[4,10]Above all, the critical factor for the healthy prognosis is the healing of periodontal ligament (PDL) cells, which in turn is dependent on the vitality of PDL cells attached to the

root surface of the donor tooth. Therefore, extraction without damaging the root surface of the donor tooth and immediate transplantation in the recipient site are critical for the successful autotransplantation. [1,11]

The donor tooth and recipient site should be both examined carefully for satisfactory and relevant dimensions of socket and root length [4, 12]. The recipient site should have adequate bone support with sufficient attached keratinized tissue to allow tooth stabilization and be free of infection and/or inflammation [4]. Insufficient buccolingual width in the recipient site or excessive preparation of the site may result in resorption of the alveolar ridge, loss of buccal bone coverage, and consequent loss of periodontal integrity. An extensive study that evaluated autotransplantation of 53 molar teeth with developed roots reported that lack of buccal bone plate was the only significant predictor for transplant failure [13]. Another contraindication for transplantation would be the presence ofsharp root curvatures which may lead to increased risk of PDL damage and cemental tear during extraction [3, 12].

In both the cases extraction procedure was carried out with special care in order to preserve periodontal ligament cells. The tooth roots were wrapped with gauze soaked in coconut water. The periodontal ligament cells are extremely sensitive, and viability is significantly decreases with increase in extraoral dry time.[14]The increased length of the extra-alveolar time increases the risk of healing capacity of the periodontal ligament cells which in turn may induce inflammatory external root resorption. In the present case, extraoral dry time was maintained well within the 3o minutes limit i.e 15 min and 11 min respectively. There was no external root resorption noted in the follow –up radiographic examination as coconut water used to maintain the viability of the cells. Coconut water is an excellent storage media for avulsed teeth, as it has a PH and osmolality compatible to PDL cells [15].

Revitalization and revascularization of mature teeth does not occur in autotransplantaion.[16, 17]. Previous studies have shown a high incidence of pulp necrosis in mature teeth. Hence, endodontic therapy or root resection with retrograde restoration has been advised to prevent pulpal infection and/or inflammation and subsequent root resorption [18-19], In this case, root canal therapy was initiated after 2 weeks of stabilization.The use of a rigid splinting promotes the complete immobilization of the tooth leading to root resorption.Non-rigid splinting on the other hand has proven to be an effective technique in promoting healing and regeneration of periodontal fibres which in turn provides better prognosis.[14]

Transplanted tooth with viable PDL has osteoinductive property that helps in regeneration of bony defects around the transplanted tooth without grafts, thus proving to be more cost effective as compared to implants.Better esthetics with natural emergencence profile due to formation of normal interdental papilla. [20]

According to Tsukiboshi, the successful transplants must show normal pocket depth, physiological mobility, no clinical discomfort, and normal PDL space and lamina dura.12 Judging by such criteria, these cases, though had short follow-up period, showed successful results.[21]

CONCLUSION

From these cases, it can be concluded that autogenous transplantation should always be considered as a treatment modality when well indicated. However, patient selection, presence of the suitable donor and appropriate recipient site contributes to its success. All these requires proper planning, good knowledge of exodontia, competence in surgical technique and patient compliance. If undertaken properly autotransplantation is a biological solution to establish function and helps in the preservation of the alveolar ridge, allowing the reestablishment of the masticatory function and hence should be considered as a prime option.

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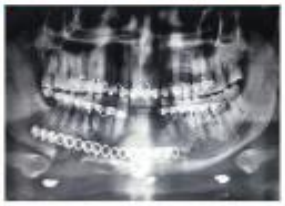

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