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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 students 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 congratulate **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, Darbhanga.

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 interdisciplinary 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

## 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 are appreciated to be chosen for publication in “Journal of oral & dental health”. However our priority of publication always remains towards innovative research work. Till date no concrete work has been done on prevention of spread of viral infection from patient to dental surgeon or vice versa.

So, scope is available for research & innovation. Hope authors take interest to go ahead with research on this aspect and bring shield of Protection.



**Dr. Arunachalam Sudheer,**  
Principal, Professor & Head, Prosthodontics and Crown & Bridge  
Editor in Chief  
Journal of Oral & Dental Health

Mithila Minority Dental College & Hospital  
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## 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 breakthrough 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 a 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

**DR. ARUN S. DODAMANI**

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# An Evaluation of Nasolabial and Mentolabial angle in Class I malocclusion in Mithilanchal Population: A Cephalometric Study

## Abstract

**OBJECTIVE:** To establish relation of nasolabial and mentolabial angle with normal facial profile of males and females in Mithilanchal population of Bihar.

**MATERIALS AND METHODS:** The study was done on 32 subjects belonging to male and female comprising of Class I malocclusions meeting the inclusion criteria. The samples were collected from the pre-treatment records of the Department of Orthodontics. Mean values of each variable were calculated and compared between male and female groups. ANOVA test was performed to analyse the significant difference at  $P \leq 0.05$ .

**RESULTS:** The mean value of the nasolabial angle was found to be significantly larger in female than males.

**CONCLUSION:** There is significant difference of Nasolabial Angle and the Mentolabial Angle between male and female having Angles's class I malocclusion in Mithilanchal Population.

**KEY WORDS:** Angles's class I malocclusions; Nasolabial Angle; Mentolabial Angle; Mithilanchal..

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## INTRODUCTION

An attractive face is a balanced and complimentary match of the eyes, nose, lips and ears; together with a harmony of the jaw and teeth accentuated by the colour and texture of skin and hair<sup>1</sup>. Facial harmony and balance are ascertained by the facial skeleton and its tissue drape<sup>2</sup>. Hence, soft tissue evaluation is being emphasized during diagnosis and treatment planning of patients

Nasolabial angle is an angle formed by drawing a line tangent to the base of the nose and a line tangent to the upper lip. Average nasolabial angle in adult with balanced jaw is 102°. While the mento labial angle is the angle formed by the intersection of a tangent to the lower lip (sublabial to labraleinferius) and a tangent to the upper part of the soft tissue chin pad (sublabial to soft tissue pogonion). This angle should be gently curved (mean=102±10 degrees)<sup>4</sup>.

Nasolabial angle (PCm, Ls, N; Fitzgerald) and soft tissue pogonion, sublabial and labialeinferioris are the key points in the cephalogram to decide the mentolabial angle. So, the importance of nasolabial angle and mentolabial angle will be the key to evaluate the esthetic profile of a person. Keeping these things in mind, the parameters will be tested and compare with the other studies which will also guide us in establishing the norms of nasolabial angle and mentolabial angle for an acceptable esthetic profile.

## MATERIALS AND METHODS

32 subjects visiting the OPD of department of Orthodontics and Dentofacial Orthopedics and department of Oral Medicine and Radiology at Mithila Minority Dental College and Hospital, Darbhanga were selected and their lateral cephalograms were collected for this study. The ethical clearance will be taken from the ethical committee of Mithila Minority Dental College and Hospital, Darbhanga.

The following criteria will be followed during the selection of subjects:

The following criteria will be followed during the selection of subjects:

### Inclusion criteria

1. Should be Class I molar relation bilaterally with good facial balance.
2. Should be between 20 – 36 years of age.
3. Should have intact 28 permanent teeth excluding third molar.
4. Should have Class I skeletal jaw bases.
5. All patients should have standardized lateral cephalometric radiographs.

### Exclusion criteria

1. History of orthodontic treatment and cosmetic surgery of face.
2. History of facial trauma.
3. Facial nerve palsy.
4. Denture wearer.

All cephalometric radiographs of the patient will be taken in natural head position and with the lips relaxed. 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 3H or 0.3mm HB pencil. All reference points will be first identified, located and marked.

a). The nasolabial angle will be evaluated by using the following parameters:

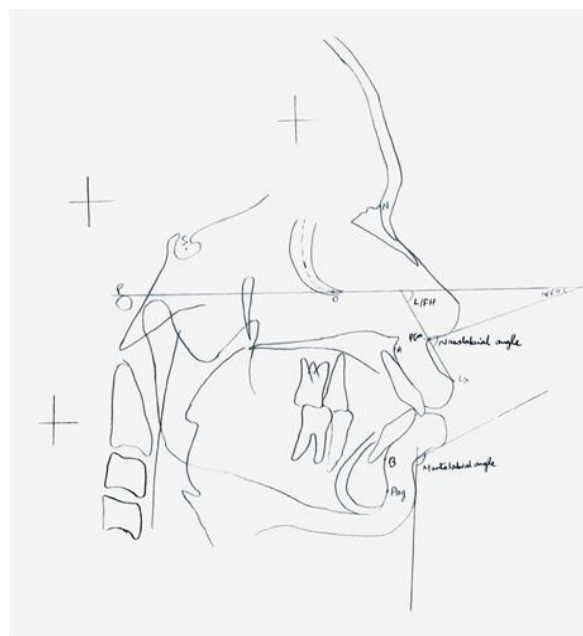
Cephalometric landmarks of nasolabial angle will be identified by sella (S), nasion (N), porion (P), orbitale (Or), subspinale (A), supramentale (B), pogonion (Pog), posterior columella point (PCm), and labrale superius (Ls).

For nasolabial angle, the soft tissue angular measurements used in this study are lower border of the nose to Frankfort horizontal plane angle or N/FH, upper lip to Frankfort horizontal plane angle or L/FH, and nasolabial angle.

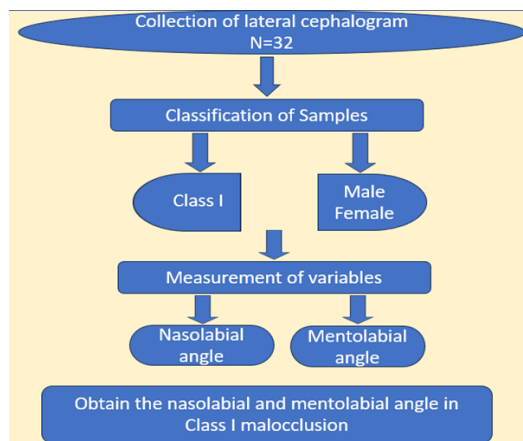
- i. PCm tangent
- ii. N/FH angle
- iii. PCm Ls line
- iv. L/FH angle.

b). The mentolabial angle will be evaluated by using the following parameters:

1. Sublabiale
2. Labrale inferius
3. Soft tissue pogonion
4. Tangent from sublabiale to labrale inferius
5. Tangent from sublabiale to soft tissue pogonion.



## CONCEPTUAL FRAMEWORK



## STATISTICS

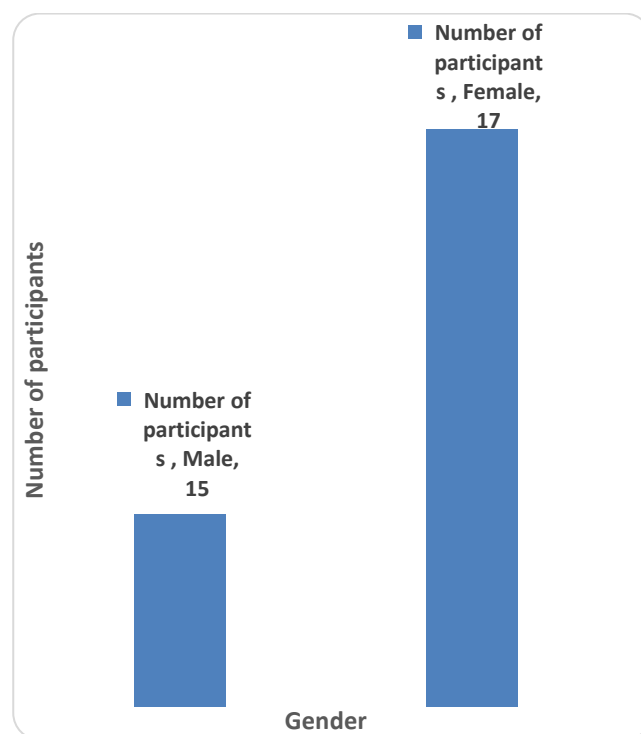
Table 1 shows frequency of gender.

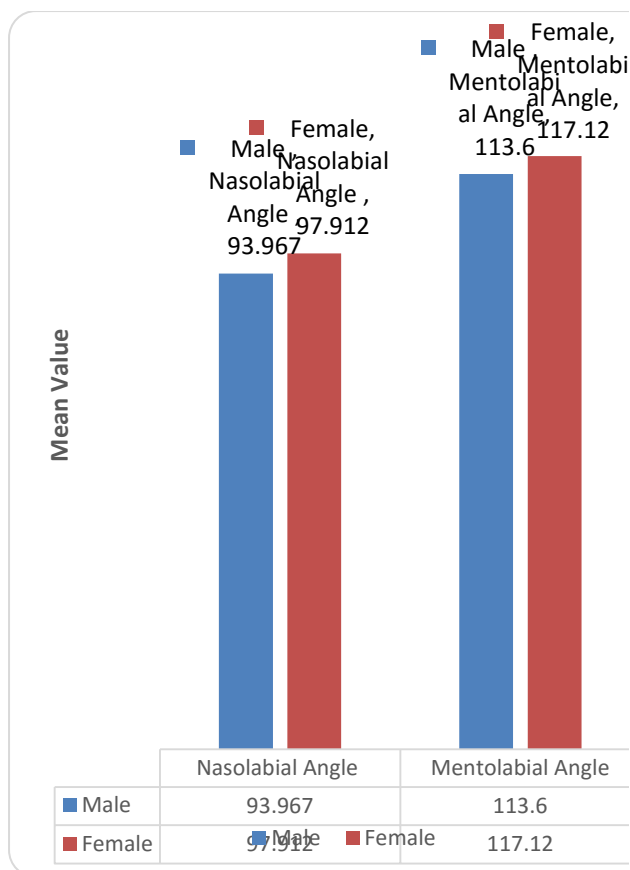
Gender	Frequency	Percent
Male	15	46.9
Female	17	53.1
Total	32	100.0

Table 2 shows comparison of different parameters with gender

F.ANOVA p- Value < 0.005 Significant

	N	Mean	Std. Deviation	95% Confidence Interval for Mean		F	p-value
				Lower Bound	Upper Bound		
Nasolabial angle	Male	93.967	10.3725	88.223	99.711	1.010	0.323
	Female	97.912	11.6703	91.911	103.912		
	Total	96.063	11.0853	92.066	100.059		
Mentolabial sulcus	Male	113.60	6.479	110.01	117.19	2.192	0.149
	Female	117.12	6.900	113.57	120.67		
	Total	115.47	6.634	113.00	117.93		
Facial angle	Male	88.73	3.369	86.87	90.60	0.094	0.761
	Female	89.06	2.633	87.70	90.41		
	Total	88.91	2.955	87.84	89.97		
Angle of convexity	Male	7.80	2.908	6.19	9.41	3.072	0.090
	Female	5.88	3.238	4.22	7.55		
	Total	6.78	3.190	5.63	7.93		
SGnFH	Male	58.07	3.555	56.10	60.04	0.002	0.963
	Female	58.12	2.667	56.75	59.49		
	Total	58.09	3.062	56.99	59.20		
ANB	Male	4.87	1.060	4.28	5.45	1.241	0.274
	Female	4.24	1.954	3.23	5.24		
	Total	4.53	1.606	3.95	5.11		
SGnSN	Male	64.07	2.549	62.66	65.48	0.076	0.785
	Female	64.29	2.114	63.21	65.38		
	Total	64.19	2.292	63.36	65.01		
FI/A	Male	21.73	4.415	19.29	24.18	0.003	0.955
	Female	21.65	4.212	19.48	23.81		
	Total	21.69	4.239	20.16	23.22		
WPH	Male	16.833	7.3622	12.756	20.910	0.097	0.757
	Female	17.706	8.3260	13.423	21.988		
	Total	17.267	7.7770	14.463	20.101		
LPH	Male	76.667	9.2595	71.539	81.794	1.224	0.277





## RESULTS

The mean value of the nasolabial angle was  $96.06^\circ \pm 11.08^\circ$  with males at  $93.96^\circ \pm 10.37^\circ$  and females at  $97.91^\circ \pm 11.67^\circ$ . The N/FH angle had a mean value of  $17.29^\circ$  and a standard deviation of  $\pm 7.77^\circ$ . The males had a mean value of  $16.83^\circ \pm 7.36^\circ$  and the females  $17.70^\circ \pm 8.32^\circ$  [Table 2]. The mean value of the L/FH angle was found to be  $78.82^\circ \pm 10.42^\circ$ . The males demonstrated a mean value of  $76.66^\circ \pm 9.25^\circ$  and the females  $80.73^\circ \pm 11.27^\circ$  [Table 2]. The mean of mentolabial angle was  $115.47^\circ \pm 6.834$  with male at  $113.60^\circ \pm 6.47^\circ$  and female at  $117.12^\circ \pm 6.900^\circ$ .

## Discussion

Evaluation of the soft tissue profile is important in the diagnosis and treatment planning of the orthodontic patient. It has been tested that soft tissue changes arise in tandem with orthodontic remedy and coincide with each increase and orthodontic remedy which normally has an immediate effect at the soft tissue profile, despite

the fact that the soft tissue adjustments aren't constantly consistent<sup>11</sup>. These factors require a thorough evaluation of the soft tissue profile before deciding on orthodontic treatment.

When considering orthodontic treatment, examination of the soft tissues around the nasolabial folds is critical. This area is affected by the movement of the maxillary incisors in any of the three spatial planes. However, there are not many reliable and consistent techniques to evaluate the nasolabial region.<sup>6-11</sup>

This study used a method to locate the posterior columella point, where a tangent was drawn to the lower border of the nose and a line drawn from it. This point on the labralesuperiorius proved to be a reliable method to determine the nasolabial angle. The postero-inferior angle formed by the intersection of the Frankfort horizontal plane and the tangent line of the lower nasal margin gave a representative nasal slope. The antero-inferior angle created by the intersection of Frankfort's horizontal plane and the line drawn from the columella point from the posterior tangent to the labralesuperiorius gave a typical upper lip tilt<sup>13</sup>.

The average nasolabial angle in our study was  $93.96^\circ \pm 11.67^\circ$ , which was lower than that of Nanda et al.<sup>14</sup> women ( $110.7^\circ \pm 10.9^\circ$ ) and a lower average compared to Dr. Jay P Fitzgerald<sup>13</sup> values in white adults ( $114^\circ \pm 10^\circ$ ). The variability of the upper L/FH angle was the smallest of the three angles measured. The mean of this angle was lower than the nasolabial angle described by Hunt and Rudge<sup>13</sup>. Their angle was formed by the Frankfort horizontal plane and the line tangent to the upper lip passing through the base of the nose at an angle of approximately  $90^\circ$  to the normal. The difference in normal values was again explained by the posterior location of the subnasale point compared to the posterior columella point<sup>15</sup>.

Contrary to the findings of Owen et al.<sup>16</sup>, a greater nasolabial angle value of  $105^\circ \pm 8^\circ$  was found. The different position of the tips of the two nasolabial angles is a probable reason for the difference. Their subnasale apex is created by bisecting the tangents of both upper lip and nasal columella. As a result, the tip was located much further than the posterior columella point.

Mentolabial sulcus is also a determining factor in lower facial cosmetics. To determine the extent of genioplasty reduction in patients with horizontal microgenia, Zide and Boutros<sup>17</sup> determine an important diagnostic point of the upper component of the mentolabial angle, which is the slope of the path from the lower lip to the mentolabial groove.

The mentolabial angle proposed by Ángel Eduardo Miranda Salguero et al.<sup>18</sup> was smaller ( $104.1^\circ \pm 11^\circ$ ) compared to our study ( $115.47^\circ \pm 6.834$ ).

And the mentolabial angle recommended by Sushma Sonawane et al.<sup>19</sup> in a group of 60 (30 men and 30 women) was 107-118 degrees, which was less compared to the results of our study.

In the future, there is also room for other studies because the nasolabial and mantolabial angles of males and females differ in Mithilanchal population.

## CONCLUSION

In our present study, the method of constructing the nasolabial angle, given by Dr. Jay P Fitzgerald<sup>13</sup>, has been employed and the nasolabial angle of 32 subjects has been constructed which determines the relative angles of the nose and upper lip and their relation to each other.

The findings of this investigation of the nasolabial and mentolabial region reveal that the

- mean and standard deviation, from a sample of 32 subjects, for the three nasolabial parameters were  $17.29^\circ$  for the N/FH angle,  $78.82^\circ \pm 10.42^\circ$  for the L/FH angle, and  $96.06^\circ \pm 11.08^\circ$  for the nasolabial angle with males at  $93.96^\circ \pm 10.37^\circ$  and females at  $97.91^\circ \pm 11.67^\circ$ .
- The mean of mentolabial angle was  $115.47^\circ \pm 6.834$  with male at  $113.60^\circ \pm 6.47^\circ$  and female at  $117.12^\circ \pm 6.900^\circ$ .
- There was statistically significant difference between males and females in this study.

Result gives us the knowledge about the P value as per the ANOVA test which states that the study is statistically significant. We can therefore say that there is significant difference of Nasolabial Angle and the Mentolabial Angle between male and female having

Angles's class I malocclusion in Mithilanchal Population. Hence, a population and gender specific normative data for nasolabial angle, mentolabial angle and its associated components must be available for correct orthodontic diagnosis and treatment planning.

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# Assesment of lip pattern in different types of Malocclusion

## Abstract

**OBJECTIVE:** To Identify and describe different lip patterns in different skeletal Malocclusion.

**MATERIALS AND METHODS:**Thirty two subjects were selected among the patient visited the department of Orthodontics and Dentofacial Orthopedics at Mithila Minority Dental College and Hospital, Darbhanga and their lateral cephalograms were collected for this study to identify skeletal class I, II, III malocclusion. Informed consent was taken from the patient. Lip print was recorded by lipstick-paper method and was classified according to Tsuchihashi classification as Type I, Type I', Type II, Type III, Type IV, Type V.

The ethical clearance will be taken from the ethical committee of Mithila Minority Dental College and Hospital, Darbhanga.

**RESULTS:**Partial vertical groove (PVG) lip pattern was most prevalent for all the groups. In skeletal Class I, PVG lip pattern was most prevalent, whereas in skeletal Class II Division 1, intersecting groove, in skeletal Class II Division 2, PVG, and in skeletal Class III, complete vertical groove were prevalent. The difference between the four malocclusion groups of each type of lip print was significant.

**CONCLUSION:** Type I Partial Vertical Grooves (PVG) was most prevalent for all the groups and Type II forked groove (FG) was least prevalent for all the groups

Type I' Partial Vertical Grooves (PVG) was most prevalent in skeletal Class I malocclusion and Class II Division 2 malocclusion

Type III Intersecting Grooves (IG) was most prevalent in skeletal Class II Division 1 malocclusion  
Type I Complete Vertical Grooves (CVG) was most prevalent in skeletal Class III malocclusion.

**KEYWORDS:** Angles's class I & Class II, Class III malocclusions; lip pattern.

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## INTRODUCTION

Lip print is a forensic examination technique involving the study of lip patterns. Traditional methods of personal identification include anthropometry, fingerprinting, gender determination, age estimation, height measurement, identification with specific individuals, and blood grouping.

The folds and grooves of the red part and the human transition zone of the lip do not have any anatomical name. Therefore, it is called by "sulci labiorum rubrorum" because these structures are grooves. The figure formed by these sulci is called "figura linearum labiorum". Rubrorum i.e. usually lip patterns.



There is a strong relationship between skeletal malocclusion (classes I, II, III) and soft tissue configuration. Skin and lip microscopic examination can be used as a simple, easy-to-use, Inexpensive and non-invasive way to explore malocclusion of genetic relation and their timely prevention.

Santos recommends lip wrinkles and bumps for personal identification. He divided lip creases and lip grooves into simple and composite types. Simple folds and creases into straight line, curved line, diagonal line, and sinusoidal curve.

Lip patterns vary from person to person and are determined by how the lip muscles contract to form a specific pattern. This is why lip patterns play such a critical role in forensic identification

## MATERIALS AND METHOD

Thirty two subjects were selected among the patient visited the department of Orthodontics and Dentofacial Orthopedics at Mithila Minority Dental College and Hospital, Darbhanga. Their lateral cephalograms was collected for this study to identify skeletal class I, II, III malocclusion. Informed consent was taken from the patient. Lip print was recorded by lipstick-paper method and was classified according to Tsuchihashi classification as Type I, Type I', Type II, Type III, Type IV, Type V.

The ethical clearance was taken from the ethical committee of Mithila Minority Dental College and Hospital, Darbhanga.

The patient should be between 18-30 years old and systemically healthy. The patient must have a standardized lateral cephalometric radiograph.

Patients excluded from the study were those with cleft lip and palate who had undergone prior surgical procedures in the orofacial region, any lesion on the lips, developmental anomalies, systemic diseases affecting bone and general health, as well as children and mentally disabled patients.

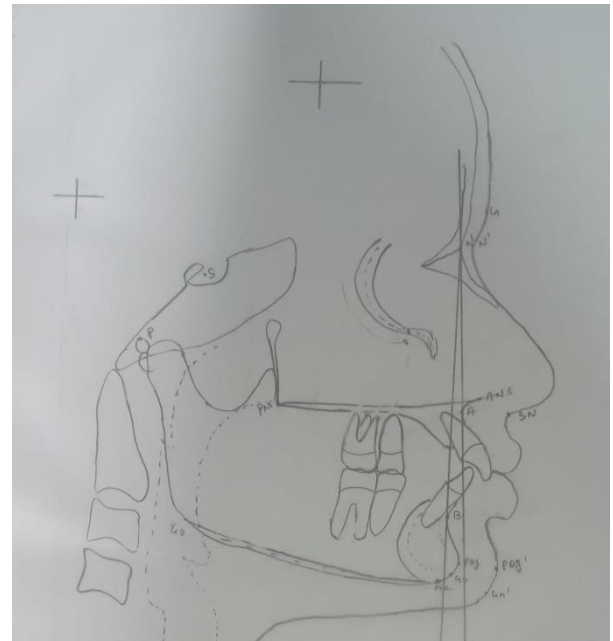
## ARMAMENTARIUM:-

Knife, Lipstick, Lipstick brush, Dappen dish, Cotton ball, Cellophane tape strips.

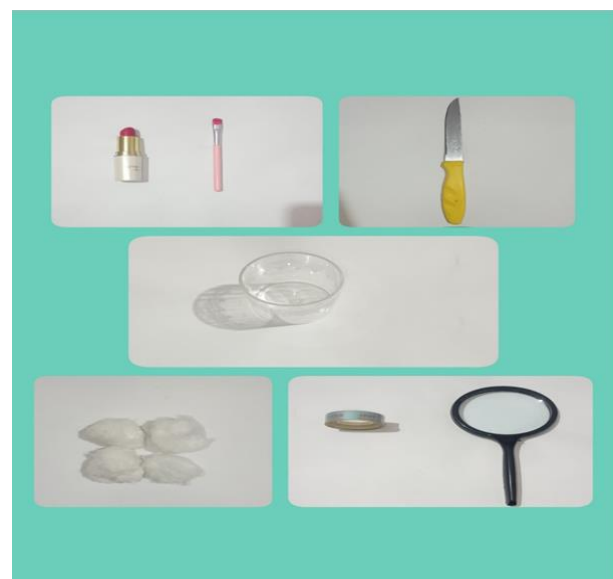
Sample Size-Thirty Two

Digital soft copies of the lateral cephalograms of all Thirty Two participants were obtained For classification,

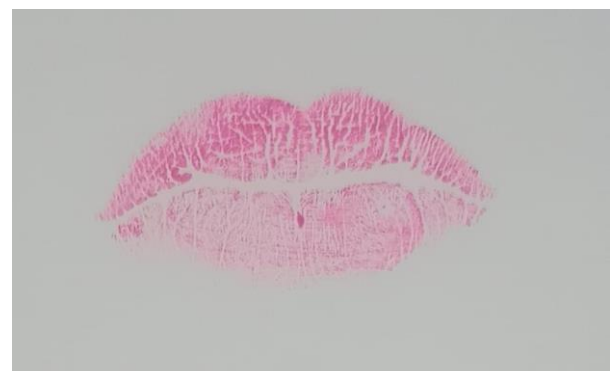
Lip prints for all the participants were recorded on white-colored photo (glossy) papers with their name, age, sex, and type of skeletal pattern using lipstick-paper method.



**Fig :-1 ANB ANGLE**



**Fig: 2 ARMAMENTARIUM**



**Fig: 3 LIP PRINT**

## RESULTS

The obtained data were tabulated and subjected to statistical analysis using software SPSS 17.0 version. Means and standard deviation were found and Chi- square test was considered for statistical comparisons.

**Table 1 - Prevalence and comparison of type of lip print pattern in different malocclusion groups on the basis of gender (n=32)**

GENDER				LIP TYPES						Chi-Square Tests	p-value
				TYPE 1	TYPE 1'	TYPE 2	TYPE 3	TYPE 4	Total		
MALE	MALOCCLUSION	CLASS I	No. of participants	1	1		1		3	3.178*	0.079
			% within MALOCCLUSION	33.3%	33.3%		33.3%		100.0%		
			% within LIP	20.0%	33.3%		33.3%		27.3%		
			% of Total	9.1%	9.1%		9.1%		27.3%		
		CLASS III	No. of participants	3	1		0		4		
			% within MALOCCLUSION	75.0%	25.0%		0.0%		100.0%		
			% within LIP	60.0%	33.3%		0.0%		36.4%		
			% of Total	27.3%	9.1%		0.0%		36.4%		
		CLASS II DIV 1	No. of participants	1	1		2		4		
			% within MALOCCLUSION	25.0%	25.0%		50.0%		100.0%		
			% within LIP	20.0%	33.3%		66.7%		36.4%		
			% of Total	9.1%	9.1%		18.2%		36.4%		
		Total	No. of participants	5	3		3		11		
			% within MALOCCLUSION	45.5%	27.3%		27.3%		100.0%		
			% within LIP	100.0%	100.0%		100.0%		100.0%		
			% of Total	45.5%	27.3%		27.3%		100.0%		
FEMALE	MALOCCLUSION	CLASS I	No. of participants	3	3	4	1	0	11	18.383*	0.105
			% within MALOCCLUSION	27.3%	27.3%	36.4%	9.1%	0.0%	100.0%		
			% within LIP								
			% of Total								

		CLASS III	% within LIP	75.0%	33.3%	80.0%	50.0%	0.0%	52.4%	21.079*	0.049
			% of Total	14.3%	14.3%	19.0%	4.8%	0.0%	52.4%		
			No. of participants	1	0	1	0	1	3		
			% within MALOCCLUSION	33.3%	0.0%	33.3%	0.0%	33.3%	100.0%		
		CLASS II DIV 1	% within LIP	25.0%	0.0%	25.0%	0.0%	100.0%	14.3%		
			% of Total	4.8%	0.0%	4.8%	0.0%	4.8%	14.3%		
			No. of participants	0	2	0	1	0	3		
			% within MALOCCLUSION	0.0%	66.7%	0.0%	33.3%	0.0%	100.0%		
		CLASS II DIV 2	% within LIP	0.0%	22.2%	0.0%	50.0%	0.0%	14.3%		
			% of Total	0.0%	9.5%	0.0%	4.8%	0.0%	14.3%		
			No. of participants	0	4	0	0	0	4		
			% within MALOCCLUSION	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%		
Total	MALOCCLUSION	CLASS I	% within LIP	0.0%	44.4%	0.0%	0.0%	0.0%	19.0%		
			% of Total	0.0%	19.0%	0.0%	0.0%	0.0%	19.0%		
			No. of participants	4	0	0	2	1	7		
			% within MALOCCLUSION	19.0%	42.9%	23.8%	9.5%	4.8%	100.0%		
		CLASS III	% within LIP	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		
			% of Total	19.0%	42.9%	23.8%	9.5%	4.8%	100.0%		
			No. of participants	4	4	4	2	0	14		
			% within MALOCCLUSION	28.6%	28.6%	28.6%	14.3%	0.0%	100.0%		
		CLASS II	% within LIP	44.4%	33.3%	60.0%	40.0%	0.0%	43.8%		
			% of Total	12.5%	12.5%	12.5%	6.2%	0.0%	43.8%		
			No. of participants	4	1	1	0	1	7		
			% within MALOCCLUSION	57.1%	14.3%	14.3%	0.0%	14.3%	100.0%		
		Total	% within LIP	44.4%	8.3%	25.0%	0.0%	100.0%	21.9%		
			% of Total	12.5%	3.1%	3.1%	0.0%	3.1%	21.9%		

Total	CLASS II DIV 1	No. of participants	1	3	0	3	0	7
		% within MALOCCLUSION	14.3%	42.9%	0.0%	42.9%	0.0%	100.0%
		% within LIP	11.1%	25.0%	0.0%	60.0%	0.0%	21.9%
		% of Total	3.1%	9.4%	0.0%	9.4%	0.0%	21.9%
	CLASS II DIV 2	No. of participants	0	4	0	0	0	4
		% within MALOCCLUSION	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
		% within LIP	0.0%	33.3%	0.0%	0.0%	0.0%	12.5%
		% of Total	0.0%	12.5%	0.0%	0.0%	0.0%	12.5%
	Total	No. of participants	9	12	5	5	1	32
		% within MALOCCLUSION	28.1%	37.0%	15.6%	15.6%	3.1%	100.0%
		% within LIP	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	28.1%	37.5%	15.6%	15.6%	3.1%	100.0%

\*P<0.05 significant  
As shown in table 1 when we compare with gender there were no significant but as a total number of participants there were statically significant.

**Table 2 - Prevalence and comparison of type of lip print pattern in different malocclusion groups**

		MALOCCLUSION				Total	Chi-Square Tests	p-value
		CLASS I	CLASS II	CLASS II DIV 1	CLASS II DIV 2			
LIP	TYPE 1	No. of participants	4	4	1	9	21.079*	0.049
		% within LIP	44.4%	44.4%	11.1%	100.0%		
		% within MALOCCLUSION	28.6%	57.1%	14.3%	28.1%		
		% of Total	12.5%	12.5%	3.1%	28.1%		
	TYPE 1'	No. of participants	4	1	3	8		
		% within LIP	33.3%	8.3%	25.0%	33.3%		
		% within MALOCCLUSION	28.6%	14.3%	42.9%	37.5%		
		% of Total	12.5%	3.1%	9.4%	37.5%		
	TYPE 2	No. of participants	4	1	0	5		
		% within LIP	80.0%	20.0%	0.0%	100.0%		
		% within MALOCCLUSION	28.6%	14.3%	0.0%	15.6%		
		% of Total	12.5%	3.1%	0.0%	15.6%		

Total	TYPE 1	No. of participants	2	0	3	0	5
		% within LIP	40.0%	0.0%	60.0%	0.0%	100.0%
		% within MALOCCLUSION	14.3%	0.0%	42.9%	0.0%	15.6%
		% of Total	6.2%	0.0%	9.4%	0.0%	15.6%
	TYPE 4	No. of participants	0	1	0	0	1
		% within LIP	0.0%	100.0%	0.0%	0.0%	100.0%
		% within MALOCCLUSION	0.0%	14.3%	0.0%	0.0%	3.1%
		% of Total	0.0%	3.1%	0.0%	0.0%	3.1%
	Total	No. of participants	14	7	7	4	32
		% within LIP	43.8%	21.9%	21.9%	12.5%	100.0%
		% within MALOCCLUSION	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	43.8%	21.9%	21.9%	12.5%	100.0%

\*P<0.05 significant  
Table 2 shows that partial vertical groove (PVG) lip pattern was most prevalent for all the groups. In skeletal Class I, PVG lip pattern was most prevalent, whereas in skeletal Class II Division 1, intersecting groove, in skeletal Class II Division 2, PVG, and in skeletal Class III, complete vertical groove were prevalent. The difference between the four malocclusion groups of each type of lip print was significant.

## DISCUSSION

Lip patterns, being analogous to the fingerprints found in the palms and digits, gained popularity for personal identification in the field of forensic medicines. Any factor that tends to affect the development of a particular structure will ultimately affect all the other structures that develop along with it. Hence, there is a possibility for the developmental changes that occur in relation to alveolus to be reflected in the cheiloscopy pattern.

Lip patterns are unique to each individual, and the uniqueness of patterns depends on the way the lip muscles relax to produce a particular pattern. Thus, they play a very important role in forensic identification.

Hirth et al<sup>7</sup>. observed that the lip grooves might be influenced by hereditary factors. King et al<sup>8</sup>., found that there is a fundamental genetic control of craniofacial form.

The lip, alveolus, and palate develop completely during the first 6–12 weeks of gestation. It is known that any factor active during the time period of genetic expression is bound to affect all structures developing at that time. Therefore,

extrinsic factors that cause malocclusions at the time of development should also affect the lip print patterns.

Kulkarni et al<sup>9</sup> assessed 90 subjects to find a correlation between sagittal skeletal jaw relation and lip prints. The patients were categorized into skeletal class I, class II, and class III. Lip prints obtained were analyzed. It was concluded that a significant difference was observed in the lip print pattern and the quadrants of upper and lower lips.




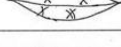

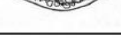
Raghav et al<sup>1</sup> evaluated the correlation between lip prints and different skeletal malocclusions. The prevalence of vertical lip patterns was significantly higher in subjects having skeletal class III malocclusion.

During investigation of several cases of disasters or death due to unnatural reasons, it becomes important to determine and identify the deceased or criminal. Though there are several more commonly used methods to compare the previously recorded database of the person with currently available anthropometric records, lip print records have also got its place in investigating cases. Though it's a useful technique, its practical use has remained uncommon. After the study on a large number of patients and coming up with a classification system pertaining to different types of lip prints from Suzuki and Tsuchihashi there was a surge to validate their observation. Literature reported from different continents have equivocal results.

Type I – Complete Vertical pattern was found to be the most common one, in males, females and overall. There is enormous variation in this finding in literature reported before. Shilpa Patel et al<sup>10</sup> studied 100 subjects in the age group of 18-24 years and found Type 1- Complete vertical to be the most common pattern in males. Type II – Bifurcation type was the most common in females and overall. Nisha Kaul et al<sup>11</sup> conducted similar study at 200 subjects with the similar conclusion to our study mentioning Type 1- complete vertical to be the commonest lip pattern. Basheer S et al<sup>12</sup> studied a larger group of 800 subjects and concluded that type II - Bifurcation was predominant in males, Type - IV Reticular – in females and Type I – Complete vertical, in overall population. Verma et al<sup>13</sup> studied 208 subjects and found type II - Bifurcation to be the commonest in males and females.

Within the limitation of this study (small sample size), it can be stated that the prevalence of type of lip pattern was different in different groups of skeletal malocclusion. The consideration of

skeletal malocclusion as Class II Division 1 and Division 2 will help in sorting out participants in more reliable manner in cases of mass disaster or criminal investigations. Lip print pattern can also be recorded for each patient and saved in his personal database for personal identification. As lip print pattern develops early in our life, the type of malocclusion can also be predicted beforehand for the successful execution of Preventive and interceptive orthodontic procedures.

Types of Lip Prints	
Type I Complete vertical grooves (CVG)	
Type I Partial vertical grooves (PVG)	
Type II Forked grooves (FG)	
Type III Intersecting grooves (IG)	
Type IV Reticular grooves (RG)	
Type V Undetermined grooves (XG)	

**Fig: 4 Different types of lip print pattern observed in the study**

## CONCLUSION

Partial Vertical Grooves (PVG) was most prevalent for all the groups and Type II forked groove (FG) was least prevalent for all the groups. Partial Vertical Grooves (PVG) was most prevalent in skeletal Class I malocclusion and Class II Division 2 malocclusion. Type III Intersecting Grooves (IG) was most prevalent in skeletal Class II Division 1 malocclusion. Complete Vertical Grooves (CVG) was most prevalent in skeletal Class III malocclusion.

**Conflict of Interest:** None.

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# Assessment of changes in facial profile following Orthodontic Treatment with Extraction - A Cephalometric Appraisal

## Abstract

**OBJECTIVE:** To compare the soft tissue profile changes of patients treated with extraction of four premolars of males and females in Mithilanchal population of Bihar.

**MATERIALS AND METHODS:**Thirty subjects visited the OPD of department of Orthodontics and Dentofacial Orthopedics and the department of Oral medicine and Radiology at MithilaMinority Dental College and Hospital, Darbhanga with angles class I bimaxillary protrusion were selected and their lateral cephalograms was collected for this study. Mean value of each variable were calculated and compared between male and female groups.The ethical clearance was taken from the ethical committee of Mithila Minority Dental College and Hospital, Darbhanga.

**RESULTS:**The mean value of the kplmogorov-simrov test and Shapiro test was found to be statistically significant. In the present study an attempt has been made to quantify the soft tissue profile using pre and post treatment lateral cephalogram of bi-maxillary protrusion. all the patients underwent extraction of four first premolars and uniform treatment mechanics. The patients profile was improved,with the reduction in lip procumbancy,decreased in lip eversion and protrusion .

**CONCLUSION:** There was a reduction of the convexity of the face as a result of the retraction of the anterior teeth and the simultaneous retraction of lips . Improvement of facial esthetic was brought about by the combined effect of the changes in the dental and soft tissues resulting a more balanced profile and an esthetically pleasing smile .

**KEY WORDS:**Angles class I Bimaxillary protrusion; Lip protrusion ; Facial profile ; Mithilanchal .

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## INTRODUCTION

Nowadays, there is a greater demand for orthodontic therapy. Aside from the fact that orthodontics treats both functional and aesthetic issues, most, if not all, patients seek orthodontic treatment for aesthetic reasons.<sup>1</sup> Facial aesthetics is a well-known feature that can have a beneficial effect on interpersonal interactions and self-esteem.



The increasing desire for this aesthetic ideal in modern culture has emphasised the need of addressing facial harmony as an orthodontic treatment goal, in addition to a stable functional occlusion. There is still some debate about the relationship of the skeletal structures and their soft tissue covering.<sup>2</sup>

A balanced soft tissue profile is a desired treatment objective in orthodontics. So, precise focus should be on Orthodontic diagnosis and treatment plan which consider the soft tissue profile of the patient and must take account of the perspectives of orthodontic alterations based on soft tissue analysis. Although we are not able to change the position of the nose and chin with orthodontic treatment alone, changing the position of the incisors can influence lip profile.<sup>3-10</sup>

Therefore, the aesthetic line, which assesses the location of the lips in relation to the nose and chin, is frequently used to evaluate the profile.<sup>2</sup> Dental extraction is occasionally advised in the context of orthodontic therapy to gain room for straightening crowded teeth as well as to conceal modest skeletal malocclusion.<sup>5</sup> So, Orthodontists have long recognized that the extraction of premolars often is accompanied by changes in the soft-tissue profile.<sup>11</sup>

The objectives of this study are to quantify the profile changes occurring in a diverse sample of orthodontic patients treated with extraction of four first premolars, to evaluate the esthetic consequences of these changes, and to compare these results among patients treated with different appliances or techniques.

All the patients underwent extraction of four first premolars and uniform treatment mechanics (in the present study, orthodontic correction of Bimaxillary Protrusion resulted in favorable soft tissue changes with straightening of the facial profile and improvement in lips posture).

## MATERIALS AND METHOD

Thirty subjects visited 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 will be selected and their lateral cephalograms will be collected for this study. The

ethical clearance will be taken from the ethical committee of Mithila Minority Dental College and Hospital, Darbhanga.

Pre- and posttreatment lateral cephalometric radiographs of 30 orthodontic patients were analyzed. All patients were treated with pre adjusted edgewise appliances, extraction of maxillary first premolars and extraction of mandibular first or second pre-molars. The decision whether to extract mandibular first or second premolars was based on an evaluation of mandibular crowding, cephalometric position of the mandibular incisors, and an evaluation of the soft tissue profile. The average treatment time was 32 months.

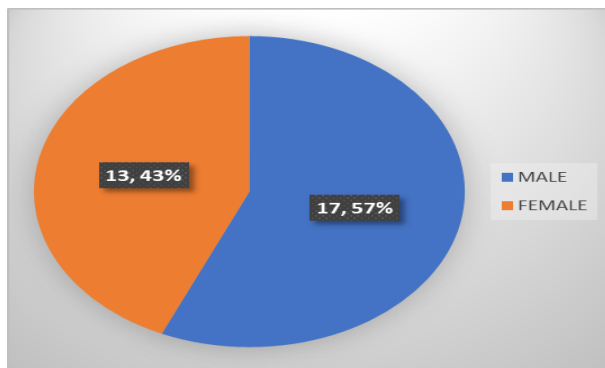
## SOFT TISSUE MEASUREMENTS :-

1. NLA (°)
2. MLA (°)
3. A-E Line (mm)
4. Ls-E line (mm)
5. Li-E line (mm)
6. B-E line (mm)
7. UL-Sn- Pog line (mm)
8. LL-Sn- Pog line (mm)
9. Sn-Me line (mm)
10. Sn-St line (mm)
11. St-Me line (mm)

Finally, a comparison would be statistically made based on these parameters .

## RESULTS

<b><u>No of patients (n=30)</u></b>	
<b><u>Gender</u></b>	
<b><u>No. of males</u></b>	<b><u>n=17</u></b>
<b><u>No. of females</u></b>	<b><u>n=13</u></b>



**Fig1:-Pie chart**

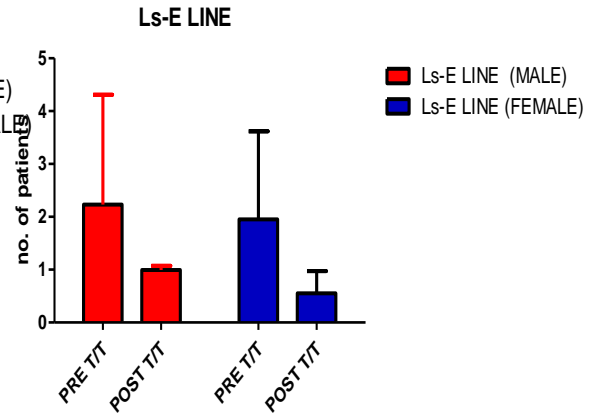
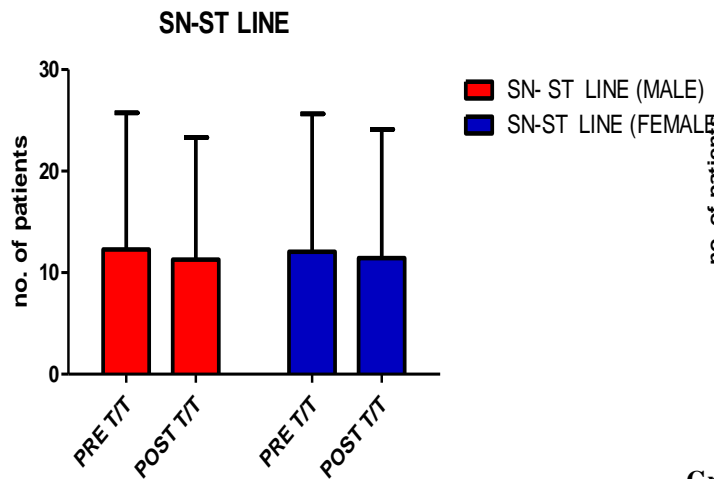
**Note :-** The data calculated as mean  $\pm$  standard deviation is found clinically significant. The p-value obtained was also significant.

Data was entered in spreadsheets of Microsoft excel version 2021. The statistical analysis carried out using appropriate statistical software-statistical package for social sciences (SPSS version 27.0) and graph pad (version 9.0.3 and version 5). Normal distribution of the data was checked by applying kplmogorov-simrov test and Shapiro wilk test. For normally distributed continuous variable, data was represented as mean and SD. For normally distributed variables, independent t test was applied for statistical analysis. A p-value  $<0.05$  was considered as statistically significant. The data obtained shows clinically significant but statistically non-significant because of less sample size.

Parameters	Time frame	Gender						p- value
		Male			Female			
		N	Mean value	Std. Deviation	N	Mean value	Std. Deviation	
NLA	Pre	17	85.14	6.72	13	87.33	5.27	
	Post	17	82.24	5.34	13	85.23	4.99	0.05
A-E line	Pre	17	4.92	0.73	13	4.95	0.74	
	Post	17	3.97	0.53	13	3.77	0.48	0.04
Ls-E line	Pre	17	3.7	0.76	13	3.13	0.77	
	Post	17	1.45	0.32	13	1.23	0.34	0.05
Li – E line	Pre	17	3.42	2.63	13	3.14	0.93	
	Post	17	2.56	0.71	13	2.69	0.47	0.03
B- E Line	Pre	17	4.5	0.63	13	4.3	0.82	
	Post	17	3.87	0.54	13	3.67	0.53	0.04
UL-SN POG Line	Pre	17	4.6	0.45	13	4.36	0.39	
	Post	17	3.21	0.50	13	2.88	0.65	0.05
LL- SN POG Line	Pre	17	3.85	0.69	13	3.25	0.38	
	Post	17	2.11	0.80	13	2.0	0.84	0.04
SN-ME Line	Pre	17	55.2	3.19	13	54.16	1.34	
	Post	17	51.23	2.89	13	52.78	1.39	0.06
ST- ME Line	Pre	17	30.42	4.07	13	29.83	4.29	
	Post	17	27.77	3.98	13	27.87	4.32	0.05
SN-ST Line	Pre	17	21.8	2.79	13	21.66	2.49	
	Post	17	19.8	1.99	13	19.78	1.98	0.04

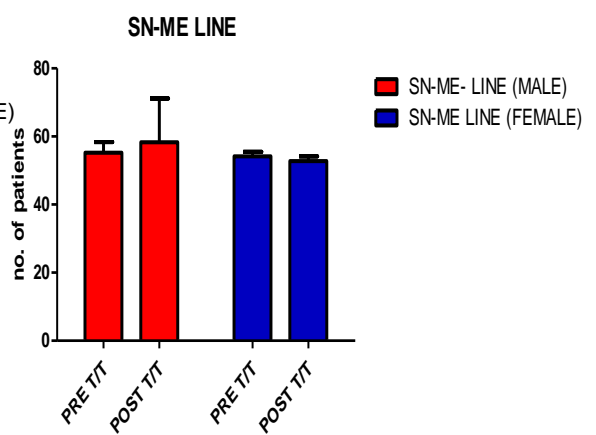
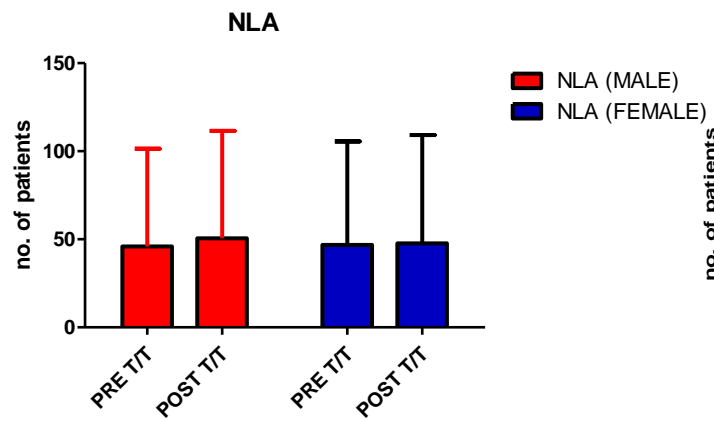
**Table 1 :- Independent t-test**





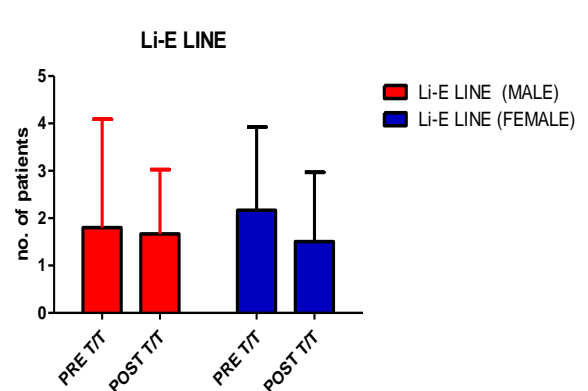
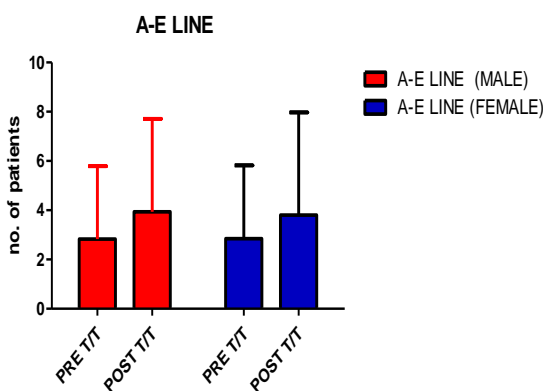
Graph:-4

Graph:-1



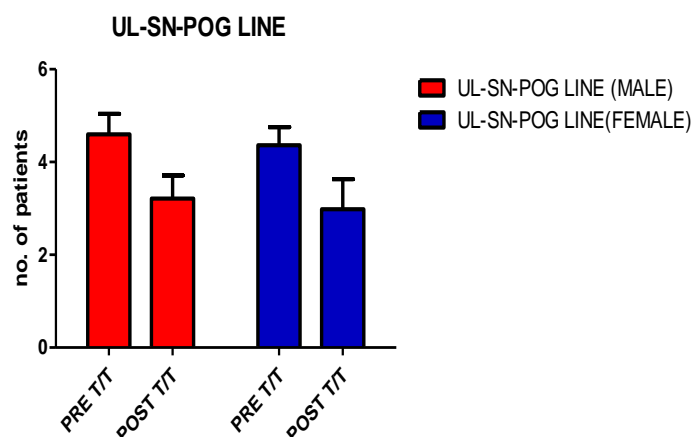
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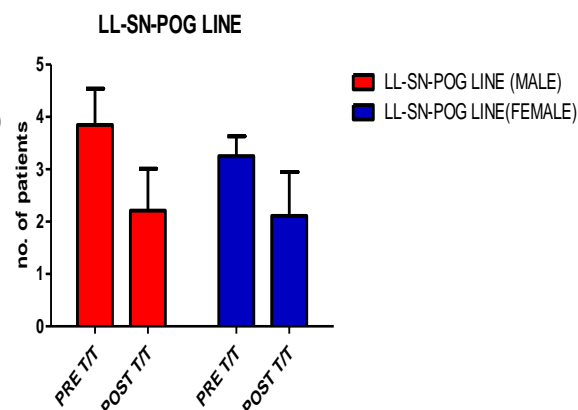


Graph:-3

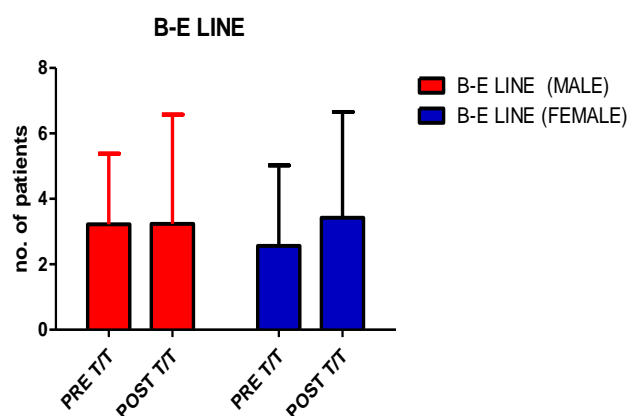
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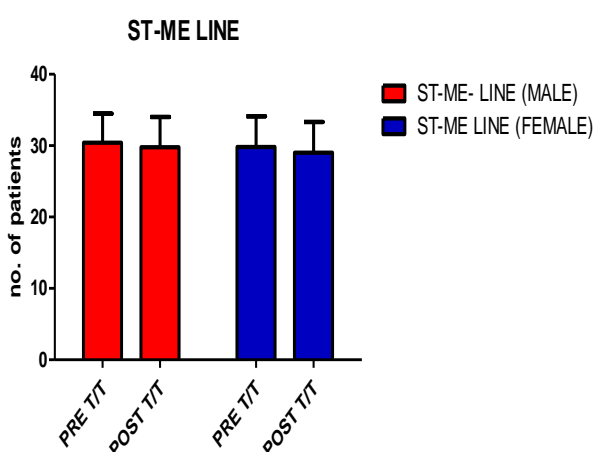
Graph:-7



Graph:-10



Graph:-8



Graph:-9

## DISCUSSION

Careful selection of patients substantially reduced many of the variables which may have adversely affected the results of earlier studies. Unfortunately, this careful selection also reduced the size of the sample. In an attempt to reduce the effects of the remaining growth during and after treatment as well as possible differences between sexes,<sup>8,16</sup> the sample was limited to female patients, mean age of 13 years 6 months, who already had experienced their first menstruation before the start of treatment. Subtelny<sup>26</sup> and Vig and Cohen<sup>27</sup> have reported that changes take place in the soft tissue profile with normal growth during early adolescence, nevertheless by the onset of menstruation the growth spurt is considered all but complete.<sup>33</sup> One of the major objections that could be posed to the conclusions drawn from a small sample is the lack of power of the statistical tests, when these tests are applied to small size samples.

There are few studies with which the present results can be compared. Most investigations of changes in facial profile during orthodontic treatment have been concerned with the predictive relationship between incisor retraction and lip position. Some that do provide specific data on profile changes combine extraction and non-extraction cases,<sup>4,21</sup> or do not even mention at all if extractions are performed.<sup>18</sup> Finally, the method used in other studies<sup>9,16</sup> to measure the changes in the soft tissue landmarks (system of coordinates) leads to results that are not directly comparable to our results (gleaned from angular measurements and linear measurements from soft tissue landmarks to lines of reference).

Finnoy, Wisth and Boe<sup>2</sup> evaluated profile changes in 30 Class II, division I cases treated with an edgewise appliance after extraction of four premolars. They found mean changes of 6.5° for the nasolabial angle, -2.4 mm for the Ss to E line, -3.3 mm for Ls to E line, -2.5 mm for Li to E line, and 1.3 mm for Si to E line. Drobocky and Smith<sup>3</sup> evaluated profile change in 160 cases, between 10 and 30 years of age at the start of treatment, who were treated with removal of four first premolars. Their sample was composed of five different treatment subgroups. The mean changes reported from the subgroup treated with an edgewise appliance in northern California (23 patients) were: 3.58° for the nasolabial angle, -0.64 for the labiomental angle, -2.60 mm for the Ss to E line, -2.84 mm for Ls to E line, -3.32 mm for Li to E line, -2.10 mm for Si to E line, -1.70 mm for the protrusion of the upper lip to Sn-Pg', and -2.62 mm for the protrusion of the lower lip to Sn-Pg'. The changes reported by these two papers are relatively close to the respective values reported by us.

Battagel<sup>4</sup> evaluated changes in soft tissue profile of 30 patients with a mean age of 12.7 at the start of treatment. These cases were treated with edgewise mechanics and the extraction of upper first premolars. Extractions in the lower arch were performed where necessary to relieve crowding. The mean changes reported were: 9.31° for the nasolabial angle, 3.19° for the labiomental angle, 4.42 mm for the Ls to E line, and -2.39 mm for Li to E line. Clearly, the mean angular changes mentioned above are greater than ours, although the nasolabial angle and the labiomental angle were the two measurements in our sample with greater individual variability.

In the present study an attempt has been made to quantify the soft tissue profile using pre and post treatment lateral cephalogram of bi-maxillary protrusion in Mithilanchal population. This study has determined the angular and linear soft tissue measurement of a sample of adult Mithilanchal male and female subjects. Two angular measurement and Nine linear measurements that describe various aspect of the soft tissue profile were evaluated and compared.

Syed Zameer Khurshid et al 2015; in his study on Soft Tissue Changes Associated with First Premolar Extractions in Kashmir Female Population shows a comparative resemblance to

our study which shows, there is a reduction of the convexity of the face as a result of retraction of the anterior teeth and the simultaneous retraction of lips. Improvement of facial esthetic was brought about by the combined effect of the changes in the dental and soft tissues resulting a more balanced profile and an esthetically pleasing smile. The patients profile was improved, with the reduction in lip Protrusion, decreased in lip eversion and protrusion. These differences should be considered when formulating an orthodontic diagnosis and treatment plan for patients of varying ethnic backgrounds.

## CONCLUSION

One of the most important aspects of orthodontic diagnosis and treatment planning is the evaluation of the patient's soft tissue profile, which is very important from the point of view of both the patient and the orthodontist. Orthodontic diagnosis and treatment planning must consider soft tissues profile from the patient's point of view and must consider the perspectives of orthodontic changes based on soft tissue analysis. In order to achieve high patient satisfaction after orthodontic treatment, it is important that dental and facial aesthetic defects are correctly identified at the beginning of treatment. To identify these defects, the orthodontist must understand the appropriate aesthetic standards.

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# Knowledge, Attitudes and Awareness of Clinical Establishment Act Among Dental Health Professionals in Dhule, Maharashtra, India - A Cross Sectional Survey

## Abstract

### Objectives:

1. To Assess knowledge, attitude and awareness towards the Clinical Establishment Act, 2010, among dental health professionals, practising at Dhule, Maharashtra State, India.

2. To compare the knowledge, attitude and awareness towards the Clinical Establishment Act, 2010, between general dental practitioners and specialty dental professionals.

### Materials & Methods:

After approval from the Institutional Ethics Committee, a structured and self-administered questionnaire consisting of 15 close-ended questions was prepared and tested by conducting a pilot study. The validity and reliability of the questionnaire was obtained by giving the questionnaire to subject matter experts. The required changes were made and subsequently, the questionnaire was finalised. The list of dental practitioners in Dhule city was obtained by the local branch of the Indian Dental Association. Male: Female ratio was 1:1.1. with 99 BDS practitioners and 57 Specialty (MDS) Dental professionals or students. The information was collected to assess the knowledge, attitude and practices of the dental professionals towards the Clinical Establishment Act, 2010 and the data obtained was summarised, tabulated and analysed using Chi-square test.

### Results:

Overall results indicated a negative result with regards to knowledge and attitude; but a positive result with regards to behaviour among dental professionals towards the Clinical Establishment Act, 2010.

### Conclusion:

Dental professionals, alike the Medical professionals are healthcare service providers and thus come under the ambit of the Clinical Establishment Act. It is imperative and inevitable, that they be trained and motivated to keep themselves updated regarding the minimum standards of dental practice as mandated by the legislation.

**Key Words:** Clinical Establishment Act, Dental Health professionals, Dental Practice.

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## INTRODUCTION

India accounts for a substantial part of the global burden of disease, with 18% of global deaths and 20% disability-adjusted life-years (DALYs).

While the growing burden of chronic disease accounts for 53% of deaths (44% of DALYs), 36% of deaths (42% of DALYs) are attributable to communicable diseases, maternal and perinatal conditions, and nutritional deficiencies suggesting a protracted epidemiological transition.<sup>2</sup> One-fifth of maternal deaths and one-quarter of child deaths in the world occur in India.<sup>3,4</sup> Life expectancy at birth is 63 years for males and 66 for females, and

the under-5 mortality rate of 69 per 1000 births in India falls behind the South-East Asia regional average.

5 The above statistics, however, mask the marked variation in the distribution of health within India. While health outcomes have improved over time, they continue to be strongly patterned along dimensions such as gender, caste, wealth, education, and geography.<sup>6–8</sup> For example, the infant mortality rate among the poorest and richest wealth quintiles was 82 and 34 per 1000 births in 2005–6, respectively.<sup>9</sup> Similarly, the under-5 mortality rate among mothers with no education compared to those with secondary or higher education was 106 and 49 per 1000 births, respectively. As shown in Figure 2, typically the state variation in under-five mortality tends to be largely patterned along the level of state economic development. Substantial geographic inequalities in health outcomes in India, with life expectancy ranging between 56 years in Madhya Pradesh to 74 years in Kerala; a difference of 18 years, which is higher than the provincial differences in life expectancy in China,<sup>10</sup> or the inter-state differences in the United States.<sup>11</sup>

Many of these health inequalities result from a broad set of social, economic, and political conditions which influence the level and distribution of health within a population. Addressing these structural factors which constitute the social determinants of health, is important as some of these health inequalities may represent health inequities that result from the unjust distribution of primary social goods, power and resources.<sup>12,13</sup> Redressing any inequities in health can be considered a primary goal of public policies, with health systems having a specific and special role in achieving equity, alongside efficiency, in the distribution of health in a population and the exposure and vulnerability to ill-health.<sup>14–16</sup>

Equity in health and equity in health care have been a longstanding guiding principles, with commitment to the serving the needs of the poor and underprivileged being central to health policy documents. The ‘Health Survey and Development Committee Report’ of 1946 led by Sir Joseph Bhore set out a detailed vision and plan for providing universal coverage to the population through a government-led health service.<sup>17</sup> Since then, health policies and priorities have been outlined in the “Five Year Plans”, developed as a part of India’s centralized planning and development strategy. The first official National Health Policy, put forward in 1983, reiterated the need for universal comprehensive care.<sup>18</sup> Influenced by the Alma Ata declaration, the policy emphasized the primary health care approach, in

addition to recommending decentralization of the health system, improved community participation, and expansion of the private sector to reduce the burden on the public sector. While the next National Health Policy of 2002 continued to champion India’s vision, this was to be carried out on the “basis of realistic considerations of capacity”.<sup>19</sup> More recently, in 2009, the Government of India drafted a National Health Bill proposing the legal framework to recognize the ‘right to health and ‘right to health care’ with a stated recognition to address the underlying social determinants of health.<sup>20</sup> However, implementing policy commitments to equity in health care remains a challenge given India’s institutional and implementation capabilities,<sup>21</sup> even though this is a challenge facing the global health community, and not unique to India.<sup>22</sup>

For many observers, the period of 2012 - 2013 is the year of global economic slowdown and political uncertainty. Several policies directions rolled out during these years are likely to impact the health status of the people of India in the decades to come. Providing healthcare for a billion plus population has always been considered an impossible task for a developing country like India.<sup>23</sup> India has been spending just about 1.2% of her gross domestic product (GDP) on the health sector, perhaps the lowest in the world. In the 12th Five Year Plan (2012-17)<sup>24</sup>, the government has proposed a significant increase in the spending on healthcare. For the first time in the history of Republic of India, a basic framework of Universal Health Coverage (UHC) has been proposed. Although the exact modality for delivery of the UHC is being discussed and debated on various forums, it is likely to take concrete shape over the next decade.<sup>25</sup>

Healthcare is an essential commodity. Rapidly changing demographic trends, spiralling population base, increasing affordability with rising income, have further contributed to the escalation in the need, for “good quality” healthcare.<sup>26</sup> Many countries are exploring various means and methods to improve the quality of health care services.

In India the quality of services provided to the population by both public and private sectors remains largely an unaddressed issue. The current structure of the health care delivery system does not provide enough incentives for improvement in efficiency. Mechanisms used in other countries to produce greater efficiency, accountability, and more responsible governance in hospitals are not yet deployed in India. The for-profit private sector accounts for a substantial proportion of health care in India (50% of inpatient care and 60-70% of outpatient care), but



has received relatively less attention from the policy makers as compared to the public sector.

Thus the private sector health care delivery system in India has remained largely fragmented and uncontrolled, and there is a clear evidence of deficiencies in the quality of care. Problems may range from inadequate and inappropriate treatments, excessive use of higher technologies, and wasting of scarce resources, to serious problems of medical malpractice and negligence.

The foremost concept of Regulation in Clinical Establishments is legislation or imposition of legal restrictions or controls, where participants must conform to legislated requirements. The clinical Establishment bill is a step in same direction, making it mandatory for each and every clinical establishment including every individual clinic, consulting chamber, nursing homes, hospitals, laboratory or any other investigative or treatment place, by whatever name it may be called to be registered and follow minimum standards of setup.

Essentially, the elements of any regulatory process include establishment of rules, its application to specific cases, detection or monitoring of violations and imposition of penalties on violators.<sup>27</sup>

This study aims to study one such legislation that was brought in to bring a uniformity in the health care services being delivered across the country.

## AIM AND OBJECTIVES

**Aim:** To assess knowledge, attitude and awareness towards the Clinical Establishment Act, 2010 among dental health professionals practicing at Dhule, Maharashtra, India.

**Objectives:** To assess knowledge, attitude and awareness towards the Clinical Establishment Act, 2010 among dental health professionals.

To compare the knowledge, attitude and awareness towards the Clinical Establishment Act, 2010 among dental health professionals within general practice and specialty [B.D.S vs. M.D.S]

## MATERIALS AND METHODS

The present study is a cross-sectional study directed at Dentists across Dhule city.

**Ethical Clearance:** Prior to the start of the study, a protocol of the intended study was submitted to the Ethical Review Committee, ACPM Dental College & Hospital, Dhule and ethical clearance for the present study was obtained. Purpose of the

present study was told to every participant and written informed consent was taken from each participant.

**Sampling Technique:** The present study is based on convenience sampling technique where participants were selected on the basis of their convenient accessibility and proximity to the researcher.

**Preparation of Questionnaire:** After the approval from the Ethical Review Committee a structured and self-administered questionnaire consisting of 15 closed ended questions was prepared and tested by a pilot study. The validity and reliability of the questionnaire was obtained by giving that questionnaire to subject matter experts. The required changes were made then, questionnaire was finalized. The list of dentists of Dhule city was obtained from IDA (Indian Dental Association) Dhule branch. Male female ratio was 1:1.1 . with 99 BDS and MDS dentists of them 57 were staff of dental college. The information was collected to assess the knowledge, attitude and practices of dental practitioners towards the Clinical Establishment Act, 2010.

### Inclusion Criteria:

- i. Participants those who were willing to participate in the present study.
- ii. Participants who filled the entire questionnaire.
- iii. Participants or Dentists practicing in Dhule city.

### Exclusion Criteria:

- i. Participants those who were not willing to participate in the present study.
- ii. Participants who did not fill the entire questionnaire.
- iii. Participants or Dentists not practicing in Dhule city.

**Duration:** The present study was conducted over a period of one week.

**Administration of Questionnaire:** The questionnaire was administered to dentists in the form of hard copy of it and given enough time to complete it.

**Administration of Questionnaire:** The questionnaire was administered to dentists in the



form of hard copy of it and given enough time to complete it.

**Statistical Analysis:** The collected data was tabulated in Microsoft excel and subjected to statistical analysis using Statistical Package for Social Sciences (SPSS- Version 16).

## RESULTS

### Educational Qualification Group Distribution:

Out of 156 dentists participated in the study, 63.5% or 99 were B.D.S or graduate dental practitioners whereas the 36.5% or 99 were postgraduate or M.D.S dental practitioners.

**Dentists' Awareness about Clinical Establishment Act:** The awareness about the Clinical Establishment Act. It shows that 66.7% of the BDS practitioners were aware of the Act previously of have read literature on the same, whereas 33.3% of the BDS general practitioners were not previously aware of this Act. In specialists or Post Graduate Dental Practitioners, 57.9% of the specialist were not aware of this Act previously whereas 42.1 % of the specialists were aware of the Act or had read literature related to the Act previously.

Table No 1: Dentists (n=156) Awareness about Clinical Establishment Act

Groups	Responses	Frequency	Percent
BDS	Yes	66	66.7
	No	33	33.3
MDS	Yes	24	42.1
	No	33	57.9

### Dentists' Awareness regarding Clinical Establishment Act being relevant to dental practitioners:

The awareness about the Clinical Establishment Act being relevant to dental practitioners. It shows that 84.8% of the BDS practitioners were aware of the fact that this Act is of paramount importance to Dental Practitioners having their own clinical establishments, whereas 15.2% of the BDS general practitioners did not know so. In specialists or Post Graduate Dental Practitioners, 57.9% of the specialist were aware

that this Act is important to practitioners whereas 42.1 % of the specialists did not know so.

Table No 2: Dentists (n=156) Awareness regarding Clinical Establishment Act being relevant to dental practitioners.

Groups	Responses	Frequency	Percent
BDS	Yes	84	84.8
	No	15	15.2
MDS	Yes	33	57.9
	No	24	42.1

### Belief that legislations like these can really bring about an improvement in the quality of health care services being delivered across the country?

Table No. 3 shows the Dentists' belief whether legislations like the Clinical Establishment Act can bring about improvement in the health care service quality being delivered across the country. While 87.9% of the BDS practitioners showed a very positive faith in this legislation, 12.1% were of the negative opinion. Following a similar trend, 73.7% of the MDS practitioners were of positive opinion for newer legislations like these whereas 26.3% of the MDS practitioners felt there is no absolute necessary of such Acts.

Table No 3: Dentists (n=156) Belief that legislations like these can really bring about an improvement in the quality of health care services being delivered across the country?

Groups	Responses	Frequency	Percent
BDS	Yes	87	87.9
	No	12	12.1
MDS	Yes	42	73.7
	No	15	26.3

### Dentists' attitude towards attending CDE programs if conducted on Medico-Legal issues such as the Clinical Establishment Act and its implications on Dental Practitioners:

Table No. 4 showed the attitude of the dental practitioners towards attending Continuing Dental Programs enlightening them regarding the Clinical Establishment Act and its provisions applicable towards dental practice. While 100% of the BDS practitioners and 89.5% of the MDS practitioners showed an enthusiastic willingness to attend such programs, 10.5% of the MDS practitioners did not feel it necessary to attend such programs..

Table No 4: Dentists' attitude towards attending CDE programs if conducted on MedicoLegal issues such as the Clinical Establishment Act and its implications on Dental Practitioners.

Groups	Responses	Frequency	Percent
BDS	Yes	99	100.0
MDS	Yes	51	89.5
	No	6	10.5

### Knowledge of dentists regarding the Clinical Establishment was passed by

Table no. 5 showed the Dentists' knowledge as to who passed the legislation of the Clinical Establishment Act. While 66.7% of the BDS practitioners and 57.9% of the MDS practitioners knew that this legislation was passed by the Hon'ble Parliament of India, 24.2% of the BDS practitioners and 19.3% of the MDS practitioners mistook that it was the Dental Council of India that passed this Act.

Table No 5: Knowledge of dentists regarding the Clinical Establishment was passed by

Groups	Responses	Frequency	Percent
BDS	DCI	24	24.2
	MCI	4	4.0
	The Parliament	66	66.7
	WHO	5	5.1
MDS	DCI	11	19.3
	MCI	9	15.8
	The Parliament	33	57.9
	WHO	4	7.0

### Knowledge of dentists regarding when was the Clinical Establishment passed

Table No. 6 showed the knowledge of the Dentists as to when was this legislation passed. 54.5% of the BDS practitioners and 21.1% of the MDS practitioners answered the question correctly that it was passed on 18th August 2010. howed the Dentists' knowledge as to who passed the legislation of the Clinical Establishment Act. While 66.7% of the BDS practitioners and 57.9% of the MDS practitioners knew that this legislation was passed by the Hon'ble Parliament of India, 24.2% of the BDS practitioners and 19.3% of the MDS practitioners mistook that it was the Dental Council of India that passed this Act.

Table No 6: Knowledge of dentists regarding when was the Clinical Establishment passed

Groups	Responses	Frequency	Percent
BDS	18 <sup>th</sup> Aug 2010	54	54.5
	3 <sup>rd</sup> May 2010	16	16.2
	3 <sup>rd</sup> Aug 2010	14	14.1
	15 <sup>th</sup> Aug 2010	15	15.2
MDS	18 <sup>th</sup> Aug 2010	12	21.1
	3 <sup>rd</sup> May 2010	9	15.8
	3 <sup>rd</sup> Aug 2010	23	40.4
	15 <sup>th</sup> Aug 2010	13	22.8

### Knowledge of Dentists' regarding the purpose or objective of the Clinical Establishment

Table No. 7 showed the knowledge of the Dentists' regarding the purpose of making and implementing this Act. Only 10.1% of the BDS practitioners and 21.1% of the MDS practitioners answered correctly as this Act was passed to bring about uniformity in the quality of Health Care delivery. However, a large number of BDS practitioners 39.4% & 22.8% of the MDS practitioners, feel that this Act was brought to bring about uniformity in the prices charged by the dentists.

Table No 7: Knowledge of Dentists' regarding the purpose or objective of the Clinical Establishment Act.

Groups	Responses	Frequency	Percent
BDS	Bring uniformity in the health care delivery	10	10.1
	Bring uniformity in prices of health care delivery	39	39.4
	Registration and inspection of clinical establishments	11	11.1
	All of the above	39	39.4
MDS	Bring uniformity in the health care delivery	12	21.1
	Registration and inspection of clinical establishments	13	22.8
	All of the above	32	56.1

### Knowledge of Dentists regarding the formation of statutory bodies under this Act.

Table No. 8 shows the Knowledge of Dentists regarding the formation of statutory bodies under the Act. 63.6% of the BDS practitioners knew the formation the National, State and District authorities

Table No 8: Knowledge of Dentists regarding the formation of statutory bodies under this

Groups	Responses	Frequency	Percent
BDS	National council	6	6.1
	National and State council	28	28.3
	National & State council & District Registration Authority	63	63.6
	None of the above	2	2.0
MDS	National and State council	29	50.9
	National & State council & District Registration Authority	28	49.1

### Knowledge of the Dentists regarding the National Council under the Clinical Establishment Act, 2010.

Table No. 9 shows the knowledge of the Dentists regarding the functions of the National Council. 98% of the BDS practitioners and 64.9% of the MDS practitioners answered correctly as 'All of the above'

Table No 9: Knowledge of the Dentists regarding the National Council under the Clinical Establishment Act, 2010.

Groups	Responses	Frequency	Percent
BDS	Compile a national register	2	2.0
	All of the above	97	98.0
MDS	Compile a national register	16	28.1
	Classify establishments into categories	2	3.5
	Develop minimum standard and their review	2	3.5
	All of the above	37	64.9

### Knowledge of the Dentists' regarding as to who constitute the National Council.

Table No. 10 shows the Dentists' knowledge as to who constitute the National Council under the Clinical Establishment Act. 87.9% of the BDS practitioners and 35.1% of the MDS practitioners answered correctly as "All of the above"

Table No 10: Knowledge of the Dentists' regarding as to who constitute the National Council.

Groups	Responses	Frequency	Percent
BDS	DGHS	1	1.0
	Representative of dental, medical, pharmacy, nursing council	11	11.1
	All of the above	87	87.9
MDS	DGHS	10	17.5
	Representative of dental, medical, pharmacy, nursing council	27	47.4
	All of the above	20	35.1

### Knowledge of the dentists' as to the functions of the State Council

Table No. 11 shows the knowledge of the Dentists regarding the State Council under the Clinical Establishment Act. 86.9% of the BDS practitioners and 47.4% of the MDS practitioners answered correctly as "All of the above"

Table No 11: Knowledge of the dentists' as to the functions of the State Council

Groups	Responses	Frequency	Percent
BDS	Compiling a state register	12	12.1
	Hearing of appeals	1	1.0
	All of the above	86	86.9
MDS	Compiling a state register	30	52.6
	All of the above	27	47.4

### Knowledge of the Dentists' regarding as to who is the chairperson of the District Regulating authority under the Clinical Establishment Acts.

Table No. 12 shows the knowledge of the dentists' as to who will the chairperson of the District regulating authority under the Clinical Establishment Act. 40.4% of the BDS practitioner and 15.8% of the MDS practitioner answered correctly as "The District Collector". 70.2% of the MDS practitioners mistook that the District Health Officer was the chairperson of the District Regulating Authority.

Table No 12: Knowledge of the Dentists' regarding as to who is the chairperson of the District Regulating authority under the Clinical Establishment Acts.

Groups	Responses	Frequency	Percent
BDS	District Collector	40	40.4
	District Health Officer	59	59.6
MDS	District Collector	9	15.8
	District Health Officer	40	70.2
	Municipal Commissioner	8	14.0

### Knowledge of dentists as to whether Can a qualified medical / dental practitioner run a clinical establishment without registering in accordance with the provisions of the Act.

Table No. 13 showed the Dentists' knowledge as to whether a qualified medical / dental practitioner run a clinical establishment without registering in accordance with the provisions of the Act. To which 75.8% of the BDS practitioners and 52.6% MDS practitioners answered correctly as 'No'. However, 14.1% of the BDS practitioners and 22.8% of the MDS practitioners were not sure.

Table No 13: Knowledge of dentists as to whether a qualified medical / dental practitioner run a clinical establishment without registering in accordance with the provisions of the Act?

Groups	Responses	Frequency	Percent
BDS	Yes	10	10.1
	No	75	75.8
	I don't know	14	14.1
MDS	Yes	14	24.6
	No	30	52.6
	I don't know	13	22.8

### Knowledge of Dentists regarding that for Registration & Continuation, which of the following conditions must be fulfilled by the Clinical Establishment?

Table No. 14 shows the Dentists' Knowledge regarding the conditions to be fulfilled for registration and continuation of the Clinical Establishment under this Act. 93.9% of the BDS practitioners and 68.4% of the MDS practitioners answered correctly as 'All of the above'

Table No 14: Knowledge of Dentists regarding that for Registration & Continuation, which of the following conditions must be fulfilled by the Clinical Establishment?

Groups	Responses	Frequency	Percent
BDS	Minimum standard of facilities and services	3	3.0
	Minimum requirement of personnel	2	2.0
	Maintenance of records	1	1.0
	All of the above	93	93.9
MDS	Minimum standard of facilities and services	11	19.3
	Minimum requirement of personnel	4	7.0
	Maintenance of records	3	5.3
	All of the above	39	68.4

### Knowledge of Dentists regarding that If a Clinical Establishment was running prior to the Act being passed, within a period of \_\_\_\_ years / months, it has to be registered

Table No. 15 shows the Knowledge of the Dentists' regarding the when should a clinical establishment, that is running prior to this Act, should get registered with the authority? Only 43.4% of the BDS practitioners and 21.1% of the MDS practitioners answered correctly as to 1 year.

Table No 15: Knowledge of Dentists regarding that If a Clinical Establishment was running prior

to the Act being passed, within a period of years / months, it has to be registered?

Groups	Responses	Frequency	Percent
BDS	One year	43	43.4
	Two years	1	1.0
	15 days	1	1.0
	6 months	54	54.5
MDS	One year	12	21.1
	Two years	6	10.5
	15 days	5	8.8
	6 months	34	59.6

## DISCUSSION

Out of 156 dentists participated in the study, 63.5% or 99 were B.D.S or graduate dental practitioners whereas the 36.5% or 99 were postgraduate or M.D.S dental practitioners. A better understanding of the study would've been possible if the ratio would've been near to 1:1

It shows that 66.7% of the BDS practitioners were aware of the Act previously of have read literature on the same, whereas 33.3% of the BDS general practitioners were not previously aware of this Act. In specialists or Post Graduate Dental Practitioners, 57.9% of the specialist were not aware of this Act previously whereas 42.1 % of the specialists were aware of the Act or had read literature related to the Act previously. It can be hypothesized that since BDS practitioners are more concerned regarding clinical practice and running clinical establishments, they shall have a better idea of these legislations, especially legislations like the Clinical Establishment Act that aims to impact drastically on Clinical practitioners. There were also practitioners who have listened to or heard occasionally regarding the act from colleagues or some friends. However, since they hadn't read any literature extensively over the Act, they chose to say no as to whether they are aware of the provisions of the Act.

It shows that 84.8% of the BDS practitioners were aware of the fact that this Act

is of paramount importance to Dental Practitioners having their own clinical establishments, whereas 15.2% of the BDS general practitioners did not know so. In specialists or Post Graduate Dental Practitioners, 57.9% of the specialists were aware that this Act is important to practitioners whereas 42.1 % of the specialists did not know so. Since due to the already higher awareness regarding the Act among the BDS practitioners, there was already some knowledge as to this Act being important from Dental Practice – Perspective and thus the higher percentage.

While 87.9% of the BDS practitioners showed a very positive faith in this legislation, 12.1% were of the negative opinion. Following a similar trend, 73.7% of the MDS practitioners were of positive opinion for newer legislations like these whereas 26.3% of the MDS practitioners felt there is no absolute necessity of such Acts. This showed that despite ignorance regarding the Act, the practitioners – BDS & MDS alike are positive regarding the impact of this Act to the improvement in quality of dental care service provided. The remaining proportion of the population were of the opinion that newer and newer legislations can only prove to be an obstacle for dental practice and not help improve it.

While 100% of the BDS practitioners and 89.5% of the MDS practitioners showed an enthusiastic willingness to attend such programs, 10.5% of the MDS practitioners did not feel it necessary to attend such programs. According to the guidelines of the Maharashtra State Dental Council, it is mandatory for dental practitioners to attend continuing dental education program on Infection Control and Medico-Legal/Jurisprudence every 5 years. Though it has never been enforced mandatorily, this results show us that the dental practitioners though, may not be aware of the several legislations necessary for dental practice, are yet willing to attend programs that can keep them updated as to the number of legislations pertaining to the dental practice.

While 66.7% of the BDS practitioners and 57.9% of the MDS practitioners knew that this legislation was passed by the Hon'ble Parliament of India, 24.2% of the BDS

practitioners and 19.3% of the MDS practitioners mistook that it was the Dental Council of India that passed this Act. It can be hypothesized that since the Dentists' Act 1948 is the only Act taught as a part of the undergraduate curriculum, the dental practitioners feel only the Dental Council of India have the right to formulate laws and rules affecting the dental practice.

Only 10.1% of the BDS practitioners and 21.1% of the MDS practitioners answered correctly as to this Act was passed to bring about uniformity in the quality of Health Care delivery. However, a large number of BDS practitioners 39.4% & 22.8% of the MDS practitioners, feel that this Act was brought to bring about uniformity in the prices charged by the dentists. This has been a wide misconception as seen from the various opposition to the Act by various Health Professional Groups – IMA, IDA etc. This Act has no provision whatsoever to have a capping of the prices charged by dentists across the country. There is no effort on the part of the policy makers to bring about a uniformity in the prices charged by dentists through this Act. This wide misconception is due to the fact that the dental practitioners were not apprised of the provisions of this Act or due to informal talks between ignorant professionals that might have led to this misconception.

When asked if the Clinical Establishments can function without registering with the suitable authorities, 75.8% of the BDS practitioners and 52.6% MDS practitioners answered correctly as 'No'. However, 14.1% of the BDS practitioners and 22.8% of the MDS practitioners were not sure. The Clinical Establishment though has been enacted by the Maharashtra State Legislature, it is yet to be implemented in full spirit. Hence the registration process has not yet been streamlined for dental practitioners.

## SUMMARY AND CONCLUSION

The conclusions are as follows:

1. 66.7% of the BDS practitioners & 42.1 % of the MDS Practitioners were aware of the Act previously or had read literature on the same.
2. 84.8% of the BDS practitioners & 57.9% of the MDS practitioners were aware of the fact that this



Act is of paramount importance to Dental Practitioners having their own clinical establishments.

3. While 100% of the BDS practitioners and 89.5% of the MDS practitioners showed an enthusiastic willingness to attend such programs, 10.5% of the MDS practitioners did not feel it necessary to attend such programs.

4. The Dentists had average knowledge as to the Clinical Establishment Act and its implications on Dental Practice.

## RECOMMENDATIONS

The present study has its own limitations. The present study was limited by its cross-sectional nature and smaller sample size. Both can be overcome by having an extensive survey over the same topic with a larger sample size to get a better insight as to the knowledge, attitude and practices employed by the dentists' regarding various provisions of this Act and its implications on practicing dentists. There is a need for continuing efforts to sensitize dentists regarding the importance of medico-legal issues such as these. More such continuing dental education programs can be organized to educate the dentists regarding the various legislations pertaining to their clinical practice. With all these strategies, the goal should be that the Dentists and dental care providers should be motivated and encouraged to adopt an ethical and legal practice.

Regarding the Act, If the clinical establishment act is taken and implemented in the right spirit it will be a boon for public health and the overall progress of our nation. So the bill should not be so rigid that the practitioners make an excuse of it in delivery of care. Therefore it needs to be handled carefully so that both practitioner and public can get maximum of it. Hence it should be reconsidered.

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# Aesthetic Rehabilitation of Ellis Class II Fracture Using the Template Technique: A Case Report

## Abstract

**Introduction:** Coronal fracture in permanent dentition is the most common type of dental injury. The clinician should take into consideration aspects of esthetics and should plan the exact treatment plan.

**Conclusion:** This case report describes an aesthetic rehabilitation of fractured anterior teeth using the template technique.

**key word-** Composite, Esthetics, Rehabilitation, Trauma, Template technique

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## INTRODUCTION

The second most common cause of tooth loss is orofacial trauma, which severely affects a patient's appearance, speech, and ability to eat. Most of these fractures occur in the maxillary central incisors, with boys suffering nearly twice as many as girls.<sup>1</sup> The most well-known risk factors include age and gender, specific behavioral features, falls, collisions, notably those involving cars or bicycles, and physical and athletic activity.<sup>2</sup> Traumatic dental injuries account for between 6% and 37% of all dental injuries worldwide. Additionally, reports of seasonal variations in the incidence of trauma have been made.<sup>3</sup> Dental trauma to the incisors and the tissues that support them is one of the most challenging dental emergencies. It requires immediate assessment and treatment for both psychological and physical reason.<sup>4</sup> Because it is still developing, treatment for trauma to young permanent teeth is essential to reduce unwanted problems. Treatment for dental trauma is commonly overlooked, despite the fact that it can cause discomfort, make it difficult for the patient

impact on their self-esteem. However, the appearance of the anterior teeth is one of the most significant parts of a person's appearance, and it can be influenced by a variety of factors such as the color, shape, number, alignment, and position of fillings as well as other factors.<sup>5</sup> Adjacent tooth trauma requires appropriate functional and cosmetic restoration.<sup>6</sup> Success depends on having a thorough understanding of the patient's desires. Using a crown and bridge to fix a damaged tooth is more expensive, time-consuming, and requires several visits.<sup>7</sup>

The use of the Putty index restoration technique for treating fractured teeth, which is minimally invasive, cost-effective, and successful. This technique has shown excellent longevity and superior matching ability in carefully selected cases. In this article, an esthetic rehabilitation of fractured anterior teeth restored with putty index composite restoration is discussed.

Fig.1 Preoperative intraoral photograph

## CASE REPORT

A 24-year-old man presented to the outpatient Department of Conservative Dentistry & Endodontics at MITHILA MINORITY DENTAL COLLEGE AND HOSPITAL in DARBHANGA, BIHAR, India for the treatment of a fractured upper front tooth with aesthetic concerns. The patient had a history of trauma 10 months ago when he was hit by a pole while playing. Clinical examination revealed an Ellis class II (uncomplicated) fracture in tooth 11. The tooth was asymptomatic with no associated soft or hard tissue injuries to the supporting tissues and responded well to Electric Pulp Test and Cold test. An intraoral periapical radiograph of tooth 11 showed no pulpal or periapical pathosis. After a thorough investigation, it was decided to restore the tooth with an indirect composite restoration using the template technique. Oral prophylaxis was performed to remove calculus and stains. A rubber dam isolation was achieved, and a 45° bevel was given to remove unsupported enamel and increase the surface area of the tooth. Fast setting alginate was used to make a preliminary impression of the upper and lower arches, and diagnostic dental stone study models were prepared. Crown build-up was done on the prepared cast using inlay wax to mimic the natural anatomy of the tooth, and any occlusal discrepancies were checked. The tooth was duplicated using Polyvinyl siloxane putty impression material, with impressions taken up to the incisal third on the labial aspect. The template was acquired (Figure 2 and 3). A clinical try-in of the template was performed intra-orally to ensure proper fit. Following the selection of the appropriate shade for the composite material, the fractured tooth was restored using this crown former, with minimal finishing and polishing required after the restoration



Wax pattern and putty impression



Fig.2 Mock up done with inlay wax and putty impression



Fig.3 Palatal shelf build up done

Post-operative intraoral photograph



Fig 4. Post operative intraoral photograph

## DISCUSSION

The fracture of a permanent incisor can be a distressing event for a young patient, leading to

psychological and social repercussions. Managing anterior tooth fractures poses a significant challenge for clinicians, requiring consideration of both functional and aesthetic aspects. Treatment goals may differ based on the patient's age, socio-economic background, and oral condition during treatment planning.<sup>9</sup> Several treatment options exist for restoring fractured teeth, such as composite restoration, fixed prosthesis, and reattachment of the fracture fragment (if feasible), followed by post- and core-supported restorations. Well-established treatment choices like laminated veneers or full-coverage restoration may be contemplated after multiple fragment rebonding or composite resin restorations have been attempted and proven ineffective. However, these options often involve sacrificing healthy tooth structure and present difficulties in achieving a exact match with adjacent unrestored teeth. Various techniques have been explored for composite restoration, including direct and indirect methods, freehand composite restorations, and the use of preformed crowns or thermoplastic molds as templates. While preformed crowns and thermoformed templates have shown promise, they come with certain limitations, such as the need for specialized equipment like vacuum forming, availability issues, time constraints, and the challenge of achieving proper incremental layering of the composite material. In this particular case, a novel approach combining direct and indirect restoration methods was developed using polyvinyl siloxane (PVS) rubber base impression material (putty) as a template. This method offers a simple, rapid, and cost-effective alternative to more invasive procedures. The use of the PVS template enables precise incremental layering of the composite material, ensures optimal depth of cure, facilitates accurate reproduction of anatomic contours, and minimizes the need for extensive polishing. The patient underwent a follow-up appointment after seven days to assess if any minor alteration were needed for the restoration.

## CONCLUSION

It is essential to utilize skills and knowledge of materials and techniques effectively to achieve the desired aesthetics in patients. The esthetic restoration of a fractured tooth is a complex process; however, this technique can serve as a straightforward, efficient, and suitable solution that meets the needs of both the patient and the dentist.

The patient underwent a follow-up appointment after seven days to assess if any minor tweaks were needed for the restoration.

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# Ameloblastoma Arising from A Dentigerous Cyst- A Case Report

## Abstract

We are reporting a case of an ameloblastoma which arose in the wall of a dentigerous cyst. The clinical, radiographic and histological characteristics were similar to those of dentigerous cysts, as were seen on doing an incisional biopsy. Enucleation was done intraorally under local anaesthesia. Post-operative excisional biopsy revealed strands and cords arising from the cystic lining, which are suggestive of ameloblastic changes.

**Keywords:** Unicystic ameloblastoma, Plexiform ameloblastoma, Enucleation.

## Case Report

A 15-year-old girl was referred to the department of Oral and Maxillofacial Surgery in Mithila Minority Dental College & Hospital Darbhanga due to an asymptomatic swelling on her right cheek [Fig-1] Swelling extending lower border of mandible to the right corner of mouth and Antero-posteriorly, it is symphysis region to the body of mandible. Her prior medical history did not play a role. A right mandibular, bicortical expansion was seen during an intraoral examination. It extended from the corner of mouth to the first molar and buccally into the cheek, with normal mucosa covering it [Fig-2]. When the enlargement was felt, an egg shell crackling was felt. A panoramic radiograph [Fig-3] showed multiple, unilateral, well-defined, radiolucent area in the right mandibular body that extended inferiorly along the anterior border of the body of mandible and anteriorly along the alveolar crest, up to the distal surface of the lateral incisor. The area was also located lingual mucosa and reached the lower border of the mandible. The lower border of the mandible was the location of the malpositioned,

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anesthesia, suggesting that the lesion was a dentigerous cyst. This was confirmed by performing an incisional biopsy. Under local anesthesia, the lesion and the unerupted canine were excised [Fig-4]. The mental neurovascular bundle remains intact following enucleation, as shown in [Fig. 5] and [Fig. 6].



[Fig-1]: Extra oral clinical photograph





[Fig-2]: Intraoral view



[Fig-6]: Inferior alveolar neurovascular bundle intact after enucleation



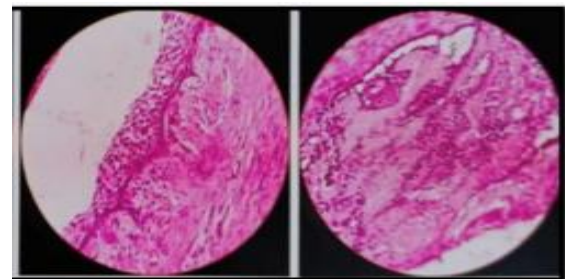
[Fig-3]: Radiograph showing the radiolucent lesion



[Fig- Enucleated tissue alone with tooth  
Sent for biopsy



[Fig-4]: Intra operative view



[Fig-7] [Fig-8]  
[Fig-7]: Histological picture showing features of dentigerous cyst  
[Fig-8]: Histological picture showing features of ameloblastoma



[Fig-5]: Cystic cavity after enucleation



[Fig-9]: Six months follow up radiograph





[Fig-10]:After Six months photograph.

## Histopathological findings

Incisional biopsy was suggestive of the lesion being a dentigerous cyst with 2-3 layers of epithelial lining and inflammatory component in the stroma. The specimen underwent an excisional biopsy, which revealed regions with two to three layers of thick epithelium as well as a proliferative lining in some places. There were spots in the compacted underlying stroma that showed they contained odontogenic epithelium.

These were anatomizing strands and cords that were extensions of the cyst wall's intracapsular proliferation. According to the histological characteristics [Fig-7,8], the lesion was most likely a dentigerous cyst with ameloblastomatous alterations. Following an excisional biopsy, the specimen showed areas with two to three layers of thick epithelium and, in certain cases, a proliferative lining. Spots of odontogenic epithelium were visible in the compressed underlying stroma.

These were anatomizing cords and strands, extensions of the intracapsular proliferation of the cyst wall. A dentigerous cyst with ameloblastomatous changes was most likely the lesion, based on the histological findings [Fig-7,8].

## Discussion

One of the most prevalent kinds of cysts in the jaw is dentigerous cyst (DC). An unerupted or impacted tooth's crown is surrounded by an asymptomatic unilocular/ multilocular radiolucency in the clinical

presentation of a typical DC. The majority of the time, a DC is easy to diagnose; nevertheless, even with radiography, a "typical" DC may be mistaken for another type of cell, such as a dental follicle, an odontogenic keratocyst, or a keratocystic odontogenic tumour (KCOT). Or a unicystic ameloblastoma on histological analysis [1]. The histological diagnoses of these lesions are therefore critical [2].

The most frequent cause of pericoronal radiolucency, which is connected to impacted teeth, is a dentigerous cyst [3]. Dentigerous cysts are typically discovered on routine dental radiographs due to their lack of symptoms. A combination of radiographic and histological evidence is used to diagnose dentigerous cysts [4]. When fluid builds up between the crown of an immature or developing tooth and the follicular epithelium, dentigerous cysts occur within the lining of the dental follicles [5].

Dentigerous cysts typically appear in the second and third decades of life, peaking in adolescence. In our case, they frequently grow around the crowns of mandibular third canine [6]. Ameloblastomas are benign, locally aggressive tumors that originate from the maxilla or, less frequently, the mandible. Ameloblastomas, initially identified by Robinson and Martinez, are cystic lesions that exhibit radiological and clinical features of odontogenic cysts. However, upon histological examination, the lesions reveal a characteristic ameloblastomatous epithelium lining a portion of the cyst cavity, either with or without luminal or mural tumor proliferation [7].

Prior to this report, this variant had been referred to as a mural or an intra luminal ameloblastoma. In a 35 clinic-pathological study done on 57 cases of unicystic ameloblastomas, Ackerson classified this entity into three histological groups: luminal unicystic ameloblastoma, intraluminal / plexiform unicystic ameloblastoma and mural unicystic ameloblastoma. In the wall of dentigerous cysts, 15% to 20% of all unicystic ameloblastomas develop. Ameloblastomas have been observed to grow inside the walls of odontogenic cysts since 1925; dentigerous cysts are the most often documented example of these [8].

According to immunohistochemical studies, ameloblastomas arising from dentigerous cysts show Ki-67 expression, which supports the concept that

these tumors behave biologically similarly to unicystic ameloblastomas [9]. The phrase “plexiform unicystic ameloblastoma” describes an epithelial growth pattern that has been identified in jaw cystic lesions. Because it does not meet the histological criteria that were previously established for ameloblastomas, some pathologists have classified it as a hyperplastic epithelium rather than an ameloblastoma.

By presenting ten cases of unicystic ameloblastomas that showed both patterns, Gardner et al.’s article offered histological proof that plexiform unicystic ameloblastomas were, in fact, variations of conventional unicystic ameloblastomas. The biological characteristics of plexiform unicystic ameloblastomas provide additional proof of their ameloblastomatous nature. This pattern is comparable to traditional unicystic ameloblastomas even when it manifests alone [2]. It is rare for ameloblastomas to develop in kids and teenagers younger than 18 years old. Out of the 206 cases that Lucas reviewed, only 14.6% of ameloblastoma instances were observed in children and adolescents [10].

In view of the reported ameloblastomatous potential of dentigerous cysts, it is thus important to be able to recognize true ameloblastomatous epithelium from ameloblastoma-like epithelium. In most cases of odontogenic cysts, the presence of an ameloblastomatous epithelial lining in inflamed odontogenic cysts is insufficient to diagnose unicystic ameloblastomas, unless other more diagnostic features of unicystic ameloblastomas are evident [11]. In such cases, other diagnostic criteria which are included to make a diagnosis of unicystic ameloblastomas, as were described by Vickers and Gorlin, are cysts which are lined by an ameloblastic epithelium, with a tall columnar basal layer, a subnuclear vacuole, reverse polarity of hyper chromatic nucleus and a thin layer of oedematous, degenerating stellate reticulum like cells on surface [12].

## CONCLUSION

Only after the enucleated material underwent a histological analysis was a diagnosis feasible in this instance. Therefore, the most accurate method for distinguishing between multicystic ameloblastomas and dentigerous cysts is a histological investigation. It emphasizes the significance of enucleation as the primary treatment option for big, cystic lesions, as

opposed to child-specific conservative techniques like decompression and marsupialization. While marsupialization may aid in the preservation of important structures, enucleation—complete removal of the lining—is a more appropriate course of action when considering the possibility of more aggressive transformation of the cystic lining. In our case, this involves focusing on the potential preservation of important structures and providing close monitoring.

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# Anticipatory Guidance to Prevent Anterior Tooth Crossbite in 6-Year Old Child – A Case Report

## Abstract

### INTRODUCTION

Crossbite is defined as an abnormal labiolingual or buccolingual relationship between maxillary and mandibular teeth when the teeth of both arches are in occlusion. It can be further Classified as anterior or posterior and also whether a single tooth or groups of teeth are involved.

### CASE REPORT

In this case report we discuss about prevention of developing single anterior tooth crossbite with the help of tongue blade therapy. Treatment was completed with a time interval of 6 months.

### DISCUSSION

Early management of cross-bite in the deciduous or early mixed dentition is advocated to allow for spontaneous correction of succedaneoustooths.<sup>(2)</sup> There are many treatment modalities for an anterior crossbite correction like Tongue blades, reversed stainless steel crowns, fixed acrylic planes, bonded resin- composite slope, and removable acrylic appliances with finger springs. In this case report tongue blade therapy was used for the correction and it shows a positive result in very short period of time without any unwanted effects.

### CONCLUSION

The crossbite should be treated as soon as possible so that future orthodontic problems can be avoided. The desired outcome is achieved in a short time and without complication.

**KEYWORDS** :- Crossbite, Preventive, Malocclusion, Anticipatory Guidance, Mixed Dentition

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## INTRODUCTION

One of the major responsibilities of the dental practitioner is to intercept adverse patterns of dental eruption in the child and even check for abnormal occlusion.<sup>(1)</sup> Crossbite is defined as an abnormal labiolingual or buccolingual relationship between maxillary and mandibular teeth when the teeth of both arches are in occlusion. It can be anterior or posterior and can also be a single tooth or groups of teeth involved. In the mixed dentition period, the most common developmental problem seen is the anterior crossbite.

Anterior crossbite is defined as an abnormal relationship between opposing teeth in a buccopalatal or labiopatal direction. It is seen

when one or more of the maxillary incisors occlude lingual to the mandibular incisors while the posterior teeth are in occlusion. The prevalence of anterior crossbite in children ranges from 4% - 26%.

The aetiology of anterior crossbite can be classified as Dental or skeletal.<sup>(3-7)</sup> Crossbites of dental origin must be distinguished from those of skeletal origin. In the simple anterior dental crossbite the skeletal frame is normal, while abnormalities are seen in the affected teeth only. Anterior crossbite clinically manifests with reverse overjet, premature contact of cross-bite teeth leading to the displacement of the mandible, gingival recession, and mobility of the lower incisors involved in the crossbite.

## ETIOLOGY

The anterior dental crossbite may be the result of one or a combination of several etiologic factors:

1. Traumatic injuries to the primary dentition that cause a lingual displacement of the permanent tooth bud
2. A repaired cleft lip
3. A labially situated supernumerary tooth
4. A fibrous tissue barrier caused by losing a primary tooth prematurely
5. An inadequacy of arch length causing the lingual deflection of the permanent tooth during eruption
6. Detrimental habit patterns like a habit of biting the upper lip
7. An overretained primary tooth
8. Odontomas

## MANAGEMENT

The correction of anterior crossbite can be carried out by various treatment modalities

There are many possible approaches to the treatment of a simple anterior dental crossbite. The following treatment approaches have been recommended for simple anterior dental crossbite.

### Tongue blade therapy.

A simple one tooth anterior dental crossbite may be corrected this way. The success and prognosis of this procedure is greatly dependent on patient

cooperation and parental supervision. There is no precise control of the amount and direction of force applied.

### Lower inclined plane.

Treatment of anterior dental crossbite involving one or more teeth may be accomplished by using a cemented lower inclined acrylic plane. This technique has the possibility of opening the bite if worn for more than 3 weeks.

### Stainless steel or composite crowns

. Another method is cementing a reverse anterior stainless steel crown on the lingually locked incisor at a 45° angle to the occlusal plane. This method is subject to all the disadvantages of the inclined plane method and is difficult to apply to partially erupted maxillary incisors.

### Hawley retainer with auxiliary springs.

This appliance is used frequently for minor tooth movement in pediatric dentistry. In this procedure the prognosis depends on patient cooperation and parental supervision.

### Labial and lingual arch wires.

The use of labial and/or lingual arch wires has proven successful. The disadvantage of the use of these appliances is the expense and additional training required to use them efficiently.<sup>2-3</sup>

## ANTICIPATORY GUIDANCE

- The process to provide practical, developmentally appropriate information about the children's health to prepare parents for the significant physical, emotional and psychological milestones (AAPD)
- They include topics like: Diet counselling, oral hygiene, Fluoride, Trauma prevention, Non-nutritive habits
- Other topic like: - Sealants, Malocclusion and orthodontic needs, wisdom tooth removal etc.

In this case report anticipatory guidance was done to prevent single tooth crossbite with the help of



Tongue blade therapy. Treatment is completed in the time interval of 6 months.

## CASE REPORT



A 6-year-old male patient accompanied by his parent presented to the department of pediatric and prevent dentistry of Mithila Minority Dental College and Hospital with the chief complain of pain in the lower right back tooth region since 2 days. No relevant medical or dental history was recorded. On examination, deep occlusal caries was present w.r.t 84, grade II mobility was present w.r.t 81 and a single tooth crossbite was present w.r.t 11 with 81 and it was anticipated that if it is present in the mixed dentition period it will also be present in his permanent dentition and will require a complex treatment modality. So a anticipatory guidance therapy to prevent developing crossbite was planned with the help of tongue blade therapy. The condition was explained to the parents and after their consent the tongue blade exercise was explained to both the child and the parents and follow up was for 3 and 6 month. A positive result was achieved

**FIG.1- TONGUE BLADE EXERCISE**



**FIG.2 - PRE – OPERATIVE**

**FIG.3 – FOLLOW UP AFTER 3 MONTHS**



**FIG.4 – FOLLOW UP AFTER 6 MONTHS**

## DISCUSSION

Anterior crossbite is a fast growing type of malocclusion and is one of the causes of a child's undesirable appearance during the period of mixed dentition. The best time to counsel, manage this type of cases and prevent malocclusion is during the mixed dentition period. Early intervention requires less complicated procedure.<sup>(1)</sup> Treatment could be more challenging if it is postponed until a later stage of development.

The tongue blade therapy was used to prevent the developing anterior tooth crossbite in this case. As it was a developing crossbite tongue blade therapy was used. Tongue blade therapy is an ideal choice for correction of developing anterior single tooth crossbite. Patient and his parents were willing for the treatment and the patient was cooperative and also this therapy was cost effective so it was chosen for the correction. As the crossbite was anticipated to be seen in the permanent dentition so it was a preventive treatment approach and after the correction it shows a very positive result.

## CONCLUSION

- Anterior crossbite is a malocclusion that needs to be corrected at an early stage to



establish a well-balanced occlusal development.

- As the incidence of cross bite in primary and mixed dentition increases patients having functional and esthetic problems are becoming more common in dental practice
- These patients requires special attention with regards to functional and cosmetic problems in primary stage because if they are ignored, later they may requires more complicated treatment.
- Early treatment of such cases shows positive result and also the treatment requires less time for correction making it acceptable for the patient.

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# Management of Implant failure: A Case series

## Abstract

Osseointegrated dental implants have been considered the most esthetical and functional alternative to missing teeth. However, the treatment is not always successful resulting in implant loss. The implant failure can be classified as early failure (the Osseointegration is not established) and late failure (involving a breakdown of the established Osseointegration). The implant loss can be attributed to biological, microbiological and biomechanical factors. Dental implant failure has led to continuous innovations of various implant systems and interceptive treatment modalities. These concerns have also led to the selection of implant designs that best suit the various types of bone. This case series aims to discuss different implant failure cases and how to manage them.

**Keywords:** Implants, Osseointegration, Implant Failures

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## INTRODUCTION-

The name peri-implant disease refers to the pathological inflammatory changes that take place in the tissue surrounding a load-bearing implant.<sup>1</sup> Implants during the last twenty years is the standard care for the edentulous region, and an implant-supported prosthesis is most acceptable for replacing the missing teeth. Implant success depends on the absence of mobility at the start of the prosthetic phase, the absence of continuing radiolucency around the implant and the absence of peri-implantitis, and patient satisfaction<sup>2</sup>.

Today, in the general population, long-term success rates of over 90% to 95% are considered to be realistic treatment outcomes. Endosseous implant therapy can greatly improve the function and esthetics of carefully selected partially or completely edentulous patients. Failure of bony healing around the implant and subsequent failure of osseointegration; due to local or systemic factors is sometimes found.<sup>2</sup>

## Implant Cumulative Success Rates

Criteria are required for the definition of implant success vs loosening or failure. Various criteria have been proposed for the evaluation of implant success.<sup>2-4</sup> Cumulative success rates of dental implants are evaluated over the years and are affected by many factors.<sup>5</sup> These include implant location in the jaw, type of implant, diameter and length of implant, prosthetic construction, and whether they are used for single tooth replacement or in an edentulous oral cavity.<sup>6</sup>

### 1. Classification of implant failure

#### 1.1 According to Askary et al.

- Ailing implant: Soft tissue problems exclusively.
- Failing implant: An implant that is progressively losing its bone anchorage, but is still clinically stable, can be defined as a failing

- Failed implant: Implants with mobility excessive bone loss (>70%) not amenable to treatment are failed implants.<sup>2</sup>

#### **A. According to aetiology**

- Host factor
- Surgical factor
- Implant selection factor
- Restorative factor

#### **B. According to condition**

- Ailing Implant
- Failing Implant
- Failed Implant

#### **C. According to timing of failure**

- Before stage II
- After stage II
- After restoration

#### **D. According to failure mode**

- Lack of osseointegration
- Unacceptable aesthetics
- Functional problems
- Psychological problems

#### **E. According to supporting tissue type**

- Soft tissue loss
- Bone loss
- Combination

#### **F. According to origin**

- Peri implants
- Retrograde Peri-implantitis

#### **G. According to the condition of failure**

- Clinical and radiographic status

### **2. Parameters used for evaluating failing/failed implants.**

While it is possible to differentiate between a successful and a failed implant, it remains difficult to identify failing implants. The parameters that have been employed clinically to evaluate implant conditions were discussed by Esposito et al, with an attempt to identify the most reliable ones.<sup>7</sup> For monitoring implant conditions and implant failure, certain clinical parameters are as follows:-

### **2.1. Clinical Signs of Early/Late Infection**

A marginal infection that is progressing rapidly. However, clinical signs of infection, such as hyperplastic soft tissues, suppuration (spontaneous, on probing or under pressure), swelling, fistulation, colour changes of the marginal peri-implant tissues, etc., are signs that call for intervention. There is no mobility or radiographic changes indicating bone loss.<sup>7</sup>

### **2.2. Bleeding On Probing**

Bleeding on probing is commonly used though its use is not universally acceptable.<sup>7</sup>

### **2.3. Probing Depths**

It is of little diagnostic value unless accompanied by signs (e.g. radiographic radiolucencies, purulent exudate, bleeding) and/or symptoms (e.g. discomfort, pain) while checking dental implants. Sulcus depths greater than 5 to 6 mm around implants have a greater incidence of anaerobic bacteria and may require intervention in the presence of inflammation or exudate (e.g. surgery, antibiotic regimens).

### **2.4 Pain or Sensitivity**

Subjective findings of pain or tenderness associated with an implant body are difficult to assess. The absence of pain under vertical or horizontal forces is a primary subjective criterion after initial healing. Pain should not be associated with the implant after healing. When present, it is more often an improper fitting prosthetic component or pressure on the soft tissue from the prosthesis. Percussion and forces up to 500gm (1.2 psi) is applied to check for pain or discomfort at implant site.

### **2.5. Clinical Discernible Mobility.**

Mobility is always a clear sign of failure. Mobility of a poorly connected abutment is checked initially and then mobility of the underlying implant is evaluated. Implant must be suspected to be surrounded by a fibrous tissue capsule when mobility is present. Occasionally, clinically discernible mobility can be present without distinct radio-graphic bone changes.<sup>7</sup>

### **2.6. Radiographic Signs of Failure**

There seems to be a unanimous consensus that progressive marginal bone loss is a pathological

sign, which can lead to implant failure. Adell et al determined that the mean bone loss for Branemark osseointegrated implants is 1.5 mm for the first year, followed by a mean bone loss of 0.1 mm per year.<sup>2</sup> This value was confirmed by Cox and Zarb with their 3-year report showing a mean bone loss of 1.6 mm for the first year and a mean of 0.13 mm in subsequent years.<sup>12</sup> There can be two well-distinct radiographic pictures: a thin peri-fixture radiolucency surrounding the entire implant, suggesting the absence of direct bone-implant contact and possibly a loss of stability, and an increased marginal bone loss. Since, the distinction between the two radiographic pictures is not always clear, when a suspected peri-fixture radiolucency or excessive marginal bone loss is observed, first the prosthetic component of implant is removed and then implant is checked for stability.

## 2.7. Dull Sound at Percussion

It has been suggested that a subdued sound upon percussion is indicative of soft tissue encapsulation, whereas a clear crystallization sound indicates successful osseointegration.<sup>7</sup> Although it is a rather subjective test without a solid scientific background but it can provide a useful indication to the examiner.

## 3. Stages of implant failure.

Implant failure can occur at any time. According to the timing of failure, it can be:-

- Before stage II (after surgery)
- At stage II (with healing head and/or abutment insertion)
- After restoration<sup>8</sup>

### 3.1. Before stage II.

It usually occurs as a result of implant misplacement, that is, when it is placed in an infected socket, periapical lesion after tooth extraction, or immature bone previously augmented or contaminated implant is placed in the osteotomy site, infection or soft tissue complications. The failed dental implant may appear to be an exfoliating fixture accompanied by purulent exudates. First cover screw is exposed, which when examined with a probe on top of the screw by light touch, revealing a sinking or damping movement due to the fibrous tissues and the infection surrounding the fixture. It may terminate with exfoliation of the fixture in 10 days to 2 months from the time of fixture placement.<sup>8</sup>

### 3.2. At stage II.

Implant failure at this stage could be due to excessive torquing during abutment connection when inserted into the grafted bone. It probably happens because of an insufficient bone contact surface area with the implant and possibly because of poor surface treatment of the fixture.<sup>2</sup> A contaminated implant may stay in a dormant condition till torque is applied to the cover screw. Then because of lack of integration, which can result from the implant being placed in a wide osteotomy, the implant being loaded before the recommended time, or traumatic placement of the implant, it comes out. It cannot be considered an early failure because it is not early enough, and it is not a late failure because it happened before prosthetic placement.<sup>8</sup>

## 3.3. After restoration

This particular timing of failure is the most common. It starts after an osseointegrated implant is loaded and ultimately the failure occurs. The most common cause is occlusal trauma. It has its clinical manifestations, known as peri implantitis.<sup>8</sup>

## 4. Risk factors for dental implants

### 4.1. Dentist-related Risk Factors

#### 4.1.1 Preoperative Factors.

The relationship between dental implant failure and irradiated patients is not clear. Irradiated and non-irradiated jaw have similar implant survival rate. The complication of radiation starts when the dose exceeds 64 Gy.<sup>8,9</sup>

#### 4.1.2 Peroperative Factors

There are various factors which lead to implant failure during implant placement

- Improper angulations
- Lack of initial stabilization
- Impaired healing
- Overheating the bone
- Minimal space between the implants
- Placing an implant in immature bone
- Placement in the infected socket

#### 4.1.3. Postoperative Factors.

Poorly designed and incorrect guidance of the crown contribute to failure. Factors increasing occlusal loading to an unacceptable level will lead to failure. Extremely high occlusal forces contribute to implant fractures and peri-implant bone fractures. Crown width, cusp height,

guidance, and occlusal alignment can all be used to control occlusal forces.<sup>10</sup>

#### 4.2 Implant-related Risk Factors

Dental Implant Material and Surface Characteristic are as follows:-

- (1) Biocompatible
- (2) Of appropriate rigidity for prosthetic function
- (3) The implant must be adaptable to both surrounding bone and gingiva
- (4) The implant should dissipate occlusal load on the prostheses supported by it to the underlying bone
- (5) Resistant to the large and diverse peri-implant microbial load.<sup>11</sup>

The use of bioincompatible implant materials leads to implant failure initiated by adverse host tissue responses<sup>12</sup>. The implant surface coatings comprise titanium oxide (TiO<sub>2</sub>) coating, ceramic coating, or diamond coating.<sup>12,13</sup> Biodegradable ceramic coating may have the best prospects. Most dental implant materials presently used are quite biocompatible in human tissues. They are usually made of titanium, titanium-aluminium vanadium (Ti-6Al-4V), cobalt-chromium molybdenum, and more rarely of other alloys<sup>14</sup>.<sup>15</sup> However, research and development are needed to develop even more biocompatible and functional materials to prevent implant failures and to prolong implant life in service<sup>16,17</sup>.

#### Case: 1.

A 30-year-old male patient presented at the Department of Periodontology, Mithila Minority Dental College & Hospital, Darbhanga, for treatment of a painful implant at the maxillary right central incisor. The patient signed a written informed consent form for treatment, which is the standard protocol for all patients seeking treatment in the department. The implant had been placed 6 months previously. It was found that he had smoked one pack of cigarettes per day for the past 5 years. Clinically, more than 5 mm pocket depth was present around the implant. No clinically detectable mobility was present in the implant. This case was managed surgically. One hour before surgery, the patient was given 2 g amoxicillin and, after surgery, was placed on a regimen of 500 mg amoxicillin three times per day for 10 postoperative days. The patient also rinsed with 0.12% chlorhexidine gluconate for 30 seconds. After the elevation of a mucoperiosteal

flap, a bony defect that communicated with the implant was found. After the infected soft tissue was removed, the implant surface was decontaminated with a combination of saline rinses and the application of cotton pellets soaked in 50 mg/mL tetracycline HCl solution, which was left in place for 5 minutes. Alloplastic bone graft was hydrated with the tetracycline solution and compacted into the defect. The buccal and lingual flaps were released, and tension-free primary closure was achieved with 4-0 silk sutures. A periapical radiograph was taken at the end of the surgery. The patient was asked to quit smoking before the treatment under the cessation protocol. It involved complete cessation of smoking 1 week before the surgery and 8 weeks after.<sup>7</sup>

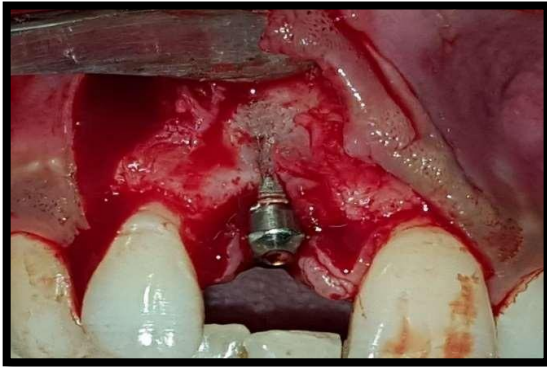


Figure 1. Preoperative Photograph



Figure 2. Mid Crestal Incision





**Figure 3. After flap reflection**



**Figure 4 . Alloplastic bone graft placed at the exposed site**



**Figure: 5. Suture placed**



**Figure: 6. Post-operative photograph**

## **Case: 2.**

A 21-year-old female reported to the department of Periodontology and Implantology referred from the Prosthodontics department at Mithila Minority Dental College and Hospital, Darbhanga with pain and Grade II mobility in 43 region.



**Figure: 1. Pre-operative photograph**

Medical history was non-contributory. The patient signed a written informed consent form for treatment. Clinical findings of the patient around 43 reason biofilm and calculus associated with the implant and due to inflammation mucositis present. On clinical examination, there was Grade II mobility around the implant. RVG Radiograph indicated a loss of osseointegration. Retrieval of the implant was planned along with placement of sticky bone. The patient signed a written informed consent form for treatment.

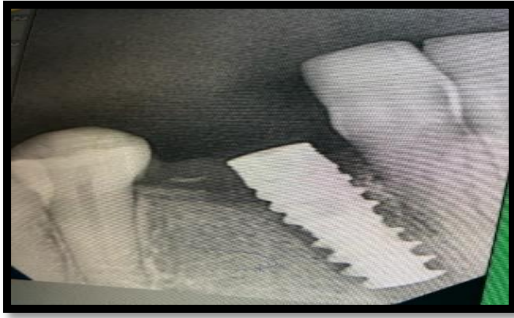
## **Surgical procedure**

The surgical phase was initiated with the administration of local anaesthesia (lidocaine with epinephrine 1:100,000) in 43 regions. Isolation of the surgical site and removal of the implant from the socket is done. After removing the implant, the flap was reflected and socket was curetted and all the de-granulated tissues around the socket and inside the socket were cleaned and irrigated.

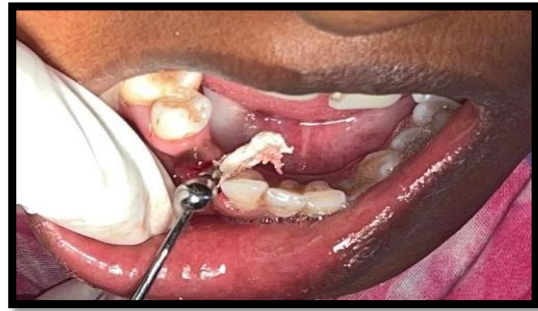
## **Preparation of sticky bone and preservation of socket**

10 ml of blood drawn from the patient. At the 700 RPM for 3 minutes, iprf was prepared and i-prf was mixed with alloplastic bone for 10 minutes to form Sticky bone. A sticky Bone was placed inside the socket, the flap was closed with suture and Coe- pack was placed at 43 region.





**Figure: 2. RVG befor treatment**



**Figure: 6. Sticky bone placed at socket**



**Figure: 3. iPRF Preparation**



**Figure: 7. Suturing done**



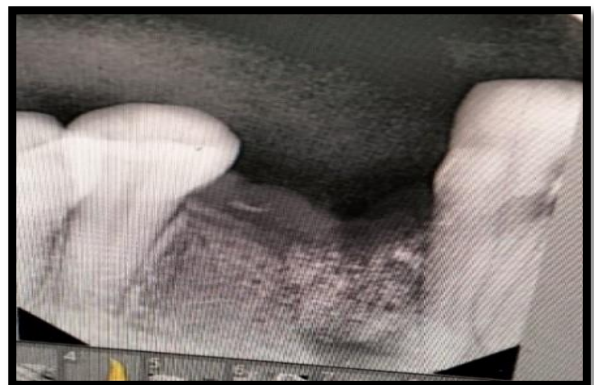
**Figure: 4. Removal of the implant and socket**



**Figure: 8. Coe- pak placed**



**Figure: 5. Sticky bone prepared was curetted**



**Figure: 9. After 3 months RVG**

### Case: 3

A 27-year-old female reported to the Department of Periodontology and Implantology at Mithila Minority Dental College and Hospital Darbhanga with pain and esthetic concerns in the maxillary right anterior region. Medical history was non-contributory. The patient signed a written informed consent form for treatment.

### Surgical procedure

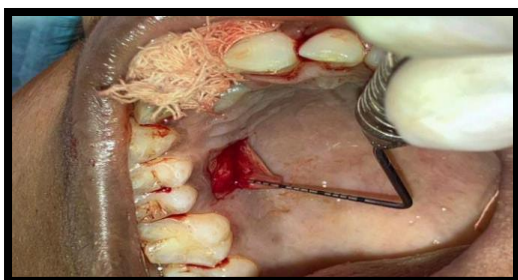
The surgical phase was initiated with the administration of local anaesthesia (lidocaine with epinephrine 1:100,000). The implant was exposed by mid-crestal incision, the flap was reflected and the connective tissue graft was taken from the palatal region. After the placement of the connective tissue graft, flap is approximated and suturing was done.



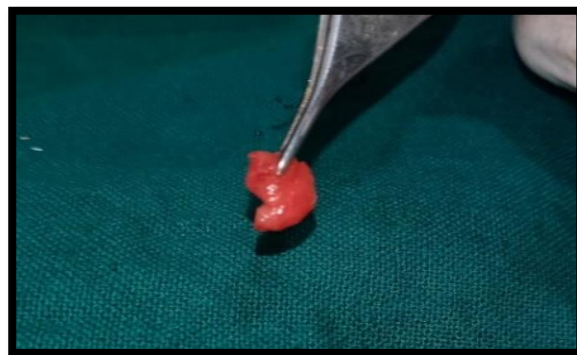
**Figure: 1. Pre-operative photograph**



**Figure: 2. Mid-crestal incision**



**Figure: 3. Connective tissue graft from palate**



**Figure: 4. Connective tissue graft**



**Figure: 5. After flap reflection, graft**



**Figure: 6. Suturing done was placed**



**Figure: 7. RVG after treatment**





**Figure: 8. After post-operative photograph**

## DISCUSSION

Before the initiation of treatment for a situation that is considered to be a failure, the condition of the associated implant(s) should be noted first. Albrektsson et al.<sup>17</sup> proposed a condition of implants which they termed as surviving. Surviving implants are those which are still in function, but which have not been tested concerning success criteria. Meffert, in 1992 classified unhealthy implants into ailing, failing and failed.<sup>18, 19</sup> Ailing implants show radiographical bone loss without inflammatory signs or mobility. Failing implants are those with progressive bone loss, and signs of inflammation but no mobility. Failed implants are those with progressive bone loss, with clinical mobility and loss of function, in the intended sense. If osseointegration mechanisms is disturbed, chances of early failure increases.<sup>20, 21</sup> The majority of failures occurred in the preload phase (88.2%), after the occurrence of osseointegration. 7.5% of the implant failures occurred after loading, and only 4.2% occurred in immediately loaded implants. This observation points to a host response role within the individual healing process.<sup>22</sup> Iatrogenicity was the identified cause of implant failure in 17.5% of cases. Other studies have evidenced a similar failure prevalence caused by iatrogenic factors, such as contamination, overheating, occlusal trauma, inadequate surgical technique, overloading forces<sup>23, 24</sup>. Peri-implant mucositis is common in patient with periodontitis. Also, periodontitis subjects were at significantly higher risk for implant failure and greater marginal bone loss as compared with periodontally healthy subjects. Hence it is better to treat periodontal disease and establish good oral hygiene behaviour before implant placement. Also, the fabrication of passively fitting prostheses is a precondition for the maintenance of osseointegration. Thus, the significance of accurate impression-making is strongly emphasized to achieve this. A misfit of superstructures generates initial stress and strain

on implants; mechanical complications such as fracture of the prosthetic framework or veneering material and fracture or loosening of occlusal and/or abutment screws may be seen with functional loading. SPT was shown to be a viable method of periodontal maintenance when placing implants in patients with periodontitis. Rocuzzo and colleagues demonstrated successful management of implants, with a survival rate of 94.7% in 15 of the subjects with a history of advanced periodontitis who were maintained and treated periodontally before implants were placed. A lack of compliance to SPT was correlated with a higher incidence of marginal peri-implant bone loss at follow-up as well as an increased incidence of implant failure. Furthermore, a higher implant survival rate was observed in the mandible (96.2%) than in the maxilla (93.5%). The various studies done on each of these failures and how to prevent these failures have been discussed too. Failure of implant has a multifactor dimension. It is recommended to treat the present condition and avoid it by understanding the etiology and pathogenesis when treating the new patients. Proper data collection, patient feedback, and accurate diagnostic tools will help point out the reason for failure. An early intervention is always possible if regular check-ups are undertaken.

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# Management of Radix Entomolaris : A Case Report

## Abstract

Normally mandibular first molars have one mesial and one distal root. But in some mandibular molars there are some anatomical variations. Presence of an additional lingual root distally in mandibular molars is called radix entomolaris (RE). Appropriate diagnosis is must before starting with root canal procedure in these teeth to ensure successful treatment outcome. This case report describes the endodontic management of mandibular molar with radix entomolaris (RE).

**KEYWORDS:** Radix entomolaris, Root canal Treatment, First molar.

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## INTRODUCTION

The main aim of any endodontic procedure is the elimination of microbes from the root canal system and prevention of further reinfection, which is achieved by biomechanical cleaning of the pulp space followed by sealing with obturating material. Therefore, recognition of the root anatomy and root canal morphology is important to know before the treatment for the long term success. The majority of the mandibular first molars have one mesial and one distal root with two mesial canals (mesiobuccal, mesiolingual) and one distal canal (Vertucci and William 1974). But mandibular molars with a varied number of roots and root canals have been observed during dental procedures.

Carabelli (1844) was the first one to mention the presence of an additional root in mandibular first molar distolingually and called it as radix entomolaris (RE). Radix entomolaris can be found in the first, second, and third permanent mandibular molars, occurring least frequently in the second molar. When the extra root is present on the mesiobuccal side, it is called as radix paramolaris. The etiology behind the formation of third root in a mandibular molar is still unclear. Supernumerary root's formation could be related to external factors during odontogenesis.

range from 5-30%. However, in Eurasian and Indian populations it is less than 5%. In African populations it is less than 3%. Studies have also showed a bilateral occurrence of radix entomolaris with a frequency of 50-67%.<sup>[2]</sup>

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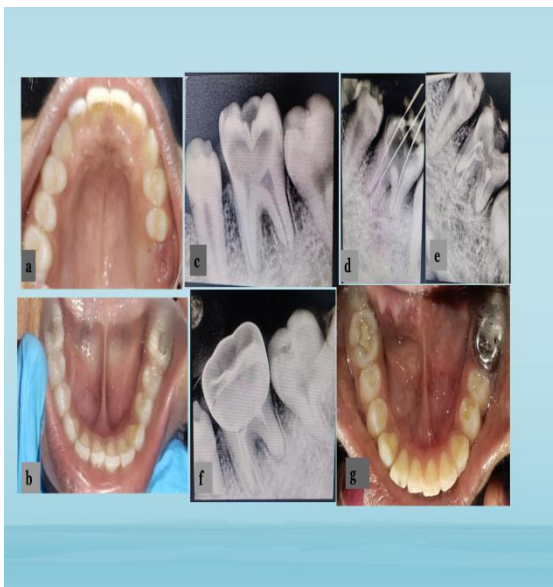
## CASE REPORTS

### Case 1

A 14-year-old female patient reported to the Paediatric and Preventive Dentistry Department with chief complaint of pain in the left mandibular back teeth region. The pain was dull in nature and associated with food impaction. The extraoral examination revealed mesoprosopic facial form and no swelling was present. Intraoral examination revealed a Class I deep occlusal dental caries in tooth number 36. The pulp vitality

test using thermal and electric pulp sensitivity test of the tooth was negative.

On radiographic examination as in Fig.1(c),there was presence of an extra root between mesial and distal roots of the mandibular first molar tooth. Different radiographs were taken at different angles to find the position of the extra root is in the buccal or lingual side. Following the same lingual opposite buccal technique (SLOB technique) it was found that the extra root was located in the lingual aspect and hence it is called Radix Entomolaris.The tooth was painful,so it was diagnosed to be symptomatic chronic irreversible pulpitis.



**Figure 1:** Radiographic and clinical photograph of case 1.

- a) Pre-op Intraoral maxilla
- b)Pre-op Intraoral mandible
- c) Pre-op radiograph
- d) working length
- e) obturation
- f) radiograph with ss crown placed
- g) Post-op intra-oral mandibular photograph

The treatment plan was to do the root canal therapy of the tooth to save the tooth.

First, the local anesthesia was administered. The access cavity was prepared with round and safe-endo bur. After removing the roof of the pulp chamber,four canal orifices were located in which there were two mesial canal orifices and one distal orifice and one orifice was lingually located. The orifice of the radix entomolaris (RE) was located at the lingual aspect of the pulp chamber. The working lengths were determined radiographically. The root canals were instrumented using K-files. During cleaning and

shaping, the root canals were irrigated with copious amounts of 0.9%normal saline. The canals were then rinsed with EDTA (Prime dental products). Biomechanical preparation of the mesiobuccal and mesiolingual canals were done up to no 30 K-file (Dentsply) and the distal canal was prepared up to 35 K-file. As the radix root was narrow, it was prepared only up to 25 K-file.The access cavity was temporarily sealed with temporary restoration(cavit). In the next appointment after one week the root canals were obturated. Initially, the prepared sized gutta-percha master cones for the four canals were selected. The selected gutta-percha master cones were coated with ZOE sealer (Dentsply) and then placed in the canal. After compacting with accessory canals the heated ball burnisher was used to remove the coronal portion of the gutta-percha cone. Then the access cavity was sealed with composite (3M ESPE, USA) and radiograph was taken to evaluate the obturation [Fig 1e ].After two weeks stainless steel crown was placed to the prepared tooth.

## Case 2

A 14-year-old, female patient with the chief complaint of dull pain in the left posterior back teeth region was presented to the Pediatric and Preventive dentistry department.There was not any relevant medical history.

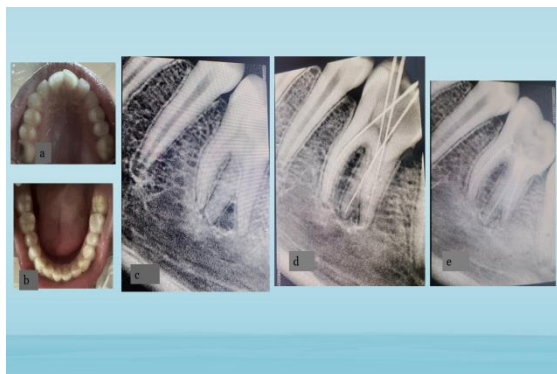
On extraoral examination, no relevant finding was found related to the chief complaint. Intraorally there was a Class I deep-occlusal dental caries in the mandibular left first molar (36).

Preoperative radiograph was taken[Figure 2 c].It revealed the presence of extra root located between the mesial and distal roots. It was planned to save tooth 36 by doing root canal treatment.

Under local anesthesia, access cavity was prepared and root canals were located. Including the orifice of RE four canals were located. The orifice of RE was located between the mesiolingual and the distal canal. The working lengths were determined radiographically [Figure 2 d]. Step back technique was used for cleaning and shaping using K-files.The root canal preparation was done up to size 30 in the mesial root canals and up to 35 in distal canal. RE root was enlarged only up to size 30 at the apex as it was narrow. Copious amounts of 0.9% normal saline and EDTA (Prime dental products) were used as irrigants. Closed dressing was given and the access cavity was temporarily sealed with cavite G (3M ESPE). After 1 week, the patient was completely free of pain and symptoms, so it was decided to obturate the tooth. The gutta-percha master cones for the four root canals were selected according to the prepared size. The root canals were obturated using zinc



oxide eugenol as a sealer. Obturation was done using lateral compaction technique with stainless steel finger spreaders (Mani, Tochigi, Japan). Excess gutta-percha from the pulp chamber was cut with scissors and sealed with ball burnisher at the orifice level. The access cavity was sealed with composite resin and verified radiographically. After 3 weeks, the patient was advised for full coverage restoration.



**Figure 2:** Radiographic and clinical photograph of case 2.

- a) Pre-op Intraoral maxilla
- b) Pre-op Intraoral mandible
- c) Pre-op radiograph
- d) working length
- e) obturation

## Discussion

Knowledge of tooth and root canal anatomy is important for any endodontic practice and for identifying features of anthropologic significance. Normally, permanent mandibular first molars have two roots which are mesial root and distal root and three root canals, but variations in the number of roots and in canal morphology are also found.<sup>[1]</sup>

Radix entomolaris (RE) is not easily diagnosable because of its overlapping by the distal root in radiographs. Radix entomolaris (RE) can become discoverable by a careful correlation between clinical and radiographical examination. There should be a thorough examination of the preoperative radiographs.<sup>[1]</sup>

When examined clinically, intraorally, an additional cusp (tuberculum paramolare) or a cervical convexity may be present which indicates the presence of radix entomolaris (RE).

Cone beam computed tomography is an ideal radiographic diagnostic aid in the management of radix entomolaris (RE) as it provides a three-dimensional view of the extra root its length and location.

If the roof of the pulp chamber is not removed properly then the location of the additional canal orifice becomes difficult because of overhanging

dentin. If the extra root canal remains untreated and infected, it leads to endodontic failure. So, when the location of orifice of radix entomolaris (RE) is distolingually, there should be modification of the classical triangular access cavity to a trapezoidal form so as to better locate and access the root canal.

The radix entomolaris (RE) canal orifice is not clearly visible sometimes after the removal of the pulp chamber roof, so a more thorough inspection of the pulp chamber floor, especially in the distolingual region is necessary. A straight access to these root canals is important for the adequate shaping and cleaning of the canal.

It may be possible that the root canal wall of the radix entomolaris (RE) is very thin. To avoid perforation or weakening of the root, the root canal was only enlarged up to no. 30 K file in both the case reports.<sup>[1]</sup>

The shape of the access cavity must be trapezoidal in order to ensure a straight line access to the canal locating, and preventing instrument separation.

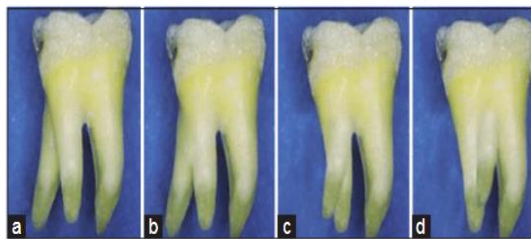
Instrument separation is another unpleasant experience with the radix entomolaris (RE). This is because of the presence of acute curvature in the coronal third in some of the cases. Instrument separation can be prevented by doing proper coronal preflaring. In case of rotary instruments, a flexible instrument with less taper is preferentially used.

Failure to locate and prepare root canal is the most often encountered cause of failure of endodontic therapy in radix entomolaris (RE). This is because of the overlapping of the radix root with the mesial or distal roots in radiographs. So, SLOB technique should be used while taking radiographs.

The root length of radix entomolaris (RE) is often inconsistent. It may be from a few millimeters to equal lengths of the mesial and distal roots length. As the incidence of RE in the South Asian and Indian population is quite higher compared to populations of other ethnic groups it is necessary to diagnose radix entomolaris (RE) radiographically and clinically.

Classification by Carlsen and Alexandersen describes four different types of radix entomolaris (RE) according to the location of the cervical part of the RE: Types A, B, C and AC.<sup>[10]</sup>

Types A refers to a distally located cervical part of the radix entomolaris (RE) with two normal distal root component. Type B refers to a distally located cervical part of the radix entomolaris (RE) and one normal distal root component. Type C refers to a mesially located cervical part while type AC refers to a central location between the distal and mesial root components.<sup>[10]</sup>



**Figure 3: Carlsen and Alexandersen Classification of Radix Entomolaris.**

a) Type A b) Type B c) Type C d) Type AC

A classification by Carlsen and Alexandersen describes

four different types of RE according to the location of the

## CONCLUSION:

The outcome of any root canal treatment depends on access, cleaning and shaping and three dimensional obturation of the entire root canal system. Different radiographic techniques like CBCT technology as well as proper angulation when acquiring radiographs proves helpful in locating canals in first mandibular molars with a high incidence of anatomical variations. A thorough understanding of the prevalence of RE, radiographic and clinical diagnosis will help the clinician in ensuring successful treatment outcomes.

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# Management of Tooth Discoloration via Bleaching: A Case Report

## Abstract

Discoloration especially in anterior region is a matter of concern for aesthetic and pleasing smile. With the advancing treatment options of discoloration includes veneers, crown and bleaching. It varies from minimal tooth preparation to no preparation at all. Advantage of bleaching over veneers and crown is that bleaching is non-invasive treatment. It can be performed in vital and non-vital teeth. It covers a large range from walking bleach /in office bleach, intracoronary bleaching to extracoronary bleaching modalities.

**KEY WORDS:** non -vital bleaching, sodium perborate, hydrogen peroxide, discoloration.

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## INTRODUCTION

When a single chromatic shift takes place, the effect of teeth with pigmentation is more pronounced because the difference with the other teeth is more noticeable [1, 2, 3]. Numerous factors can contribute to non-vital tooth discoloration, such as dental trauma, necrotic debris of the pulp and dentinal tubules, inadequate irrigation, or sealing materials in the pulp chamber or chamber walls [4,5].

Teeth whitening offers a conservative and aesthetic solution and is an option because it is not invasive, such as crowns or porcelain veneer. Chemicals like hydrogen peroxide (HP) (35%), sodium perborates, carbamide peroxide (10%) are used as bleaching agents. One way to bleach is via the walking bleach technique, by putting the active component in the pulp chamber and then sealing the tooth cavities (Indian Journal of Forensic Medicine & Toxicology).

the effectiveness of whitening for discoloured teeth following endodontic treatment with a walking bleach approach that has minimal adverse effects and a good prognosis.

## CASE REPORT

A 24-year-old female came to the Department of Conservative Dentistry and Endodontics MMDCH, Darbhanga with the chief complaint of discoloration of the upper left anterior tooth. The patient has a history of trauma 4 years back, for which she underwent RCT with 21 (pic- 1). The patient wants her tooth colour aesthetically pleasant as adjacent tooth. She has no any history of systemic illness.

Extra oral examination shows a bilaterally symmetrical face. Intra-oral examination shows that the crown of tooth 21 is darker in colour than the adjacent teeth (Pic -1). History of root treated teeth 4 years back wrt 21. Radiographic evidence reveals a well-defined 3D hermetic seal. The patient was asymptomatic at the time of clinical evaluation.

The patient was well informed about her treatment plan, the consequences, the side effects of using bleaching agents, and the number of visits the treatment should be done. In the first visit all the coronal restorative materials were removed and a space was created for the placement of an intracoronal bleaching agent i.e. sodium perborate mixed with hydrogen peroxide (35%).

Sodium-perborate is a safe bleaching material. This material also has a slower peroxide liberation and it is considered more potent than hydrogen peroxide. This slower release of hydrogen lightens the staining. The use of perborate sodium and carbamide peroxide as an alternative to hydrogen peroxide is now recommended<sup>6</sup>. One of the main disadvantages of intracoronal bleaching with HP was external cervical root resorption of the tooth. Excessive HP diffuses into the periradicular tissues, possibly leads to cervical root resorptions in the bleached teeth<sup>7</sup>. Sodium perborate can be used alone or in a combination of hydrogen peroxide, it may take slower time for significance changes.<sup>8</sup> A barrier with GIC was created at 2 mm below CEJ for the prevention of leaching of bleaching agents to sealing materials (fig-2). The resultant shape from a facial view is the “*bobsled tunnel*” outline (fig - 2).

The pulp chamber was given with cotton pellet and covered with zinc phosphate cement. The patient was recalled 1 week later. The tooth colour was matched using the Vita shade guide (fig-1). On the third visit, a subjective examination was conducted and there was no complaint from the patient (fig -4). Two weeks later, the tooth was restored by composite materials (fig-5). A total of three dressings were given at weekly intervals. A permanent restorative material was placed 2 weeks after bleaching procedures.



fig-1 Discoloration wrt 21.



fig-2 GIC barrier formation



fig-3 After 1 week



fig-4 After 3 weeks



fig -5 After composite restoration .



fig-6 After 3 month recall.

## DISCUSSION

Tooth discoloration especially in anterior region affects the person aesthetically and psychologically leading to low self-esteem. Amongst all the treatment modalities such as crown, veneering, bleaching is a noninvasive conservative treatment approach for discoloration in traumatic anterior tooth. Necrosis in the tooth 21 is caused by trauma that occurred about 4 years ago. The main Physiology behind the tooth discoloration are Erythrocyte lysis and intra-pulpal haemorrhage are the results of dental trauma. The dentinal tubules will be gradually penetrated by blood or blood components that wash the pulp chamber, discolouring the tooth crown. The degree of discoloration depends on how long the pulp has undergone necrosis; the longer the coloured chemicals have been present in the pulp, the more discoloration<sup>9</sup>.

The fundamental idea of most bleaching procedures is the gradual oxidation of the dye with

breakdown, despite the fact that bleaching is a complicated chemical process. The bleaching material undergoes an oxidation reaction with the organic structure of the hard tooth tissue. Long-chain pigments gradually break down into simpler molecules with a brighter colour, like carbon dioxide, oxygen, and water. Inorganic molecules do not decompose; this reaction, known as a reduction-oxidation reaction, is what gives bleaching its name. Unstable peroxide typically transforms into unstable free radicals. Other compounds are oxidised by these free radicals<sup>9-11</sup>.

One potent oxidizer is hydrogen peroxide. Because it must be kept in the refrigerator and kept in a dark container, using high concentrations of hydrogen peroxide requires caution because they are unstable thermodynamically and have the potential to explode. The plastic and plugger devices can be used to apply bleaching materials, which need to be changed every three to seven days. 2-4 treatments appointment are often required, depending on the degree of discolouration and patient satisfaction. In order to avoid over bleaching, the patient needs to be reminded to examine her teeth every day<sup>12</sup>. Because peroxide has a relatively low molecular weight (30 g/mol), hydrogen peroxide will release and seep into the surface of enamel and dentine when this material comes into contact with teeth. These compounds are reactive and target dark chromophores.

For successful intracoronal bleaching appropriate case selection, proper diagnosis, history, follow up is vital. Indications for intracoronal bleaching are endodontically treated teeth, and discoloration that can't be removed via external bleaching. The number of appointments varies from 2-4 depending upon the severity of the discoloration of the concern teeth. A barrier with gic has been made below 2 mm of CEJ to prevent any leakage of the bleaching agent. The leakage which occur can cause cementum necrosis, and inflammation of the periodontal ligament so that eventually root resorption occurs. A waiting period of 2 week should be taken before the placement of composite, because the bleaching or oxidizing agent can interfere with the bond strength of composite.

## CONCLUSION

Intracoronal bleaching is one of the best treatment modalities of rct treated traumatized tooth. This kind of bleaching provides good aesthetics and economic benefits to the patients. The type of intrinsic stain can play a significant part in the outcome of tooth bleaching, and the choice of treatment depends on clinical experience and judgment of the dentist in the context of the patient's circumstances<sup>12</sup>.

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# Nifedipine - Influenced Gingival Enlargement - A Case Report

## Abstract

Gingival enlargement has a multifactorial nature and is affected by factors such as age, demographic variables, genetic predisposition, oral hygiene status, pharmacokinetic variables (dose and duration of the time the drug is taken, sequestration of the agent in the gingival cervicular fluid) and molecular & cellular changes in gingival tissues. Evidence support the fact that the plaque induced gingival inflammation exacerbates the expression of drug influenced gingival overgrowth. Disproportionate, disfiguring, aesthetically and functionally, compromising overgrowth of gingival tissue necessitates the need for precise diagnosis and pertinent management. Gingival enlargement may result in interference with normal masticatory function, speech, difficulty with oral hygiene maintenance and malpositioning of teeth. This article reports a case of 65yr old female patient with Nifedipine-Influenced Gingival Enlargement (NIGE) and with poor oral hygiene maintenance. NIGE patient responded well to the alteration of the medicine, thorough Scaling & Root Planing (SPR) - with stringent home care procedures and strict follow-up.

**Key words:** Nifedipine, Gingival Enlargement

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## Introduction

The size of the gingiva corresponds with the sum total of the bulk of cellular and intercellular elements and their vascular supply. Increase in the size of gingiva is called gingival enlargement or gingival overgrowth. Alteration in the size of gingiva occurs in response to interaction between the host and the environment, this represents an inflammatory response to bacterial plaque (Loe et al. 1965). Various systemic factors and conditions that increase the susceptibility to gingival overgrowth; Pregnancy, Puberty, Nutrition Associated, Scurvy, Multi System Syndrome, Leukemia, Wegener Granulomatosis, Sarcoidosis, Genetic predisposition, Hereditary or Familial

Gingival fibromatosis, Plasma cell enlargement, Non-specific conditioned enlargement (pyogenic granuloma), mouth breathing, an Idiopathic variant where-cause has not been described, selected drugs and agents.

According to the 2017 World Workshop on the classification of Periodontal and Peri-implant diseases and conditions, Drug-Influenced Gingival Enlargement (DIGE) is included under gingivitis–dental biofilm induced. Drugs like Anticonvulsants; Hydantoins (Ethotoin, Mephentyoin, Phenytoin), Succinimides (Ethosuximide, Methsuximide, Phensuximide),

Valproic acid (Valproic acid), Immunosuppressive agents like Cyclosporin A and Calcium Channel Blockers have been found to be associated with gingival enlargement.

Calcium channel blockers are a group of drugs developed to manage cardiovascular conditions like hypertension, angina pectoris, coronary artery spasm and cardiac arrhythmia. They are classified based on their chemical composition as Benzothiazepine derivatives (eg. diltiazem), Phenylalkylamine derivatives (eg. verapamil), Dihydropyridines (eg. Amlodipine, felodipine, isradipine, nifedipine, nifedipine, nitrendipine, oxodipine, nimodipine, nisoldipine) (Hassell et al. 1991, Seymour et al. 1991). The primary undesirable side effects results from excessive vasodilatation, which manifests as facial flushing, dizziness, headache, tremor, joint stiffness, dermatitis, puritis, urticaria, peripheral edema and gingival hyperplasia (Lewis 1983).

Ramon et al. in 1984 published the first report in the scientific literature associated with nifedipine-influenced gingival enlargement (NIGE). The prevalence of NIGE has been reported to be 15%-83% (average 42.5%) (Barclay et al 1992). This wide prevalence rate may be attributed to variation in population characteristics, sample size and methods of evaluating the gingival enlargement. Nifedipine concentration in gingival crevicular fluid was 15 to 316 times greater than plasma levels. A minimum concentration of up to 800ng/ml can cause gingival overgrowth. The degree of overgrowth depends on increased concentration above the threshold value, and also depends on the host susceptibility and sensitivity. Gingival enlargement itself can cause difficulty in oral hygiene maintenance thereby leading to secondary gingival enlargement. Gingival enlargement can be transient and reversible or can be chronic and irreversible. The objective of this study was to present a case report showing the reversible nature of drug-induced gingival enlargement after altering the medication along with scaling, root planning and proper oral hygiene maintenance.

## Case Report

A 65yr old female patient reported to the Department of Periodontics and Implantology, with the chief complaint of pain, swollen and bleeding gums. A thorough medical and dental history was taken. Patient was found to be hypertensive and was on Nifedipine for 8yrs. The gingival tissue was friable, easily bleed on probing, exudate, severe halitosis and pseudopockets were present. On clinical examination, combined gingival enlargement was seen (both drug influenced and Inflammatory).

The enlargement was generalised and diffuse, limited to the marginal, papillary and attached gingiva, more prominent on the labial and buccal surface of the maxillary & mandibular parts of the gingiva. The enlarged gingiva appeared erythematous, edematous, smooth, shiny, nodular, extending coronally and partially obscuring the tooth, presenting both aesthetics and functional problems to the patient (Figure:1,3 & 5). A less inflammatory, fibrotic, lobulated, firm resilient and pink gingival enlargement was seen on the lingual and palatal surfaces of the mandible and maxilla respectively (Figure:7,8,(supplementary figure)). The gingival enlargement accompanied with poor plaque control was seen.

In this case because of the fear of bleeding and pain the patient was not maintaining the oral hygiene. As the tissue became larger the plaque control became more difficult. Secondary inflammatory process exist that complicates the gingival enlargement caused by the drug. According to Bokenkamp & Bohnhorst 1994 index for severity and extent of gingival enlargement gingiva presented a Grade III enlargement. Plaque is a primary requisite for NIGE, severity of gingival overgrowth is directly proportional to the degree of plaque build-up and plaque induced inflammation, minimal or no plaque can also cause NIGE. Diagnosis is made by clinical examination and patients past and present medical history. Full mouth IOPA and OPG is required to rule out periodontal disease, complete blood count to rule out anemia, leukemia, in case the presentation of the disease is unusual – tissue biopsy, histopathological examination is mandatory to evaluate malignant changes, culture to rule out candidiasis and other infection. The differential diagnosis include inflammatory gingival enlargement, familial or hereditary conditions e.g. Familial fibromatosis, idiopathic fibromatosis, hereditary gingival hyperplasia, scurvy, systemic diseases, leukemia, tuberculosis, sarcoidosis (their diagnosis can be corroborated hematologically) and gingival tumors. A thorough history, physical, clinical examination and investigation including biopsy may be required to confirm the etiology.

The case was diagnosed as nifedipine-influenced gingival enlargement (NIGE). Management strategies – Primary aim was to alleviate patients discomfort enabling them to chew, eat, reduce swelling and give a better cosmetic appearance to the gingiva. Non-surgical approach is the first line of treatment, including professional plaque control, self-maintained oral hygiene care, NSAIDS, antibiotics, topical antifungal and folate supplementation, followed by discontinuing or changing the medication. 6-12 months should be

allowed before surgery is considered, conventional gingivectomy, gingivoplasty, periodontal flap surgery, electrocautery, CO2 laser 10600nm can be used to correct gingival enlargement. Laser is preferred over the scalpel as it has strong bactericidal and hemostatic effects. Consultation with the physician was done for consideration in alteration of the medication and determination of patients risk status relative to oral prophylactic procedures. Nifedipine was replaced by Verapamil ( 5mg ). Thorough systematic, ultrasonic scaling and root planing (Cavitron) was done under local anaesthesia (Lidocaine hydrochloride injection BP 2% w/v).

Amoxicillin 500mg and Metronidazole 400mg 3times a day for 8days was started before scaling, along with an analgesic Ibuprofen 3times daily for 3 days. Chlorhexidine gluconate 0.20% mouth wash 4times daily for 3 weeks and Metrogyl DG gel forte 20mg was prescribed. Gingival massage using thumb and index finger to make circular motions around each tooth individually, going around the gingiva, was taught to the patient. Patient was instructed to brush twice daily, patient was trained for Bass method of brushing. Periodic reassessment, reinforcement and scrupulous plaque control measures were done. At 4 weeks follow-up significantly successful reduction in NIGE was achieved.

The gingiva appeared pink, firm and resilient, appreciable reduction in gingival overgrowth (Figure:2,4,6). Though appreciable response was seen, the patient was informed of the tendency of recurrence of gingival overgrowth. A second line of treatment surgical management of gingival enlargement comes in play when medical treatment is unsuccessful, repeated recurrence of the gingival enlargement, and when patient cannot sufficiently maintain the oral hygiene. In this particular case surgical management of gingiva was not necessary, as the patient responded well to the nonsurgical therapy.



**Fig.1 NIGE Labial Surface**



**Fig.2. Labial Surface After Scaling and Root Planing**



**Fig.3. NIGE Buccal Surface**



**Fig.4. Buccal Surface after Scaling and Root Planing**



**Fig.5. NIGE Buccal Surface**





**Fig.6. Buccal Surface after Scaling and Root Planing**



**Fig.7. NIGE Lingual Surface**



**Fig.8. NIGE Palatal Surface**

## Discussion

Calcium channel blockers act by inhibiting calcium ion influx across the cell membrane of cardiac and smooth muscle cells, thereby interfering or blocking mobilization of calcium intracellularly. It interferes with calcium influx and calcium dependent processes inside the cells. This results in dilatation of coronary arteries and arterioles, decreased myocardial contractility and oxygen demand. These agents reduce cytosolic calcium levels in gingival fibroblast and T cells thus interfering with T cell proliferation or activation and collagen synthesis by gingival

fibroblast. Fibroblast functions; such as proliferation, differentiation and production of extracellular matrix are affected by levels of cytokines and growth factors. Lucas et al suggested that gingival overgrowth results from overproduction of extracellular ground substance characterized by increased presence of sulphated mucopolysaccharides (glycosaminoglycan), collagen and abundant active fibroblast (increased protein and collagen). The enlargement is both fibrotic and inflammatory. Preponderance of inflammatory cells, fluid, with vascular engorgement and new capillary formation. Gingival enlargement lesions are characterised by increased levels of interleukin-6 (IL-6), IL-1 $\beta$ , platelet-derived growth factors subunit-B (PDGFB), fibroblast growth factor 2 (FGF2), transforming growth factor- $\beta$  (TGF- $\beta$ ) and connective tissue growth factor (Trackman et al. 2015). Macrophages are the main sources of the cytokines. There is altered macrophage balance and decreased apoptosis. In DIGE there is greater fibroblast proliferation rates, DNA synthesis and collagen synthesis. Decreased collagenolytic effects of inflammatory cells and decrease in synthesis of collagenase.

This report is not complete, without the mention on the histological features of gingiva in NIGE. The epithelium exhibits parakeratosis, proliferation, elongation and tubular rete pegs consisting of layered basal cells, that extends some distance into the lamina propria. Thickening of spinous cell layer, slight to moderate hyperkeratosis, fibroblastic proliferation and fibrosis of lamina propria accompanied by increased capillary vascularity and slight perivascular inflammation. A tenfold increase in width of epithelium was noted, inflammatory changes accompanied by edema and infiltrates of lymphocytes and plasma cells. Nifedipine influenced gingival enlargement coexist with periodontitis and attachment loss.

Some studies indicate that bacterial plaque is pre requisite for the disease to occur which therefore could be prevented by plaque removal and fastidious oral hygiene, on the contrary others believe that the presence of dental plaque is a consequence of the difficulty that the gingival enlargement represents - the dental hygiene, which then exacerbates the severity of the overgrowth. Gingival overgrowth induced by nifedipine in a patient with good oral hygiene was reported by George Sam et al. 2014. Calcium channel blockers influenced gingival enlargement has been reported around dental implants (Quach et al. 2020). The severity of gingival enlargement in patients taking medications correlates well with poor plaque control and is commensurate with the degree of

plaque induced inflammation. This is supported by the fact that edentulous areas did not show signs of enlargement in most reported cases. The enlargement in most cases have a predominant inflammatory component that often requires only an improvement in plaque control. Cessation / Alteration of the associated agent has been shown to result in tissue reduction. DIGE has a good prognosis and is generally reversible on stopping or substituting the offending drug . 6- 12 months should be allowed before surgery is considered, conventional gingivectomy, gingivoplasty, electrosurgery, lasers and modified flap operations are carried out.

There are no comprehensive description of cases managed effectively with drug substitution alone. Conventional gingivectomy, gingivoplasty, electrosurgery, lasers and modified flap operations are carried out. In cases of severe gingival overgrowth where drug therapy cannot be altered, lesions recur after surgical excisions and require, repeated surgical interventions. Cessation of the associated agent has been shown to result in tissue reduction. In this particular case conventional gingivectomy and gingivoplasty were not needed. Control of gingival inflammation and maintenance of effective oral hygiene were key factors in preventing and managing gingival overgrowth. Supportive follow-up was done. Similar reports and reviews on nifedipine were published by Brown et al 1991.

Should observe for recurrence 3-6months after procedure, in general the results last for atleast twelve months. Individual case reports have shown that meticulous self-administered oral hygiene, alongside professionally delivered oral hygiene and scaling and root planning can result in complete resolution of nifedipine-influenced gingival overgrowth (Hancock & Swan 1992). However it should be emphasized that these were only case report and lacked controls.

Patient education, dental brushing and flossing techniques, regular appointment with dentist to perform professional cleaning of the teeth. These measures can prevent or decrease the rate and the degree to which recurrence occurs. At the end of 4weeks inflammatory component had reduced dramatically the gingiva appeared pink, firm and resilient, appreciable reduction in gingival over growth. The case was followed for a period of one year.

## Conclusion

This case report of nifedipine-influenced gingival enlargement it suggests that improving plaque control and the resultant reduction in

inflammation, reduces the development and recurrence of gingival overgrowth. Alteration in the medication and zealous oral hygiene maintenance efforts were extremely important to the prevention and therapeutic management of nifedipine-influenced gingival enlargement.

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## **Conflict of Interest**

The authors did not have any conflict of interest.  
Clinical Relevance

## **Scientific Rationale for Study:**

Patients taking nifedipine are at high risk for gingival overgrowth, and the plaque induced gingival inflammation acts as a predisposing factor. In this case report a detailed description of diagnosis, clinical feature, a note on pharmacokinetics and histopathology are mentioned, along with its management.

## **Principle Findings:**

Nifedipine influenced gingival enlargement responded well to substitution of the drug and non-surgical oral prophylactic procedures.

## **Practical Implication:**

As there is an increase in the number of patients with gingival overgrowth in the clinical practice. A thorough understanding of the etiology, clinical features, pathophysiology, histology, diagnostic techniques, differential diagnosis and management of gingival enlargement is an absolute necessary in today's clinical practice.

# Rehabilitation of Fractured Tooth Segment with Fiber Post and Core Build Up: A Case Report

## Abstract

Trauma to the anterior teeth is a relatively common occurrence. The main objective while treating such cases is successful pain management and immediate restoration of function, esthetics, and phonetics. Since the development of adhesive dentistry, the patient's own fragment can be used to restore the fractured tooth. The procedure is simple and economical and needs less chair-side time as compared to many conventional methods. In addition, the procedure provides good and long-lasting function and esthetics, because the original morphology, color, and surface texture are maintained. This article reports the management of complicated crown fractures in a middle-aged adult that was successfully treated by reattachment technique. The teeth were endodontically treated followed by esthetic reattachment of the fractured fragment using the glass fiber post.

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## INTRODUCTION

Crown fractures are common after traumatic injury to teeth, particularly in the upper front region<sup>1</sup>. A significant portion of all dental injuries are complicated crown fractures involving the enamel, dentin, and dental pulp; these fractures are most frequently observed in maxillary central incisors.<sup>2</sup> Immediate attention is needed for trauma to the anterior teeth resulting in fracture fragments since it not only damages the dentition but also has a psychological impact on patients.<sup>3</sup> Managing complicated crown fractures requires considering various factors such as the extent and pattern of the fracture, the restorability of the tooth, secondary injuries, the presence or absence of a fractured tooth fragment, occlusion,

one method of treating coronal tooth fractures, particularly in cases where there is little to no biological width violation and the shattered piece is kept in place. Reattaching a fragment to a fractured tooth can preserve the tooth's natural surface texture, colour, and anatomic form, making for good and long-lasting aesthetics.<sup>4</sup> For complex fractures with closely adjacent segments, root canal treatment (RCT) and reattachment with fiberpost-reinforcement are viable options. Fibre posts luted with resin cement may improve segment retention and provide a monoblock look.<sup>2</sup> Tennery was the first to report the reattachment of a fractured fragment using the acid-etch technique. Subsequently, Starkey and Simonsen have reported similar cases.<sup>3</sup>

This paper reports a case of a complicated coronal tooth fracture that was successfully treated using tooth fragment reattachment along with post-insertion.

## CASE REPORT

A 48-year-old male patient reported to the Department of Conservative Dentistry and Endodontics at Mithila Minority Dental College and Hospital with a chief complaint of fractured upper left lateral incisor. On clinical examination, a fracture line was visible on the labial surface of maxillary left lateral incisor (Figure1). Clinical and Radiographic examination revealed a horizontal fracture (Ellis class III) in the gingival third region of the crown part. The patient was in acute pain and the coronal tooth fragment was mobile. No mobility of the remaining tooth was evident and surrounding intraoral soft tissues were normal. The fractured fragment was removed and washed thoroughly under running water and stored in sterile normal saline to prevent dehydration and discoloration (Figure3).

Local anesthesia was administered (lidocaine 2% with 1: 80,000 epinephrine) and the fractured segment in relation to 22 was atraumatically removed (Figure2). It was then cleaned with 2% chlorhexidine solution and stored in isotonic saline solution. Access was gained palatally through the fractured region. The coronal pulp tissue was removed and the chamber was irrigated with 5.25% sodium hypochlorite (NaOCl) and normal saline. Initial negotiation of the root canal was performed with a no. 10 k-file and working length was estimated with the help of Apexlocator. The canal was cleaned with 17% ethylenediaminetetraacetic acid (EDTA) and 5.25% sodium hypochlorite and shaped with hand files, by lateral condensation technique. The root canal was dried with absorbent paper points obturated with 2% gutta-percha points and Ah plus sealer. The post space was prepared using Peeso reamers, leaving apical 5 mm of Gutta-percha. A glass fiber post of diameter 1.1 mm (Reforpost GlassFiber) was selected (Figure5). The coronal part of the fiberpost was cut to fit into the coronal fractured fragment and the fragment was aligned with the apical part of the tooth fragment. fiberpost was luted using a dual cure resin cement, the fractured fragment stored in isotonic saline was taken out, and the dowel was made towards the pulpal surface of the fragment so that the extended fiberpost from the root canal was accommodated in the dowel prepared, after that the fracture site reattached using resin cement and the fractured fragment was placed in a position so that the extended fiber post fits well into the dowel made on the fragment and gently

pushed to approximate both the fragment and the fracture site (Figure6). Later the extra material was removed and finishing and polishing was done.



Figure1: Preoperative frontal view



Figure2: Preoperative frontal view after fragment removal



Figure3: Tooth fragment kept in normal saline



Figure4: Preoperative radiograph



Figure7: Postoperative radiograph



Figure5: Fiberpost inserted into canal



Figure6: Postoperative photograph after reattachment

## DISCUSSION

Treatment options for crown-root fractures include composite restoration, post-and-core supported prosthesis, gingival reattachment, surgical exposure of the subgingival fracture, orthodontic extrusion, and tooth extraction. Newer dentin bonding materials have made reattaching shattered fragments a reliable therapeutic option. Reattached teeth may withstand shear forces, just as undamaged teeth.<sup>5</sup> Reattaching the fragment improves aesthetics with a life-like translucency, reduces incisal edge abrasion, replaces the fractured portion quickly, provides a positive psychological response, and is a cost-effective procedure.<sup>6</sup> Reattachment success depends on factors such as time after trauma, fracture location, fracture size, pulpal involvement, root formation status, periodontal condition, biological width invasion, post type, and material used.<sup>7</sup> Resin-based restorative materials with tooth-colored fiber posts may be the best option due to their elastic modulus, aesthetics, strong bonding with cement, shorter chair time, and minimal tissue removal. Using a fiber post to connect fractured teeth reduces stress on the reattached tooth fragment.<sup>8</sup> Fiber-reinforced posts offer numerous advantages over metal posts. Their advantages include being passive, tooth-colored, more flexible than metal posts, and having a modulus of elasticity similar to dentin. Resin cement adheres better to surfaces with imperfections, requiring minimal preparation.<sup>9</sup> The tooth's resistance to fracture may be impacted by the reattachment material. According to Reis et al., the reattachment process has a bigger impact on the fracture strength of the reattached teeth than the reattachment materials. Singhal and Pathak examined the fracture resistance of teeth that had been reattached using



various materials, such as dual-curing resin cement, compomer, composite resin, and resin-modified glass ionomer cement. Composite resin exhibited the highest fracture resistance, while resin-modified glass ionomer cement displayed the lowest fracture resistance.<sup>10</sup>

Reattachment restores the original form, colour, and surface morphology of a fragmented tooth. This method preserves the native tooth structure with minimal or no preparation needed. The procedure is simple, rapid, and cost-effective.<sup>7</sup>

## CONCLUSION

Adhesive dentistry has revolutionized modern clinical restorative dentistry. Immediate aesthetic therapy of traumatic injuries requires proper planning based on an understanding of current procedures, indications, and risk-benefit ratios.

Tooth fragment reattachment is a safe, rapid, and aesthetic treatment for reattaching fragmented teeth. Advancements in adhesive techniques and materials have made reattaching dental fragments a viable restorative operation.

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# BIO MARKERS IN ORAL LICHEN PLANUS

## Abstract

Oral lichen planus (OLP) is a relatively common chronic mucocutaneous disease that affects up to 2% of the general population. Despite its prevalence, this condition is associated with historical controversies about its pathological behaviors, as OLP lacks highly specific diagnostic features. OLP was therefore classified as an oral potentially malignant disorder (OPMD), which in turn has led to unnecessary psychological and financial burdens to both patients and health care providers. To overcome this difficulty, numerous studies have been devoted to identifying biomarkers, which enable early identification of patients who may benefit from a particular treatment modality or at risk for poor prognosis. Biomarkers are protein molecules, gene expression, DNA variants, or metabolites that are derived from tumors, adjacent normal tissue, or bodily fluids, which can be acquired before treatment and during follow-up, thus extending their use to the evaluation of disease progression and prediction of treatment outcome.

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## INTRODUCTION-

Lichen planus is a chronic mucocutaneous condition that was first described in 1869 by the dermatologist Erasmus Wilson to describe lesions patients found in a set of 50 patients. (Wilson, 1866). The word “lichen planus” was derived from the Greek word *leichen* which means tree moss and the Latin word *planus* which means flat. While lichen planus can develop at different parts of the human body like the scalp, nails, and skin, it is mostly seen in the oral cavity and is known as Oral Lichen Planus (OLP) [1].

However, in contrast to the pruritic and self-limiting nature of cutaneous lichen planus, OLP is commonly chronic, rarely remissive, and considered a source of morbidity in some cases. Despite extensive study, OLP is considered one of the most debatable conditions in the oral medicine and pathology field.

OLP alone. Consequently, it is not uncommon to misdiagnose other oral lesions as OLP, which has caused considerable debate about its malignant transformation potential. As a result, OLP is classified as an oral potentially malignant disorder (OPMD) [2].

## EPIDEMIOLOGY

OLP is a common non-infectious mucocutaneous condition of the oral cavity. It has been reported that patients with lichenoid- mimicking features, either clinically or histologically, are the most common type of patients in oral medicine clinics, and approximately 15% of patients with OLP exhibit genital or cutaneous lichen planus.

Overall, it is believed that the highest prevalence of OLP is in Europe while the lowest is in India. However, rates of OLP in India may be significantly underestimated due to the high usage rates of tobacco products, and resulting prevalence of smoker's keratosis, which can act to camouflaged clinical presentations of OLP [3].

A Swedish demographic study that included more than 20,000 patients found an overall prevalence of OLP of 1.9%, with an increased tendency among females compared to males.

## ETIOLOGY

The etiology of OLP is not fully understood. However, the literature suggests that OLP is a T-cell mediated immune response to an unknown trigger. *Kurago et al* in 2016 proposed several potential OLP triggers, mainly local and systemic inducers of cell-mediated hypersensitivity reactions, stress, an autoimmune response to an epithelial antigen, and viral infection.

Hypersensitivity reactions are often implicated in the pathogenesis of a variant of OLP called oral lichenoid lesion (OLL). OLL describes a group of oral lesions similar to OLP but lacking the typical clinical and /or histopathological appearance of OLP. Viral infections have also been investigated as a potential trigger for OLP, with several studies assessing the association between OLP and various viral infections like cytomegalovirus, Epstein-Barr virus, human papillomavirus, hepatitis B virus, and hepatitis C virus (HCV) [4].

## HISTOPATHOLOGICAL CHALLENGES IN THE DIAGNOSIS OF ORAL LICHEN PLANUS

The clinical and histopathological features of OLP are variable and greatly influenced by several factors like the anatomical site, the clinical subtype, disease activity at the time of diagnosis, and the presence of other synchronous oral inflammatory lesions. However, neither clinical features nor histopathological features are specific to OLP and can be seen in other oral lesions.

The literature notes several characteristic microscopic features of OLP: hyperparakeratosis and hyperorthokeratosis, the presence of cytoid (Civatte) bodies, basal cell hydropic change, and a band-like of predominantly lymphocytic infiltrate in the lamina propria, saw-tooth rete ridges, and a narrow band of eosinophilic material in the basement membrane. Some of these features make a pattern known as interface mucositis and is considered a hallmark of OLP [5].

## BIO MARKERS IN ORAL LICHEN PLANUS

A trait that is measured as an indicator of pathogenic processes, normal biological processes, or reactions to an exposure or intervention is called a biomarker. Various metabolites, proteins, RNA, and DNA have been found to be biomarkers in OLP. Saliva was suggested as an appropriate biological sample to investigate biomarkers because of its noninvasive nature and wide range of compounds. In OLP, certain biomarkers that showed no abnormalities when examined in serum also showed substantial variations when examined in saliva. As of right now, opinions differ about which salivary biomarkers are best suited for therapeutic usage in head and neck premalignant diseases. Thorough evaluation of salivary biomarkers that have already been discovered is equally crucial as presenting new targets as biomarkers [6].

The ability to detect germ-line mutation indicators is crucial in identifying people who are at risk of cancer and who might not respond well to a particular cancer treatment. The cell cycle, apoptosis, and cancer risk are associated with polymorphisms in the p53/p73, CCND1, MDM2, and Harvey Ras (H-Ras) genes.

## Antioxidant and peroxidation level

It has been demonstrated that, in comparison to control healthy persons, the salivary levels of peroxidation products, such as malonaldehyde (MDA) and 8-hydroxydeoxyguanosine (8-OHdG), and antioxidants, such as vitamin C and E, were higher in OLP patients. Following more than 200 days of curcumin administration, antioxidant levels rose whereas peroxidation products (oxidants) declined [7].

As a result, the antioxidant levels of vitamins C and E may be a good biomarker to identify precancerous diseases such as OLP. Furthermore, research has shown that serum anti-gastric parietal cell autoantibody (GPCA) is present in a number of distinct OLP patient groups. Signs and symptoms of oral lichen planus, such as reticular, erosive, or ulcerative oral mucosal lesions, as well as pain or burning sensation in the lesional oral mucosa, are present in the group of GPCA-positive OLP. Additionally, levamisole combined vitamin B12 treatment for OLP patients resulted in a considerable drop in GPCA levels. The improvement of the lesions in the buccal mucosa was consistent with this GPCA level drop. Consequently, serum GPCA level is a promising biomarker for the diagnosis of oral lesion planus [8].

## Cortisol

A study demonstrated a correlation between the occurrence of OLP and salivary cortisol levels. As a result, salivary cortisol levels may be used as a possible marker for the emergence or progression of OLP lesions. R. Girardi et al. examined psychological variables, dehydroepiandrosterone (DHEA), and salivary cortisol levels in OLP patients.

In that study, the age and sex of 31 OLP patients were matched with an equal number of healthy participants. Patients' levels of anxiety and depression were assessed using the Beck test. There was no discernible variation in the salivary cortisol levels between the OLP and control groups [9].

In a different investigation, Ghalyani et al. and Tavangar et al. discovered that lichen planus patients had lower salivary cortisol levels than non-infected people. Additionally, it was discovered that OLP patients had far lower cortisol levels than the control group. Furthermore, the results of the SCL-90 questionnaire indicated that these patients had higher levels of anxiety and depression. In conclusion, despite some disagreements regarding the relationship between cortisol and OLP, any disruption in the hypothalamic-pituitary-adrenal (HPA) axis in individuals suffering from anxiety and depression results in decreased blood and salivary cortisol secretion and can lead to immune system disorders such as lichen planus [10]. Cortisol also causes a decrease in the number of lymphocytes and other immune cells.

### Immunoglobulin

Increased levels of IgG and IgA were found in patients with lichen planus investigated by Sistig et al. IgA and IgG levels were assessed by Ghalayani et al in patients with lichenoid response lesions and OLP. The findings indicated that both groups' IgA and IgG levels were higher in sick than in healthy individuals. It has been noted that patients with oral leukoplakia, oral lymph node cancer, and oral cavity carcinoma have elevated salivary IgA levels. Additionally, although the difference was not statistically significant, patients with OLP had greater IgA levels than healthy individuals in a study done in collaboration with us[11].

### Bio markers in peripheral blood

Biomarkers, such as host and viral DNA, RNA, proteins, cells, and metabolites, are abundant in peripheral blood. A member of the Papillomaviridae family of viruses is HPV. Using

polymerase chain reactions, it is possible to assess the HPV viral genome in peripheral blood in an efficient manner. Not only does the presence of HPV indicate the cause of oral malignancies, but it also indicates the prognosis that may follow.

In tissues, the expression of the p16 protein, also known as CDKN2A, is a closely linked surrogate biomarker for HPV, with 80% to 90% concordance between the two detections. Improved treatment results were correlated with higher p16 levels. On the other hand, the prognosis is bad for CDKN2A somatic mutations that disrupt function. In addition to the viral genome, peripheral blood mononuclear cells (PBMC) are frequently used to harvest human genomic DNA for research purposes. Human genomic DNA contains the blueprints for both healthy and diseased bodies, and germline variations represent individual differences. As a result, genomic DNA has been examined to look for telltale signs of oral lichen planus. A meta-analysis of case-control studies conducted up until 2010 revealed that XRCC1 codon 194 and 399 exonic variations, and the Asp312Asn variation of XPD, are frequently linked to the development of oral lichen planus [12,13].

Researchers have also looked into using human genomic DNA extracted from peripheral blood to identify biomarkers related to a patient's prognosis in relation to particular treatments. Treatment

BIO MARKERS	INDICATION	TYPE
HSP70	OCCURRENCE	PROTEIN
XPB	OCCURRENCE	GERMLINE VARIANT
XRCC	OCCURRENCE	GERMLINE VARIANT
ATM	OCCURRENCE	GERMLINE VARIANT
IL 17	PROGNOSIS	CELL
IL 2R	PROGNOSIS	PROTEIN
BCL2	PROGNOSIS	PROTEIN
EGFR	TREATMENT SIDE EFFECT	GERMLINE VARIANT
KRAS	TREATMENT SIDE EFFECT	GERMLINE VARIANT
ERCC1	PROGNOSIS	PROTEIN
LACTIC ACID	OCCURRENCE	METABOLITE
VALINE	OCCURRENCE	METABOLITE

outcomes have been demonstrated to be correlated with germline variations in genes such as Tp53, ATM, BCL2, TGF $\beta$ , which are involved in cell cycles, apoptosis, and maintaining cellular integrity [14].

**Table 1 – Bio markers in oral lichen planus**

### Bio markers in oral tissue

Tissues are brimming with molecular traits that are intimately linked to every one of the hallmarks of precancerous lesions, including anti-apoptosis, invasiveness, uncontrolled cell cycle, and metastasis. The DNA of the malignantly altered cells and tissues has somatic mutations. Numerous somatic, function-disrupting mutations in oral malignancies have been linked to a poor prognosis. These mutations are found in genes like Tp53 that protect the integrity of the cell. A worse prognosis was also linked to a lower Tp53 protein level.

Conversely, localized amplification of the cell cycle regulating gene CCND1 is often found and is linked to poor survival. Immunohistochemistry (IHC) staining of the CCND1 protein level is linked to lymph node metastasis and a poor overall prognosis; EGFR mutations, DNA copy number alterations, and protein level are the causes of this. Adverse effects were linked to tissue expressions of ERCC1 RNA and proteins. A poor prognosis has been linked to somatic FGFR1 amplification and protein levels [15, 16].

### Bio markers in saliva

One more readily available source of biomarkers is saliva. According to studies, metabolites like valine and lactic acid can signal the presence of oral cancer. Furthermore, it was discovered that ornithine, proline, citrulline, and lysine were connected to early stages of oral lichen planus. Saliva is a more specific and potentially sensitive screening tool because it comes into direct contact with oral pre-cancerous lesions. Over 100 salivary biomarkers (DNA, RNA, mRNA, protein markers) have already been identified, including cytokines (IL-8, IL-1b, TNF- $\alpha$ ), defensin-1, P53, Cyfra 21-1, tissue polypeptide-specific antigen, dual specificity phosphatase, spermidine/spermineN1-acetyltransferase, profilin, cofilin-1, transferrin, and many others. For clinical applications, salivary biomarkers still need to be validated and shown reliable, hence more study is needed [17, 18, 19].

## Challenges

The ideal pre-cancerous biomarker should be a distinct malignancy indication that produces a true positive result for the kind of malignancy without any elements that could confuse the malignancy from non-malignant tissue, nor should it correlate with any other type of malignancy. It's also important to note that the optimal pre-cancer biomarker should reduce the number of false-positive tests and yield accurate and consistent results[20].

Genetic tests have shown that premalignant tissues overexpress more genes than benign tissues do, and no specific transcripts or proteins have been found to be increased in oral lichen planus.

The majority of OLP indicators are associated with intrinsic processes seen in normal cells and tissues, including angiogenesis, apoptosis, differentiation, proliferation, and inflammation. Because biomarkers expressed in the cytoplasm or nucleus are therefore inaccessible, focus is instead placed on proteins secreted from the cell surface. Transcript proteins are also expressed at relatively high quantities, which makes them unsuitable as potential biomarkers due to their limited expression [21].

Clonal diversity, genetic instability in precancerous tissues, the varied character of precancerous tissues, or inaccurate identification of the metastatic hallmark molecule are among the many reasons why biomarkers fail. Overdiagnosis and overtreatment techniques as a result of biomarker failure are additional aggravating factors [22,23, 24].

### Future research direction

Prospective studies ought to concentrate on the identification and classification of potential biomarkers for oral cancer in the following domains: metastases, prognosis, recurrence prediction, screening, differential diagnosis, and therapeutics. When it comes to assessing clinical results and creating oral public health initiatives, these candidate biomarkers will be invaluable resources.

The identification of biomarkers for oral cancer drug therapy evaluation would be extremely helpful in determining the effectiveness of treatment. It is advised that researchers employ cutting-edge methodologies that respect the guidelines for biomarker reporting and evaluation as well as the concepts of clinical validity, analytic validity, and clinical utility [25].

## Conclusion

OLP indicators are mostly found in oral tissues and peripheral blood. Numerous immune signals that interact with precancerous cells are present in the blood. Numerous distinct or differentially expressed molecules that are important for therapy response and patient prognosis are present in the tumor tissue. In addition to blood and tissues, microbiota and saliva can also include biomarkers. Nevertheless, the research were somewhat few, and there isn't enough proof to back up saliva or microbiota's use as a biomarker. Combining numerous indicators seems like a fair approach, given that individual markers have varying sensitivity to cancer growth and outcome prediction. Pre-cancer biomarkers, meantime, have to be chosen in accordance with the disease's stages or types and the goal of treating it. To lessen bias in biomarker research, novice researchers should familiarize themselves with the procedures, approaches, reporting, and evaluation protocols. It is advised to conduct additional study to create biomarkers in order to gain a deeper comprehension of the host immune response and the diverse cell population seen in OLP tissue. Finding distinguishing biomarkers for OLP diagnosis should be the main goal of the research, and therapeutic goals are advised.

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# Dental Plaque-Induced Gingival Condition and its Management

## Abstract

**Background:** Dental plaque-induced gingivitis is an inflammatory response of the gingival tissues resulting from bacterial plaque accumulation on teeth located at and below the gingival margin. A case of 17year old male patient is reported who presented with dental-plaque induced generalized severe gingivitis with severe gingival enlargement.

**Treatment:** A thorough full mouth ultrasonic scaling, and root planing with hand instruments (Gracey curretts and Universal curretts) in the required areas was done under local anesthesia spray. Post-operative follow-up was made at 2, 4 & 8 weeks for upto 12 months, when oral hygiene maintenance programme was reinforced.

**Conclusion:** Dental plaque-induced gingivitis is a very common clinical finding in our daily practice. Scaling and root planing is still the gold standard to maintain gingiva in health, function and comfort with stringent follow-up programme.

**Key Words:** dental plaque-induced gingivitis: scaling and root planing; case report.

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## INTRODUCTION

The initiation of dental plaque-induced gingivitis occurs when dental plaque accumulates on the teeth over days or weeks without disruption or removal, due to a loss of symbiosis between the biofilm and the host immune-inflammatory response and development of an incipient dysbiosis, Loe et al 1965 (1). Various systemic factors including endocrinopathies, hematologic conditions, diet and drugs can modify the

subgingival restoration margins and hyposalivation can modify the gingival inflammatory response, Lang et al 2018(2).

Dental plaque-induced gingivitis may exhibit various patterns of observable signs and symptoms of inflammation that are localized to the gingiva. The common clinical signs of plaque-induced gingivitis include erythema, edema, bleeding, tenderness and enlargement. The intensity of the clinical signs and symptoms will vary among individuals, as well as among sites within a dentition. Gingivitis can be described based on the extent and severity of gingival

inflammation as *Localized* ( $\leq 30\%$  of the sites involved) or *Generalised* ( $>30\%$ ) and *Mild*, *Moderate* and *Severe*. More specifically mild gingival inflammation would be an area with a minor change in color and little change in the texture of the tissue, moderate gingival inflammation would be an area with glazing, redness, edema, enlargement and bleeding upon probing, severe gingival inflammation would be an area of overt redness and edema with a tendency toward bleeding when touched rather than probed.

The inflammatory gingival enlargement could be mild, moderate or severe. Mild gingival enlargement involves enlargement of the gingival papilla, moderate gingival enlargement involves enlargement of the gingival papilla and marginal gingiva and severe gingival enlargement involves enlargement of the gingival papilla, gingival margin and attached gingiva. Patients may notice symptoms that include bleeding while tooth brushing, blood in saliva, gingival swelling and redness. Halitosis in the case of established forms. Moreover plaque accumulates more rapidly at inflamed gingival sites than non-inflamed sites, creating a complex dynamic between the dental plaque biofilm and the host's immune-inflammatory response.

Epidemiologic data have shown dental plaque-induced gingivitis to be prevalent at all ages in dentate populations and this disease is considered the most common form of periodontal disease. Gingival inflammation in response to dental plaque accumulation is the key risk factor for the onset of periodontitis and progressive attachment loss around the teeth. It does not directly cause tooth loss however management of gingivitis is a key primary preventive strategy for periodontitis and a secondary preventive strategy for recurrence of periodontitis, Mariotti 1999(3).

Treatment modalities aimed at biofilm control are essential for the treatment of gingivitis. The role of bacterial plaque in the initiation and progression of gingival disease is well established. Mechanical and Chemical plaque control methods are advocated towards the treatment of gingivitis. Scaling and root planing alone often suffices as definitive therapy arresting the disease process and restoring health, comfort and function. Patient compliance with personal oral hygiene care and a regular professional periodontal maintenance programme cannot be overlooked as a key to success, Baker 1995(4).

## Case Report

A 17year old male patient reported to the department of periodontics at Bapuji Dental College and hospital, Davangere, India, with the chief complaint of bleeding from gums on

brushing, swelling, soreness of gums and bad breath. On examination generalised gingival inflammation, with all cardinal signs of inflammation; erythema, edema, bleeding on probing, tenderness and gingival enlargement, with heavy plaque and calculus deposits around the teeth were seen. (Figure.1,3,5,7). Considerable increase in probing depth was seen which at this stage could be the pseudo-pocket. The systemic and local factors that would act as potential modifying factors for dental plaque-induced gingivitis were ruled out by taking a thorough case history. Neither malnutrition nor any relevant drug history were present. One reason for the exacerbated gingival inflammatory reaction seen in this case could be increase in the sex steroid hormone in the circumpubertal age, Mariotti et al 2013(5), which is questionable. Based on the history and examination, it was diagnosed as dental plaque-induced gingivitis. According to the AAP workshop 2017 on the classification of dental plaque-induced gingivitis, it is a case of dental plaque-induced generalized severe gingivitis with severe gingival enlargement.



**Fig.1. Labial View of Dental plaque-induced gingivitis**



**Fig.2. 4weeks after Scaling and Root planing (SRP) Labial View**



**Fig.3. Right Buccal view**



**Fig. 4. after SRP Right Buccal View**



**Fig.5. Left Buccal View**



**Fig.6. after SRP Left Buccal View**



**Fig. 7. Lingual View**



**Fig. 8. after SRP Lingual View**

Treatment plan was developed which included oral prophylaxis with maintenance programme,



Academy Report (AAP) 2001 (6). Keeping in mind the severity of the inflammatory condition the procedure was done under antibiotic coverage Stedmox-M (a combination of Metronidazole 200mg + Amoxicillin trihydrate 250mg) TID for 8 days and an analgesic Diclofenac sodium 50mg 3 times a day for 3 days. Precautions were taken to meticulously follow the CDC (Center for Disease Control and Prevention) protocol for infection control during the dental procedures. When treating patients without known communicable disease, it is especially important that proper infection control measures be observed (i.e., use of protective clothing, eyewear, masks, face shield and gloves) and proper surface decontamination be performed afterwards. High speed evacuation, preprocedural rinsing with 0.2% chlorhexidine for one minute, Loe et al 1970 (7), flushing of the handpiece and waterlines or a self-contained sterile water source, thorough disinfection of environmental surfaces and adequate ventilation and air filtration units with HEPA (High Efficiency Particulate Air) filters are all important precautions to minimize the potential hazards of ultrasonic aerosols. Patients with cardiac pacemakers, communicable diseases (immunosuppressed or chronic pulmonary disorders) and with titanium implants are contraindicated for ultrasonic scaling. Scaling was performed in a systematic approach so as to cover all the tooth surfaces. A thorough full mouth ultrasonic (EMS Piezon Scaler) supragingival and subgingival scaling was done along with root planing in the required areas with hand instruments, (Gracey curettes and Universal curettes (Hu-Friedy)) under Xylocaine spray (Lidocaine 10% w/v) to reduce discomfort.

After the completion of the procedure oral hygiene instructions were given to the patient, modified Bass technique of tooth brushing, flossing and gingival massage with finger tips were taught to the patient, 0.2% chlorhexidine mouth rinse twice a day for 4 weeks and metronidazole gel 1.5% w/w for gingival massage was prescribed. Patient was recalled after 2 weeks, some amount of residual calculus was there which was removed with ultrasonic scalers, oral hygiene instructions were reinforced at this stage and patient was recalled after another 2 weeks. Four weeks after the initial procedure the gingiva appeared firm and resilient, normal in color and texture and even stippling could be seen. No tenderness, enlargement, bleeding on probing and periodontal pockets. Restoration of a healthy and functional gingiva from a severe inflammatory condition was achieved. (Figure.2,4,6,8).

## Discussion

The universal features of the dental plaque-induced gingival conditions include: clinical signs and symptoms of inflammation that are confined to the free and attached gingiva and do not extend beyond the mucogingival junction; reversibility of the inflammation by disrupting/removing the biofilm; the presence of a high bacterial plaque burden to initiate and /or exacerbate the severity of the lesion; stable attachment levels on a periodontium, which may or may not have experienced a loss of attachment or alveolar bone, Murakami et al 2018 (8). Thorough mechanical debridement alone is frequently sufficient to treat the inflammatory gingival condition, Greenstein 2000 (9). However in severe cases one or more adjunctive chemotherapeutic agents are included in the nonsurgical anti-infective regimen. The primary objective of scaling and root planing is to restore gingival health by completely removing elements that provoke gingival inflammation (i.e., Plaque, calculus and endotoxins) from the tooth surface.

Scaling is the process by which plaque, calculus and stains are removed from both supragingival and subgingival tooth surfaces. Root planing is the process by which residual embedded calculus, portions of cementum or surface dentin that is rough, or contaminated with toxins or microorganisms are removed from the root surface to produce a smooth, hard clean surface. The distance between the apical edge of the calculus and the bottom of the pocket usually ranges from 0.2 to 1.0mm. Scaling and root planing reduces tooth loss by up to 58% over time. One study showed that in disease sites deeper than 5mm, complete calculus removal was achieved only 11% of the times, Waerhang 1978 (10). Ultrasonic instruments alone or in adjunct to conventional hand instruments, have been used for scaling and root planing for many years. However hand instrumentation and ultrasonic instrumentation both methods are able to provide satisfactory clinical results as measured by removal of plaque and calculus, reduction of inflammation, pocket depth, gain in clinical attachment level and decrease in the progression of the disease, Copulos et al 1993 (11). Ultrasonic instrumentation has shown to reduce spirochetes and motile rods. The selection of either ultrasonic/hand instrumentation should be determined by the clinician's preference and experience and the needs of each patient. In practice, clinicians commonly use a combination of both ultrasonic and hand instrumentation to achieve thorough debridement.

The ability of scaling and root planing to reduce inflammation as demonstrated by reduction in bleeding on probing and gingival index score has been well established. Response to therapy; the adequacy of scaling and root planing is evaluated



when the procedure is performed and again later after a period of soft tissue healing. Clinical evaluation of the soft tissue response to scaling and root planing including probing should be conducted only 2 weeks postoperatively. Positive clinical changes after instrumentation often continue for weeks or months. For this reason longer periods of evaluation may be indicated before deciding whether to intervene with further instrumentation or surgery. Any inflammatory changes or gingival bleeding on probing noted after this interval is more likely to be due to persistent inflammation produced by residual deposits that were not removed during the initial procedure or inadequate plaque control. The success of scaling and root planing depends on meticulous plaque control (both professional and personal), the quality of root debridement and a strict maintenance regimen. In the present study the patient responded well to Scaling & Root Planning.

## Conclusion

Dental plaque-induced gingivitis is one of the most commonly encountered gingival condition in the clinical practice. The loss of health, function, comfort and esthetics necessitates the need for treatment. Scaling and root planing along the adjunct chemo-therapeutic agents remains the standard treatment modality.

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# Factor Effecting Wound Healing in Oral and Maxillofacial Region: A Reviews Article

## Abstract

As a typical biological process in the human body, wound healing is accomplished by the four well planned and highly regulated stages of haemostasis, inflammation, remodeling, and proliferation. Four highly interconnected and overlapping phases comprise the wound-healing process: tissue remodeling or resolution, haemostasis, inflammation, and proliferation (Gosain & DiPietro, 2004). These stages, together with the biophysiological processes they support, need to take place in the right order, at the right moment, and at the right intensity for the length desired.<sup>1</sup>

## Introduction

As a typical biological process in the human body, wound healing is accomplished by the four well planned and highly regulated stages of haemostasis, inflammation, remodeling, and proliferation. Four highly interconnected and overlapping phases comprise the wound-healing process: tissue remodeling or resolution, haemostasis, inflammation, and proliferation (Gosain & DiPietro, 2004). These stages, together with the biophysiological processes they support, need to take place in the right order, at the right moment, and at the right intensity for the length desired.<sup>1</sup>

Numerous insights into normal and impaired wound healing have been gleaned from laboratory and clinical trials. In recent times, a significant amount of investigation has been focused on comprehending the crucial elements that impact wounds that heal slowly. Even though there is still a lot to understand, these investigations could result in treatments that encourage healthy tissue repair and enhance poor wound healing. The numerous variables that influence cutaneous wound healing will be covered in this review, along with any possible cellular and molecular pathways.

When a healthy person has a tissue damage, their body responds with a complex series of sequential

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complete re-epithelialization, drainage resolution, and restored function to the injured tissue.<sup>2</sup>

Furthermore, the mouth cavity is a singular and extraordinary environment in which millions of microorganisms reside in a saliva-filled milieu conducive to wound healing. Oral wound healing can be hampered by a variety of systemic and local causes.<sup>3</sup>

Though several local and systemic variables might impede tissue restoration and provide unfavourable results, healing in the orofacial region is typically taken for granted. Systemic variables must also be taken into account, even though surgical attention is always directed

toward treating the local wounds. Surgery professionals can build the competencies needed to treat wounds and promote healing by having a solid understanding of the biologic principles underlying the wound-healing continuum.<sup>4</sup>

Millions of bacteria coexist in warm oral fluid within the amazing habitat of the oral cavity, which promotes wound healing. In addition to discussing the general and local aspects that contribute to effective wound healing, this review offers a fundamental overview of the wound healing process. Extreme forms of trismus brought on by fibrosis can result from oral cavity wound healing, as can clinically healed wounds without scarring and with histologically normal connective tissue beneath epithelial cells. An enhanced comprehension of the numerous local and general elements influencing oral wound healing can aid in addressing problems that result in inadequate oral wound healing.<sup>5</sup>

## PROCESS OF THE WOUND HEALING

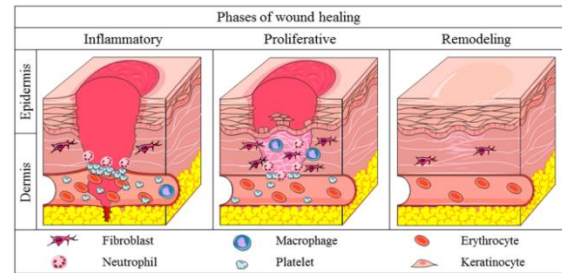
Haemostasis, inflammation, proliferation, and remodeling are the phases that typically overlap since wound healing begins as soon as an injury occurs and proceeds in a predetermined order. Understanding the intricate interplay of the cellular activities that make up healing is made easier by applying Kane's comparison of wound healing to the restoration of a destroyed house.<sup>4</sup>

Healing phase	Time	Principal cells	Housebuilding analogy
Haemostasis	Immediate	Platelets	Capping of damaged conduits
Inflammation	Day 1–4	Neutrophils	Unskilled laborers for site cleanup
Proliferation/ granulation	Day 4–22	Macrophages	Supervisor
		Lymphocytes	Specific site preparation
		Angiocytes	Plumbers
		Neurocytes	Electricians
		Fibroblasts	Framers
Remodeling	Day 22–2 years	Keratinocytes	Roofers
		Fibrocytes	Remodelers

**Table 1; Kane's analogy of wound-healing phases to house restoration.**<sup>4</sup>

stages involved in natural healing of wounds. The inflammatory phase includes both acute inflammations brought on by the movement of leukocytes and the production of growth factors and cytokines in the injured area. Phase of proliferation: increased migration and proliferation of leukocytes, fibroblasts, endothelial cells, and keratinocytes within the wound. a rise in the production of extracellular matrix constituents, as well as enhanced angiogenesis and re-epithelialization processes. Phase of remodeling: replacement of collagen I by collagen III in the extracellular matrix. MMP activity has increased.

Provisional endothelial cells, fibroblasts, and myofibroblasts of the damage undergo apoptosis.<sup>6</sup> Fig :1.<sup>6</sup>



## A. HEMOSTASIS

The initial phase of wound healing is known as haemostasis.<sup>8</sup> that after vascular injury ceases bleeding. Vasoconstriction, primary haemostasis, and secondary haemostasis are its three stages. In this process, platelets are the crucial cell, and fibrinogen is the crucial matrix element. When healthy, the monolayer of endothelial cells shields platelets from premature activation<sup>9</sup>. In healthy skin, platelets do not clump together or adhere to the vessel wall. Hepatocytes create fibrinogen (factor 1), which circulates in the blood.<sup>10</sup> It exists in platelets as well, but it does not break down into fibrin fibers—a crucial part of the blood clot.<sup>11</sup> Vasoconstriction of the vessel walls is the first response to a wound on the skin, used to stop the bleeding. Next, two simultaneous and mechanistically linked steps lead to primary and secondary haemostasis.<sup>13</sup> When collagen in the subendothelial matrix is exposed, platelets aggregate and form platelet plugs, which is the first step in primary haemostasis. When the coagulation cascade is activated and soluble fibrinogen is transformed into the insoluble strands that comprise the fibrin mesh, it is referred to as secondary haemostasis. The fibrin mesh and platelet plug come together to form the thrombus, which halts bleeding, releases growth factors and complement, and creates a temporary scaffold for the infiltration of cells required for wound healing.<sup>8</sup>

## 1. VASOCONSTRICTION

Vessels constricts quickly after damage to lessen bleeding from microvasculature ruptures. This is accomplished by the vascular smooth muscle contracting reflexively, which is brought about by vasoconstrictors such as endothelin that are released by the injured endothelium. Furthermore, the regulation of vasoconstriction is aided by circulating catecholamines, norepinephrine, adrenaline, and prostaglandins that are generated from damaged cells.<sup>13</sup> Platelet-derived growth

factor (PDGF) is generated by platelets and selectively stimulates mesenchymal cells, particularly smooth muscles in the artery walls, resulting in contraction.<sup>14,15</sup> But the first reflexive contraction only stops bleeding momentarily. This is because the muscle relaxes passively as a result of increased hypoxia and acidity in the wound, which restarts bleeding.<sup>8</sup>

## **2. FORMATION OF THE PLATELETS PLUG (PRIMARY HEMOSTASIS)**

Schultze made the initial discovery of platelets in 1865.<sup>17</sup> The word "platelets" originated when Bizzozero dubbed these cells "piastrine," or "little plates," in 1881.<sup>17</sup> Additionally, he was the first to observe that platelets had a role in the formation of thrombus.<sup>18</sup> Megakaryocytes give rise to anucleate cells, or platelets. From a morphological perspective, they have an exclusive structure known as the open canalicular system (OCS), which invades the cell membrane through tunneling.<sup>19</sup> Secretory granules, which are crucial for platelet action, are another component of platelets.<sup>20</sup> These cells move in close proximity to endothelial cells during homeostasis. But the intact endothelial cell monolayer produces negatively charged heparin-like glycosaminoglycans, prostacyclin, and nitric oxide, which inhibit platelet activation, adhesion, and aggregation, exhibiting anti-thrombotic properties.<sup>21</sup>

After a cut or blood vessel burst, the thrombogenic subendothelial matrix becomes visible.<sup>22</sup> Platelets attach to this matrix and initiate the inside-out signaling cascade via G protein-coupled receptors on their surface.<sup>23</sup>

## **3. PLATELET PLUG COAGULATION AND REINFORCEMENT**

Coagulation complexes can be assembled and activated on the surface provided by platelets. The intrinsic and extrinsic processes, which both result in factor X activation when the subendothelial matrix is exposed, are the traditional coagulation pathways. Prothrombin is changed into thrombin after factor X is activated by either route, and thrombin then breaks down fibrinogen into fibrin. Fibrin is crosslinked by Factor XIII in a covalent manner, binding the aggregated platelet plug and creating the thrombus, a permanent secondary haemostasis plug. In the later phases of healing, the thrombus also acts as a temporary matrix for the wound, allowing other cells to infiltrate.<sup>24</sup>

## **B. The Inflammatory Phase of Wound Healing**

### **1. Mechanisms of inflammatory cell recruitment.**

Since wound healing involves several steps, it is important to understand the first signals that activate the cellular response in the wounded tissue. Activation of the transcriptional machinery takes time. Thus, the wound first turns on transcription-independent pathways that can readily be activated. These include Ca<sup>2+</sup> waves, reactive oxygen species (ROS) gradients, and purigenic molecules. Increase of intracellular Ca<sup>2+</sup> occurs at the wound edges within the first few minutes of injury and propagates to the center of the wound. Damage-associated molecular patterns (DAMPs), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), lipid mediators, and chemokines released by injured cells also provide signals for the recruitment of inflammatory cells, especially neutrophils. DAMP molecules include DNA, peptides, ECM components, ATP, and uric acid. Studies across various organisms have displayed that rapid production of H<sub>2</sub>O<sub>2</sub> in the wound minimizes infections, activates keratinocyte regeneration, recruits neutrophils, and promotes new vessel formation.<sup>25</sup>

### **2. Neutrophils in wound healing.**

Neutrophils are usually not observed in the normal skin. They are produced in the bone marrow from promyelocytes and are recruited as "first responders" from the bone marrow in response to "find me" signals including DAMPs, hydrogen peroxide, lipid mediators, and chemokines released from regions of injury or infection.<sup>26</sup>

There are more than 30 different surface receptors including GPCRs, Fc receptors, integrins, and pattern recognition receptors that aid the neutrophil in detecting these injury signals. On the day following injury, neutrophils constitute 50% of all cells in the wound.<sup>27</sup>

Activated neutrophils can release factors to prolong and amplify further neutrophil infiltration.<sup>26</sup>

### **Macrophages in wound healing**

Macrophages are commonly recognized by their surface marker expression, which in mice are CD45+/CD11b+/F480+ and in humans is CD45+/CD11b+/CD66B-. Within the first 24 to 48 hours following an injury, macrophages gather at the site of damage.<sup>28</sup>

In juvenile, healthy mice, the quantity of macrophages in the wound peaks about on day 3,

falls approximately on day 5, and returns to near-baseline levels by day 10. Wounds are re-epithelialized and closed by day 14.<sup>29</sup>

**FACTOR EFFECTING WOOND HEALING**

Impaired wound healing can be caused by a variety of reasons. Both local and systemic elements can be broadly classified as influencing repair. Local factors are to the aspects of the wound that are immediately influenced, whereas systemic elements are related to an individual's overall health or illness status and have an impact on their capacity to heal. Many of these variables are interrelated, and the systemic variables influence wound healing through their localized effects.

Local Factors	Systemic Factors
Oxygenation Infection Foreign body Venous sufficiency	Age and gender sex hormones Stress Ischemia Diseases: diabetes, keloids, fibrosis, hereditary healing disorders, jaundice, uremia Obesity Medications: glucocorticoid steroids, non-steroidal anti-inflammatory drugs, chemotherapy Alcoholism and smoking Immunocompromised conditions: cancer, radiation therapy, AIDS Nutrition.

**Table 2. Factors Affecting Wound Healing.<sup>1</sup>**

**Local Factors That Influence Healing**

**Oxygenation**

In every stage of the wound-healing cascade, including angiogenesis, inflammation, fibroplasia, epithelialization, and remodeling, oxygen is essential.<sup>28,29</sup> Because oxygen is necessary for the hydroxylation of lysine and proline, low oxygenation interrupts the synthesis of collagen.<sup>30</sup> Hypoxia inhibits leukocytic, fibroblastic, and epithelial proliferation, which makes wounds in these tissues more susceptible to infection and less likely to heal.

Further reducing the efficiency of the phagocytic defense system and facilitating the growth of bacteria is the delayed migration of neutrophils, opsonins, and other mediators of inflammation to the wound site. The majority of healing issues related to small vessel atherosclerosis, diabetes mellitus, radiation, persistent infection, and cardiovascular disease can be traced back to local tissue ischemia.

The ability of the wound to withstand the inevitable bacterial expansion following an injury is influenced by the local microcirculation. Tissue that has been severely damaged by forceful manipulation, cautery, or extended air drying is

more likely to be inadequately perfused and prone to infection. Similar to incorrectly positioned or tight sutures, poorly designed flaps can also result in tissue ischemia. Anemia, hypovolemia, and peripheral vascular disease all have a negative impact on the healing of wounds. The goal of treatment, particularly for trauma patients, must be to maintain oxygenated blood flow to the wounds. Catecholamines are released in response to cold, pain, and fear. This raises sympathetic tone, tissue hypoxia, peripheral vasoconstriction, and all three of these effects. By keeping patients warm and managing their pain and anxiety, peripheral blood flow can be enhanced. It is crucial to keep patients' cardiac output and volume within the veins. Slight anemia (<20 mg/dL) should be treated with transfusion, however anemia in and of itself is not a contributing factor to poor healing. Fluid replacement therapy is necessary for patients exhibiting clinical hypovolemia because the decreased intravascular volume affects the cellular activity necessary for healing and decreases the amount of oxygen and nutrients that are transported to the tissues. Reduced tissue oxygenation is frequently caused by tobacco use.<sup>31</sup>

A pack-a-day smoker stays tissue hypoxic for the most of the day because the peripheral vasoconstriction that follows each cigarette can continue up to an hour. Carbon monoxide from cigarette smoke attaches itself to haemoglobin, decreasing the blood's ability to carry oxygen. Smokers should, whenever possible, be asked to give up their smokes for at least one week before to and following surgical treatments.<sup>4</sup>

**INFECTION**

The practice of dentistry creates an opening for corpus alienum or oral bacteria to pollute more deeply located soft and bony soft tissues. As previously said, inflammation contributes significantly to the healing of wounds. neutrophils' extravasation into the wound is in charge of eliminating microorganisms, avoiding contamination. from evolving into colonialism and into infection.<sup>32</sup>

When the skin is injured, there is the possibility of local bacterial infection, resulting in the delay of healing process.<sup>38</sup>

Staphylococcus aureus, Pseudomonas aeruginosa, and other Streptococci species are largely responsible for wound infection. In response to infection, the human organism starts an inflammatory mechanism, with the migration of leukocytes and cytokine release.<sup>34</sup> However, the phagocytic activity of leukocytes leads to the release of endotoxins by the bacteria, resulting in local necrosis and inflammation due to the



increase of pro-inflammatory cytokines, higher metalloproteinase activity and decrease of growth factors release.<sup>35,36</sup> Although an immediate inflammatory response is an initial physiologic mechanism of healing, chronic inflammation impairs the healing process, affecting re-epithelialization and delaying wound retraction and tissue remodeling.<sup>34,35</sup>

## **SYSTEMIC FACTORS EFFECTING WOUND HEALING**

### **AGE**

**Age** It is well known that older patients heal more slowly than younger ones.<sup>5</sup> In fact, a study found that older mice healed wounds less effectively than younger ones, with delays in re-epithelialization, less effective angiogenesis, and reduced collagen production and remodeling.<sup>37</sup>

There may be innate variations in the healing of wounds between mice and humans, hence it is important to recognize animal research with caution. However, a systematic analysis found that all four phases of wound healing are adversely impacted, delaying T-cell infiltration, altering chemokine release, and decreasing macrophage phagocytic activity. These findings were consistent with the outcomes of the review.

**Clinically** speaking, elderly people have a lower ability to heal, thus physicians should handle them cautiously. Because older patients have longer osseointegration periods, one such situation is when implants in these patients should be loaded later. An investigation conducted on mice revealed that in a younger cohort than in an older cohort, trabecular bone developed around implants more quickly.<sup>38</sup>

### **SEX HORMONES IN AGED INDIVIDUALS**

Age-associated deficiencies in wound healing are related to sex hormones. It has been observed that elderly males heal acute wounds more slowly than elderly ladies. A possible reason for this could be that the wound-healing process is significantly impacted by the female estrogens (estrone and 17 $\beta$ -estradiol), male androgens (testosterone and 5 $\alpha$ -dihydrotestosterone, DHT), and their steroid precursor, dehydroepiandrosterone (DHEA) (Gilliver et al., 2007). It was recently shown that the majority of the gene expression differences between wounds in young humans and senior males are controlled by estrogen.

Ashcroft and Hardman (2008). According to Hardman and Ashcroft (2008), estrogen influences wound healing by controlling a number of genes linked to inflammation, protease inhibition,

regeneration, matrix formation, and epidermal function. Research shows that while androgens negatively influence cutaneous wound healing, estrogen can help both men and women with age-related impairments in healing (Gilliver et al., 2007).

### **STRESS**

**Anxiety** The available research clearly links psychological stress to slowed wound healing. Adolescents under extreme stress who were examining patients and those who were caring for Alzheimer's patients showed signs of wounds that healed slowly.<sup>39</sup> The underlying mechanism for this is unclear, although one theory is that stress triggers the creation of glucocorticoids, which in turn suppresses the production of TNF- $\alpha$  and IL-6 cytokines. A postponed inflammatory phase is the end result.<sup>40</sup>

### **DIABETES**

Diabetes is known to impair wound healing. This is multifactorial: first, there is a build-up of toxic sorbitol in the tissues; second, there is a dispersion of nutrients and oxygen. According to a study by Jacobsen et al., 86% of implant survival was observed in non-irradiated grafted fibula bone, but 38% was observed in irradiated bone.<sup>42</sup> There is a noticeable distinction. An appropriate indicator of survival, the eight-year follow-up period was one of the study's strengths. However, because there were only 33 patients in the sample, there is a chance that the results would be affected due to outlier results. Other issues that have been reported after surgery in irradiated locations include fibrosis, necrosis, and the development of fistulas and fenestrations.<sup>43</sup>

### **MEDICATION**

Numerous drugs have the potential to impact wound healing, including those that modulate platelet activity, clot formation, inflammatory reactions, and cell proliferation. Only commonly used pharmaceuticals that significantly affect healing are reviewed here, such as glucocorticoid steroids, non-steroidal anti-inflammatory drugs, and chemotherapy treatments.<sup>1</sup>

#### **Glucocorticoid Steroids**

It is widely known that systemic glucocorticoids (GC), which are commonly used as anti-inflammatory medications, limit wound repair by suppressing cellular wound responses, such as collagen production and fibroblast proliferation, as well as by having global anti-inflammatory

effects. According to Franz et al. (2007), systemic steroids lead to inadequate granulation tissue and decreased wound contraction during the healing process. Moreover, hypoxia-inducible factor-1 (HIF-1), a crucial transcription factor in wound healing, is inhibited by glucocorticoids (Wagner et al., 2008). Systemic corticosteroids may raise the risk of wound infection in addition to their impact on the mending process. Topical administration of corticosteroids results in substantially different consequences than systemic application, which inhibits wound repair. In 79% of cases, topical low-dosage corticosteroid treatment for chronic wounds has been shown to suppress the production of hyper granulation tissue, reduce pain and exudate, and speed up wound healing.<sup>1</sup>

### **Anti-inflammatory non-steroidal medications**

Ibuprofen is one of the several non-steroidal anti-inflammatory medicines (NSAIDs) that are commonly used to treat rheumatoid arthritis, inflammation, and discomfort. Because of its anti-platelet properties, low-dosage aspirin is frequently used as a preventive treatment for cardiovascular disease rather than as an anti-inflammatory medication (Pieringer et al., 2007). Few evidence points to a detrimental effect of short-term NSAIDs on recovery. The issue of whether prolonged NSAID use impedes the healing of wounds is still unanswered. Ibuprofen systemic administration has shown an anti-proliferative effect on wound healing in animal models, leading to a reduction in the number of fibroblasts, a weakening of breaking strength, a reduction in wound contraction, a delay in epithelialization, and impaired angiogenesis (Dong et al., 1993; Dvivedi et al., 1997; Krischak et al., 2007).<sup>1</sup>

### **Chemotherapeutic Drugs**

Many of the processes essential for proper wound repair are blocked by the majority of chemotherapeutic medications, which are meant to suppress angiogenesis, fast cell division, and cellular metabolism. According to Waldron and Zimmerman-Pope (2003) and Franz et al. (2007), these drugs prevent the synthesis of DNA, RNA, or proteins, which reduces fibroplasia and neovascularization of wounds. Chemotherapeutic medications impede the formation of early wound matrix, reduce collagen synthesis, hinder fibroblast proliferation, delay cell migration into the wound, and prevent wound contraction (Franz et al., 2007). Furthermore, by impairing the patients' immune systems, these drugs hinder the

inflammatory stage of healing and raise the possibility of wound infection.<sup>1</sup>

### **OBESITY**

susceptible to infection and receive less oxygen. People who are obese frequently get wound complications. This is explained by decreased adipose tissue vascularity, increased pressure on the wound, increased wound tension, and increased risks of seroma and haemorrhage production. Moreover, skin creases serve as a breeding ground for microorganisms that can contaminate wounds<sup>44</sup>

### **ALCOHOLISM**

Alcohol reduces wound healing and makes one more prone to infection, according to the available data. Additionally, since many cases of maxillofacial trauma are associated to alcohol, the impact of alcohol on wound healing has therapeutic relevance. Exposure to alcohol was examined in a recent systematic review. The inflammatory stage of wound healing is impeded by acute exposures because they suppress cytokine activation.<sup>41</sup>

### **SMOKING**

Wound healing following extractions and after placement of dental implants has been shown to be impaired in smokers.<sup>30</sup> Nicotine causes tissue ischaemia through its vasoconstrictive activity. Furthermore, it stimulates the sympathetic nervous system to release adrenaline, potentiating vasoconstriction and causing wound hypoxia.<sup>44</sup> Smoking targets the proliferative phase, resulting in reduced fibroblast activity, decreased wound contraction, and subsequent changes in collagen deposition. This culminates in the wound having a low tensile strength.<sup>41</sup>

### **RADIOTHERAPY**

Oncology patients treated with a radiotherapy dose exceeding 50 Gy are more likely to encounter post extraction difficulties with wound healing. Furthermore, mandibular molars pose a greater risk of osteoradionecrosis following exodontia.<sup>45</sup> Irradiation is thought to bring about chronic vascular injury, affecting the supply of oxygen and nutrients to the wound post-operatively. A retrospective study by Jacobsen et al reported that implant survival in non-irradiated grafted fibula bone was 86% compared to 38% in irradiated bone.<sup>46</sup> This is a substantial difference. The positive of this study was the eight-year follow-up period which is a

reasonable marker for survival. However, the sample size was 33 patients, meaning that the results can be skewed by outlier results, giving a distorted result. Other documented problems following surgery in irradiated sites include the formation of fistulas and fenestrations, fibrosis and necrosis.<sup>1</sup> Surgery post irradiation can be detrimental to wound healing. Therefore, patients due for radiotherapy should have all necessary dental procure/surgery prior to cancer treatment.

## NUTRITION

Dietary intake Undernourished people who do not consume enough food categories and vitamins are devoid of essential elements needed for recovery (Table 3). Clearly, there are many different nutritional needs for wound healing. Because of this, eating a diversified diet makes sure the body gets all the nutrients it needs for repair and regeneration. A summary of the many clinical symptoms of non-healing intraoral lesions is provided in Table. These can be quite painful for the patient and difficult for the doctor to treat. The best clinical results are achieved when a disruption in wound healing is diagnosed early.<sup>3</sup>

Type	Role
Carbohydrates	Glucose is the main energy source for ATP synthesis. Reduced ATP production because of impaired carbohydrate intake negatively impacts on angiogenesis and new tissue deposition.
Protein	Reduced protein intake negatively affects capillary formation; fibroblast differentiation and collagen synthesis. There is also greater risk of infection due to an impaired immune system.
Amino acids	Arginine is vital in wound healing as it supports angiogenesis, new collagen formation and wound contraction. The most prolific amino acid in plasma is glutamine, a foundation of metabolic energy for cells vital to the healing process such as fibroblasts and macrophages.
Fatty acids	Omega-3 fatty acids have been found to promote cytokine production and angiogenesis.

	Thus, omega-3 supplements are recommended for those with chronic inflammatory diseases.
Vitamin C	Vital for collagen synthesis and fibroblast formation. Also, lack of vitamin C can result in a reduced immune reaction and greater vulnerability to wound infection.
Vitamin A	Vitamin A has an anti-oxidant role and is involved in cellular proliferation.
Vitamin E	This anti-oxidant is thought to reduce excess scars in the wound healing process.
Magnesium	Magnesium acts as an enzymatic co-factor during collagen formation.
Iron	Iron is vital for the chemical process of hydroxylation of the amino acids proline and lysine. Iron deficit can result in collagen malformation.

**Table 3. (3)**

## Conclusion

The physiological process of wound healing is intricate and highly regulated, including numerous cell types. This sequential process can be impacted by one or more external influences. Moreover, the mouth presents a distinct setting for wound healing because it contains warm oral fluid and serves as a home for a vast variety of microorganisms.<sup>3</sup>

Even under ideal circumstances, wound healing is a complex process that calls for prompt communication between cellular and acellular components in order to finish the process and restore the patient's and the wounded tissue's optimal function.

Several variables, which fall into the categories of local and systemic factors, can hinder the healing of wounds by interfering with one or more stages of the procedure. These factors do not preclude one another from having an impact. At any one or more of the individual phases, one or more factors may be involved, which will ultimately affect how the healing process turns out.<sup>1</sup>

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# Full Mouth Rehabilitation - A Review

## Abstract

A full mouth rehabilitation involves all the operations required to create a masticatory mechanism that is functional, aesthetically pleasing, and self-maintaining. The purpose of this article is to comprehend the physics and physiology of occlusion and different occlusal concepts of full mouth rehabilitation.

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## INTRODUCTION

The goal of dentistry is to increase the life span of the functioning dentition, just as the goal of medicine is to increase the life span of functioning individual.<sup>1</sup> The word rehabilitate implies to restore to good condition or to restore to former privilege.<sup>1</sup>

The term "occlusal rehabilitation has been defined as the restoration of the functional integrity of the dental arches by the use of inlays, crowns, bridges and partial dentures".<sup>2</sup> Full mouth rehabilitation is a challenging treatment which involves the complex and sequential treatment procedures. The aim of full mouth rehabilitation is to restore the dentate or partially dentate mouth for an orderly pattern of occlusal contacts and articulation that will ultimately optimize the oral function, occlusal stability and esthetics.<sup>2</sup>

## ETIOLOGY

There are various etiologic factors for loss of functional harmony like multiple missing teeth due to caries or any trauma, fractured or chipped teeth, TMJ disorders, Fluorosis, Periodontal problems, Malocclusion, Due to developmental anomalies like amelogenesis imperfecta, dentinogenesis imperfecta, enamel hypoplasia and due to congenital anomalies: hypodontia, anodontia and macrodontia.<sup>3</sup>

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## OBJECTIVE

The objective of full mouth rehabilitation is not only the reconstruction and restoration of the worn out dentition, but also maintenance of the health of the periodontal tissues, TMJ and associated structures.

**INDICATIONS** – The indications for full mouth rehabilitation are

- restore the impaired occlusal function,
- preserve the longevity of remaining teeth,
- maintain healthy periodontium, improve esthetics,
- to relieve pain and discomfort of teeth and its surrounding structures.<sup>4</sup>

## DIAGNOSIS AND TREATMENT PLANNING

Complete diagnostic planning is required before beginning dentition restoration for a patient. Among them are the following:

**Medical History:** This section includes information about the patient's general health status, any pre-existing medical conditions, medications, allergies, surgeries, hospitalizations, and systemic diseases. It is crucial in determining potential risks, complications, or interactions with dental treatments.<sup>5</sup>

**Dental History:** This section includes information about the patient's prior dental procedures, oral hygiene practices, history of cavities, gum disease, dental trauma, prior restorations, and any current oral health issues.

### Clinical dental examination:

**Extraoral Examination:** This type of examination looks for anomalies, edema, or asymmetry in the joints of the head, neck, and jaw.

**Intraoral Examination:** An intraoral examination evaluates the oral cavity, teeth, gums, soft tissues, occlusion, and other oral health disorders in addition to diseases including decay and gum disease.<sup>6</sup>

**Diagnostic Tests:** Diagnostic tests for assessing tooth loss is done clinically and radiographically. Clinical assessment involves photographs, assessment of occlusion using interocclusal records facial vertical measurements and diagnostic jaw relations. Radiographic measurements include all radiographic investigations.<sup>7</sup>

**Investigations:** X-rays used to capture images of the entire mouth. It includes periapical views of each tooth, bitewing views, panoramic X-rays, and occlusal X-rays to assess teeth, roots, bone levels that are not visible during a regular examination.<sup>8</sup>

### Diagnostic cast attached to an articulator:

**Diagnostic Cast:** Made from impressions, these are tangible representations of the patient's teeth.

**Articulators:** Dentists can more precisely diagnose and plan restorative or prosthodontic treatments when they place diagnostic casts on an articulator. This is especially true in complex situations requiring many teeth or concerns with jaw alignment.<sup>9</sup>

## Diagnostic Waxup-

As part of every prosthodontic treatment plan, a diagnostic wax up process should be done. In order to determine the ideal shape and occlusion of the final prosthesis, this is done during diagnostic tooth preparation. If the patient's anterior guiding or occlusal scheme need to be changed, the process is especially crucial.<sup>[10-13]</sup>

## TREATMENT PLANNING

The development of the treatment plan is based on the diagnostic data. A thorough assessment of the articulator of the discrepancies between ICP and therapeutic position permits precise programming of the most appropriate occlusal splint and the planning of definitive occlusal treatment, which may involve orthodontic or prosthodontic treatment of varying degrees of complexity or just selective grinding. In more complex cases, precise planning of definitive treatment is only feasible following the stage of temporary occlusal treatment and results evaluation.

**First phase-** Collateral therapy and interim occlusal therapy: Treatment may last anywhere from a few weeks to up to six months.

**Second Sage-** Final occlusal care and supplementary therapies: The length of time is determined by how complex the therapy program is. For example, ortho therapy and FPD.<sup>[14-21]</sup>

OCCUSAL TREATMENT	COLLATERAL TREATMENT
Temporary occlusal treatment, occlusal splints	Biofeedback Other relaxation techniques
Definitive occlusal treatment: Orthodontic treatment, selective grinding, prosthodontic treatment	Exercises Physiotherapy Electrogalvonic stimulation Drug treatment
Occlusal and articular Surgical therapy	

## MOUTH PREPARATIONS

Now that the required diagnostic process and treatment planning have been completed, the mouth has to be ready for restoration. Based on our research, any defects that need to be fixed before a whole mouth rehabilitation, such as extracting any infectious processes like impaction, retained roots, or unnecessary devitalized teeth, should be treated with appropriate endodontic therapy first.<sup>2</sup>

## SELECTING INSTRUMENTS FOR OCCLUSAL REHABILITATION

Fine results in restorative treatments can be achieved with equal success using four basic types of equipment. Every high-quality instrument's goal is necessary to precisely record the border pathways of the teeth; this can be achieved by mimicking the condyle movements at the border and then fusing the condylar pathways with the updated anterior guidance paths. Alternatively, the outcomes of the anterior and posterior determinant routes at the location of the teeth themselves might be recorded. It is important to keep in mind that anterior guidance, when using any tool, is the result of functional boundary movements that occur inside the boundaries of the envelope of motion.<sup>2</sup>

Four basic type of instruments which are used in full mouth rehabilitation-

Semijadjustable instruments

Fully adjustable instruments

Pantographic instruments

Stercographic instruments

## MOUNTING MODELS

Even the most flawlessly constructed centric bite record is of minimal use without proper mounting techniques. One of the most important tasks in correctly mounting casts is to take a facebow recording. Following the condylar axis's placement in the skull, it offers a way to transfer that axis to the upper cast by connecting it to the articulator. The correctness of a centric bite record created at an opening vertical dimension will only be preserved if the closure axis is the same on the articulator in the patient's condition. The direction of the closing route is altered by any change in the axis. When models are installed on instruments that do not accurately reproduce the axis, built-in inaccuracy occurs. Only when the models are attached using a facebow will instruments that are capable of recreating the axis do so. Recording a centric relation as near to the appropriate vertical dimension as feasible is best practice. Using a kinematic device of some kind to locate the

terminal hinge axis is the most accurate way to record the correct horizontal axis.<sup>[22-27]</sup>

## STEPS IN RESTORING OCCLUSION

The following are two guidelines that can help you avoid problems with restorative procedures:

1. Before starting any restorative process, make sure that all the subsequent steps are planned out beforehand and logically connected to one another.
2. Before starting any restorative procedure, make sure you fully understand and can see the outcome.
3. Instructions on oral hygiene must to be provided
4. It is important to control caries.
5. Completing periodontal therapy is recommended.
6. Minor tooth movement needs to be finished .
7. Necessary extractions should be done and tissues healed before permanent placement of fixed prostheses.
8. Equilibration should be completed prior to preparation of the teeth. The temporomandibular joints should be comfortable prior to finalizing any restorative treatment.<sup>2</sup>

## RESTORING LOWER ANTERIOR TEETH

The lower anterior teeth should always be completed first when planning restorative treatment for any occlusal issue. Priority one for repairing lower anterior teeth should be to establish where the incisal margins should be placed.<sup>[28-29]</sup>

## RESTORING UPPER ANTERIOR TEETH

Without the required tools, no technician—including the dentist who prepared the teeth—can reliably form anterior restorations accurately enough. The accuracy of the following data must be confirmed in the mouth and appropriately transferred to the laboratory bench in order to properly repair upper anterior teeth.<sup>[30-32]</sup>

## THE PLANE OF OCCLUSION

The incisal edges of the incisors and the tips of the posterior teeth's occluding surfaces are theoretically touched by an imaginary surface known as the plane of occlusion. As opposed to being a flat surface, the average curvature of the

occlusal surface is what the plane of occlusion actually represents.

A suitable plane of occlusion must meet the following two fundamental criteria.

1. When the mandible is protruding, it must allow the anterior guide to completely obscure the posterior teeth.
2. Upon lateral mandibular movement, it must allow for the disclusion of all teeth on the balanced side.<sup>[33-35]</sup>

## **POSTERIOR OCCLUSAL MORPHOLOGY**

The correct direction of forces is the primary goal of occlusal form. If applied in either an upward or downward direction along each tooth's long axis, teeth may resist enormous force. With the exception of the ligaments at the apex, all of the supporting periodontal ligaments evenly oppose the force, which is oriented parallel to the long axis. A force applied in a rural direction causes the tooth to lose the support of almost half of its compressed ligaments, placing nearly all of the weight on the half that is under strain. Thus, forming and positioning the centric contacts to drive forces as nearly parallel to the long axis of both upper and lower teeth as feasible is the first step in creating occlusal shapes.<sup>[36-37]</sup>

## **RESTORING LOWER POSTERIOR TEETH**

If the following criteria are met, cusp tip-to-fossa contact can be precisely restored with posterior teeth in the lower arch:

1. Proper buccal cusp location and height
2. Proper lingual cusp location and height
3. Appropriate positioning of fossae
4. Appropriate slopes for fossa walls
5. Generally exact direction of ridges and grooves

## **RESTORING UPPER POSTERIOR TEETH**

The final portion to be rebuilt should be the upper posterior teeth. It is the stationary posterior segment, and the positions of its ridges, inclines, grooves, and cusps constructed to take into account the lower posterior teeth's numerous boundary motions.<sup>[38-40]</sup>

## **OCCLUSAL CONCEPTS IN FULL MOUTH REHABILITATION**

In any technique, there are two fundamental and crucial phases that must be understood. These are: (1) an initial occlusion balancing; and (2) the

establishment of the incisal guidance. It is necessary to comprehend and adhere to the fundamentals of occlusion, and, wherever feasible, to imagine and accomplish specific goals.

## **THE OBJECTIVES OF THE PRELIMINARY OCCLUSAL EQUILIBRATION ARE:**

The goals of the preliminary occlusal equilibration are as follows: (1) retaining the vertical dimension of occlusion; (2) obtaining the maximum distribution of occlusal stress in centric relation; (3) equalizing the steepness of similar tooth inclines to distribute eccentric occlusal stresses evenly; (4) establishing smooth guiding tooth inclines; (5) reducing the steepness of guiding tooth surfaces' inclines to allow occlusal stresses to be applied more favorably to the supporting tissues; (6) maintaining the sharpness of cutting cusps; (7) increasing the number and size of food exits; and (8) decreasing the size of the occlusal contact surfaces. The early (deflective) occlusal contacts of balanced or non-functioning tooth inclines are among the most damaging types of malocclusion. These interactions aggravate the temporomandibular joint in addition to causing early tooth loss in the affected teeth. Only normal teeth find contacts on balancing cusp inclines undesirable.<sup>41</sup>

## **GNATHOLOGICAL CONCEPT**

Following his graduation from dental school in 1907, B.B. McCollum broadened his pursuit of the ideal denture to encompass natural dentitions. The term "Gnathology" was first used in 1926 [6] by Dr. Harvey Stallard, who defined it as the science dealing with the anatomy, histology, physiology, and pathology of the stomatognathic system, as well as the treatment of this system based on diagnosis, examination, and treatment planning.<sup>42</sup> McCollum founded the Gnathological Society in 1926, and along with Harrison, they discovered the first successful way to locate the transverse horizontal axis and transfer the recording to an articulator using parts from a Snow Facebow. This allowed them to treat and study the mouth as a functional unit. Their observations led to the development of the principles of mandibular movements, transverse horizontal axis, maxillomandibular relationships, and an arcon articulator that was designed to accept the transfer of these records. The goal was to record maxillomandibular relationships that accurately reproduced border jaw movements and which would prescribe the better occlusal interface. Establishing an interference-free occlusion is the aim of gnathology, which calls for the idea of an

organic occlusion. Disocclusion, cusp to fossae relationship, centric (relation) occlusion, uniform centric contact, forces aligned with the teeth's long axes, tripodism, twin centric contact for cross-tooth stability, narrow occlusal table, maximum cusp height, and fossae depth with additional anatomy are all included in organic (organized) occlusion.<sup>43</sup>

## **FREEDOM IN CENTRIC BY SCHUYLLER**

The concept of "Freedom in Centric" was first presented by Schuyler, who also backed the idea that the centric relation was more of a biological region of the TMJ than a point.<sup>44</sup> According to the established maxillomandibular connection, central occlusion is generally understood to occur at a static point of occlusal contact of opposing teeth (a single specific position). It could be more positively identified as happening in a specific region of the occlusal surfaces that the occluding tooth surfaces lay on.

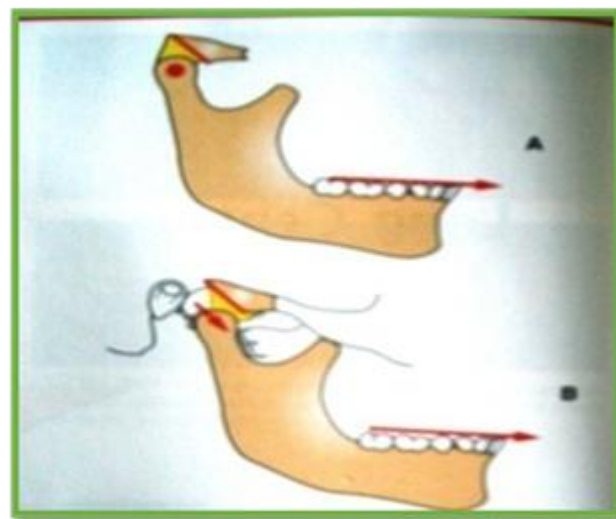
As a result, before the inclination of the tooth surfaces affected the relationship between the teeth, there would be some eccentric freedom of movement. In the most retruded maxillomandibular relation, it has been observed that a locked intercuspatation is preferable to a slight freedom of movement in the lateral and anteroposterior directions during centric occlusion. This range of motion in centric occlusion eases patient discomfort and lessens the risk of bruxism and other traumatizing effects on the supporting tissues of the dentition.

It has been established that the functionally produced path technique requires the establishment of this freedom of movement in centric occlusion. It is initially developed in the upper anterior teeth's incisal guiding component. Before the effects of these surfaces' slanted planes become noticeable, the lower anterior teeth make contact with a horizontal surface on the incisal guidance, or the lingual surfaces of the higher anterior teeth. This allows for a little amount of eccentric mobility.

There can be a minor divergence from the typical incisal guidance pattern observed in natural dentitions. Regardless of whether the functionally produced route technique or the articulating instrument itself is utilized in the final construction operations, this area of horizontal freedom in the incisal guidance mechanism will ensure the needed freedom in posterior occlusal shapes.<sup>45</sup> Dawson used the term 'long centric' for

freedom in centric. Long centric accommodated changes in head position and postural closure.

The measurable amount of long centric needed is the difference between centric-related closure and postural closure, which is rarely more than 0.5 mm.<sup>46</sup>(Fig.1)



**FIG.1-LONG CENTRIC**

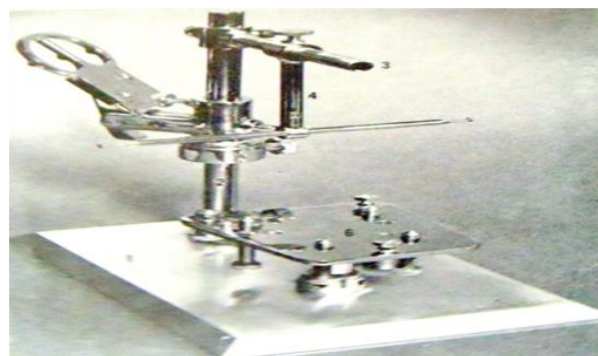
## **SIMPLIFIED OCCLUSAL DESIGN BY WILSKOTT AND BELSER**

This idea states that active force vectors on teeth are not limited to the longitudinal axes of the roots; hence, the direction of functional forces is not determined solely by the locations of occlusal contacts. The forces of eruption from the periodontium and the equilibrium between the resting pressures of the cheek and tongue muscles determine how stable the teeth are on the arch. A temporomandibular joint's variable guiding surfaces should be taken into account when designing an occlusal appliance. One occlusal contact per tooth may be the limit of contacts, and any that do not provide a valid purpose may be removed. Based on this, they proposed a simplified occlusal scheme in which; one occlusal contact per tooth usually a cusp-fossa relation is sufficient instead of a tripod contact, all interproximal contacts should be proper and tight as they stabilize the tooth mesio-distally, anterior disclusion mechanics should be applied so that posteriors do not experience any interference on lateral excursive movements, antero-posterior freedom of movement should be provided which is achieved by having concave internal slopes on the cusps of posterior teeth.<sup>47</sup>



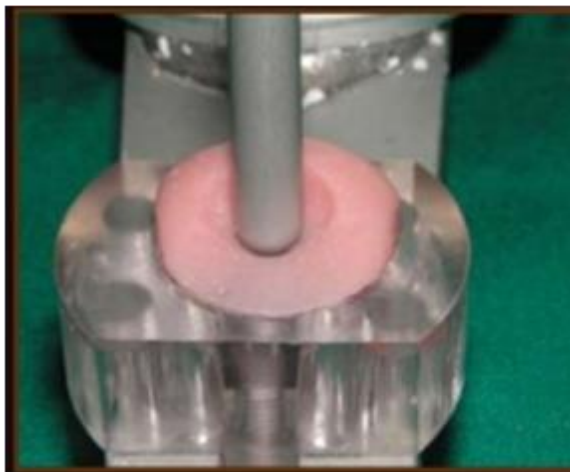
## PANKEY, MANN AND SCHUYLER PHILOSOPHY

Arvin Mann and L.D. Pankey soon realized that the fabrication of a static model of the dynamic movement of mandibular function resulted a matrix that could be used for designing any occlusion in fixed prosthodontics as well as removable. They developed the Pankey-Mann Technique of oral rehabilitation.<sup>48</sup> Their theory was relevantly founded on the spherical theory of occlusion, the "wax chew-in" method as explained by Meyer and Brenner and D'Amico's discussion of the significance of cuspid teeth. According to D'Amico, "When the opposing teeth come into functional contact, the canine teeth help to guide the mandible during the eccentric movements." The mandible's lateral and protrusive movements are dictated by the state of the upper canine teeth in relation to the lower canines and first premolars. There is another special purpose for canine teeth. These are incredibly delicate organs. They transmit the desired periodontal proprioceptor impulses to the masticatory muscles more than any other tooth when their opponents come into contact during attempted eccentric movements of the mandible. This reduces muscular tension and, as a result, the amount of force applied. It is our goal to minimize or avoid the periodontium's and restorations' failure in this crucial way.<sup>[49-52]</sup> The planning and finalization of the oral rehabilitation with the Pankey- Mann-Schuyler technique involves a segmental approach. Lower anterior, upper anterior, lower posterior, and upper posterior teeth are evaluated, planned out with a wax-up, and restored in sequence.<sup>53</sup> The Monson curve determines the ideal occlusal plane, and mandibular posterior teeth are repaired in a way that aligns with the anterior guidance so as not to obstruct the condylar guidance.<sup>49</sup> With "long centric" incisal direction and group function in working excursion, the definitive restorations are equilibrated into a centric relation position with mandibular buccal cusps onto flattened fossae-marginal ridge contact.<sup>54</sup> In the Pankey-Mann-Schuyler procedure, acrylic provisionals are used and modified intraorally.<sup>53</sup> This method has numerous benefits because the bottom repair is finished before the upper teeth are worked on. Because only one arch is operated on at a time, discomfort is reduced. The tools required for the process are simple. All that is required in addition to the standard dental instruments is the P-M instrument.(Fig.2) There is a removal of extensive and intricate extraoral records of functional jaw motions. Errors are less likely to occur because procedures are streamlined.<sup>55</sup>

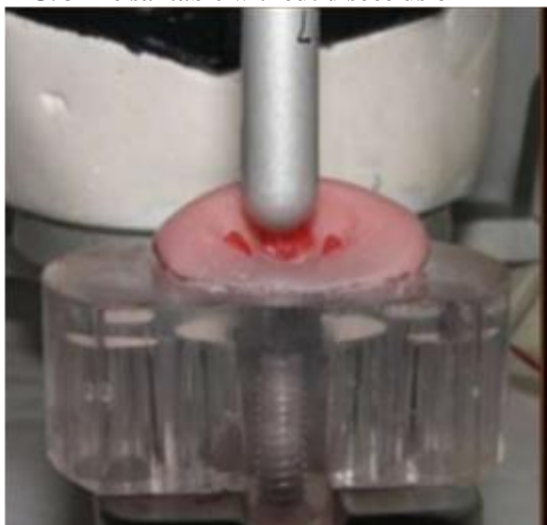


**FIG.2-P-M INSTRUMENT  
TWIN TABLE TECHNIQUE -HOBO**

Dr. Sumiya Hobo delivered it, and dentate patients are rehabilitated using it. In the twin-tables technique, a neutral line is produced by setting the working condylar route on the articulator to travel directly outward along the transverse horizontal axis. Such a functional condylar route is mimicked by a semiadjustable arc-type articulator featuring a box-shaped fossa element. (The working condylar route is reset to zero in both the frontal and horizontal planes when a fully adjustable articulator is utilized, allowing the working condyle to go straight outward. Install the maxillary study cast with a detachable anterior portion once condylar guidance has been set. To clear the articulator of obstructions preventing a smooth, gliding action, remove the maxillary anterior portion and move it eccentrically. A cusp-shape factor that harmonizes with the condylar route is produced by this approach. The anterior direction of the Twin Table Concept is specified in order to achieve a harmonious disocclusion with the condylar path. The method makes use of two distinct, specially made incisal guide tables. The term "incisal table without disocclusion" refers to the initial incisal table. (Fig.3) In order to ensure equal contacts in the posterior restorations during eccentric motions, die systems with removable anterior and posterior portions are fabricated. The other incisal table is made by inserting 3 mm plastic separators behind the condylar parts to allow the articulator to replicate boundary motions. The term "incisive guidance with disclusion" refers to this.(Fig.4) The first incisal guide table facilitates the creation of posterior tooth restorations. To accomplish incisal guidance with disocclusion, the second guide table is necessary. Using the twin-tables approach, the final prosthesis produces a restoration with anterior guidance in harmony with the condylar path and a predictable posterior disclusion.<sup>56</sup>



**FIG. 3-Incisal table without disocclusion**



**FIG. 4-Incisal table with disocclusion**

## **TWIN STAGE PROCEDURE BY HOBO AND TAKAYAMA**

The Twin-Table approach was developed into an improved version known as the Twin-Stage Procedure.<sup>57</sup> The literature suggests that anterior guiding and condylar guidance are the main factors influencing occlusal rehabilitations. This technique covers the process of restructuring an occlusion by employing cuspal angle as the primary factor. It was utilized in the rehabilitation of a badly worn dentition and was proposed by HOBO and TAKAYAMA. Condylar route has long been thought to be a significant factor in occlusion. Hobo and Takayama assert, however, that the condylar route has demonstrated a deviation and has a negligible impact on disocclusion. Nevertheless, the amount of disocclusion rose by only 0.020 mm during protrusion, 0.015 mm on the nonworking side, and -0.002 mm on the working side with each degree of elevation in the horizontal condylar guidance. As a result, the cusp angle and anterior guidance are more crucial factors in creating a disocclusion.

A mutually protective occlusion can be effectively achieved by using these average angulations of the horizontal condylar guidance.<sup>58</sup> A standard value for cusp angle was established, independent of both incisal and condylar paths, so that it could counteract natural dental degradation from caries, abrasion, and restorative work. By using the standard cusp angle, it was possible to establish the standard amount of disocclusion.<sup>57</sup>

## **YOUDELIS SCHEME**

An occlusal plan for patients of advanced periodontitis was proposed by Youdelis in 1971. The objective was to bring the rear teeth into simultaneous interocclusal contact in an axially oriented centric relation position, which is typically congruent with the intercuspal position. For protrusive excursions, anterior disclusion is offered; for lateral excursions, canine disclusion is offered. Because of the way the cuspal structure is arranged, the posterior teeth fall into group function if the canine disclusion is lost due to deterioration or tooth movement. Articulators that are fully and semi-adjustable can be employed.<sup>59</sup>

## **NYMAN AND LINDHE PLAN FOR VERY ADVANCED PERIODONTITIS**

When the patient occluded in the intercuspal position, the occlusion was meant to provide an even and simultaneous contact throughout the dentition (IP). This indicates that the bridge was kept in a stable, balanced position by the forces applied by the masticatory muscles. The occlusion was also planned to achieve intermaxillary contact concurrently across the different bridge sections during lateral mandibular excursions. This therefore indicates that every safety step was done to stop the bridge from tilting. For the motions between IP and protruded contact position and between RP (retruded contact position) and IP, the same balanced occlusal pattern was created.<sup>60</sup>

## **CONCLUSION**

Numerous methods have been covered above to return the occlusion to a functionally acceptable state; however, the two least complex methods for achieving occlusal coordination are the Pankey Mann Schuyler and Hobo Twin Stage Techniques. These methods address the various parts, allowing for a quicker, easier, and far more comfortable rehabilitation process for the patient.<sup>45</sup> These techniques help dentists remove a great deal of the time-consuming, challenging, and uncomfortable (for the patient) process of removing and reseating temporary fillings. They

also significantly reduce the amount of time patients spend in chairs and laboratories during the rehabilitation process, and patients appreciate any opportunity to expedite the completion of their work and enjoy the primary goals of oral rehabilitation—oral health, comfort, functional efficiency, and esthetics.<sup>61</sup>

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# Molar Incisor Hypomineralization Treatment Modalities: A Review Article

## Abstract

Molar and incisor hypo mineralization are a developmental defect of enamel of permanent teeth. It is systemic in origin and affects one or more than one permanent first molars, often associated with permanent incisors. It is characterized by well demarcated opacities and qualitative enamel defects which can be caused by decreased inorganic enamel components, and reduced mineralization. It can result in aesthetic, functional, and psychological, problems in children. Its reported prevalence varies, from 2.5% to 40.2%. Multiple aspects of dental treatment for it are challenging, such as behaviour management because of age of children, hence difficulty in achieving adequate local anaesthesia, tooth hypersensitivity, and retention of restorations. This review discusses the important aspects related to MIH such as its prevalence, severity, etiology, differential diagnosis, and treatment modalities applicable in young patients.

**Keywords:** enamel hypoplasia, hypersensitivity, and molar incisor hypo mineralization.

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## INTRODUCTION

Molar and incisor hypo mineralization (MIH) is a systemic developmental defect affecting one or more permanent first molars (PFMs) and also frequently associated with permanent incisors. It is a developmental deformity of the dental enamel structure. It is characterized by well demarcated opacities of enamel of teeth. It exhibits qualitative defects of enamel which is caused by reduced inorganic enamel components; and reduced mineralization. It can result in esthetic, functional and psychological, problems in children.<sup>1-3</sup> Studies have shown that prevalence of MIH range from 2.5% to 40.2%.<sup>4-6</sup> According to one study, in general population the condition affects one in six children.<sup>7</sup>

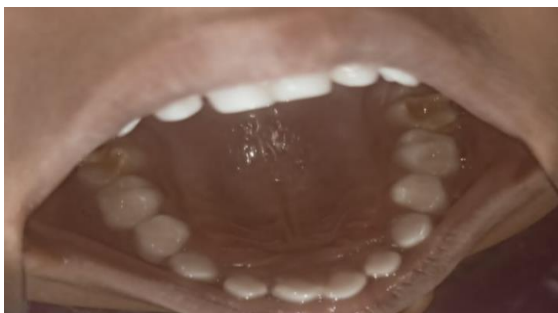
The etiology of MIH remains largely unknown but some factors have been associated with its occurrence.

The various etiological factors are summarised in the table below –



Etiology	Description
Congenital	Hereditary factors which are involved in the etiology of MIH may interact with systemic factors <sup>1,8,9</sup>
Environmental Factors	Exposure to pollutants such as dioxins during third trimester and/or first three years of life <sup>1,8,9</sup>
Systemic Conditions	Disruption of amelogenesis during early maturation caused by: Respiratory tract infections <sup>1,2,10</sup> Perinatal complications <sup>1,2,10,11,12</sup> Oxygen deprivation <sup>1,2,10,11,12</sup> Low birth weight <sup>1,2,10,11,12</sup> Calcium and phosphate metabolism disorders <sup>1,2,10,11,12</sup> Recurrent childhood illnesses <sup>1,2,10,11,12</sup> Prolonged use of antibiotics <sup>1</sup> Long-term breast feeding <sup>1,2,10,11,12</sup>

Clinical presentation of MIH exhibits, color variations of affected teeth, which range from opaque white to yellow or brown. One important finding is the post-eruptive breakdown (PEB) of affected teeth. Molars exhibit PEBs more frequently than incisors, because of the larger masticatory pressures present in the molar region. Additionally, the enamel's integrity is compromised due to MIH, leading to fragility and being prone to fractures.<sup>13-16</sup>



Patients typically presents with increased dental sensitivity, especially when exposed to thermal or sugary stimuli. This condition not only impacts the teeth's functionality, but can also have psychological effect, which adversely influence the patients' self-esteem.<sup>17-21</sup>

Several diagnostic techniques are used now a days which include the developmental enamel defects (DED), modified DDE index, the FDI, the modified Clarkson and O'Mullane DDE index, and the enamel defects index (EDI). Among these the modified DDE index is the most popular criterion used for MIH categorization. It was recommended by the European Association of Paediatric Dentistry (EAPD) in 2003.

Hence, MIH can be classified based on the extent and severity of the lesions in primarily three degrees of severity which is mild, moderate, and severe.



The International Caries Detection and Assessment System (ICDAS) criteria have been established to provide a comprehensive framework for the identification and classification of dental caries, from initial enamel changes to extensive cavitation.

According to ICDAS criteria these enamel anomalies can be classified in a standardized manner, providing the distinction between early enamel changes and more advanced structural anomalies

1. ICDAS I: This grade refers to the earliest visible changes in enamel translucency after prolonged air drying for MIH, it can manifest as slight changes in enamel opacity, indicating hypo mineralization without any structural loss.
2. ICDAS II: At this stage, distinct visual changes in enamel are evident even without air drying. The enamel may exhibit white or yellowish opacities which indicate a more pronounced hypo mineralization. A frank cavitation or loss of enamel structure still does not present.
3. ICDAS III: At this level a localized enamel breakdown is seen due to MIH. While there is no cavitation into the dentin, the enamel may have micro-cavities or signs of minor structural loss due to the weakened hypo mineralized structure.<sup>22</sup>

Diagnosis of MIH is challenging, and the condition may be confused with other hereditary conditions, particularly developmental enamel defects such as amelogenesis imperfecta, fluorosis, white spot lesions, enamel hypoplasia, and traumatic hypo mineralization.

ENAMEL CONDITIONS	CHARECTERISTICS
Molar and incisor hypo mineralization	<ul style="list-style-type: none"> <li>▪ White, creamy, or yellow-brown opacities</li> <li>▪ Affects one or more than one first permanent molars and often associated with permanent incisors, while other teeth are not affected.</li> <li>▪ Lesion &gt; 1 mm</li> <li>▪ Asymmetrical pattern</li> <li>▪ Caries</li> <li>▪ Often present Post eruptive enamel breakdown</li> </ul>
Amelogenesis imperfecta	<ul style="list-style-type: none"> <li>▪ Often with a family history</li> <li>▪ Affects primary and permanent dentitions</li> </ul>
Fluorosis	<ul style="list-style-type: none"> <li>▪ With a history of fluoride intake during tooth development</li> <li>▪ Primary dentition is usually not affected, but all permanent teeth usually tend to be involved</li> <li>▪ Symmetrical and</li> </ul>

	Mild	Moderate	Severe
Crown appearance	Demarcated opacities not involving the load-bearing area of the molars	Intact atypical restoration	Post-eruptive enamel breakdown
Enamel loss	Isolated opacities	Involvement of occlusal or incisal 1/3 of teeth, but without initial post-eruptive enamel breakdown	Post-eruptive enamel breakdown, usually severe
Caries	No associated caries	Caries limited to one or two surfaces and without cuspal involvement	Substantial progression of caries
Sensitivity	Normal dental sensitivity	Child usually exhibits normal dental sensitivity	A history of dental sensitivity
Esthetics	Generally, parents do not show concerns	Parents become concerned	Parents become more concerned

	<ul style="list-style-type: none"> <li>▪ bilateral pattern</li> <li>▪ Caries resistant</li> </ul>
White spot lesions	<ul style="list-style-type: none"> <li>▪ Occur in the cervical areas of teeth because of plaque accumulation in this area</li> </ul>
Traumatic hypomineralization	<ul style="list-style-type: none"> <li>▪ History of injury to the affected deciduous tooth</li> <li>▪ Often limited to one tooth</li> <li>▪ Asymmetrical pattern</li> </ul>

So, for appropriate and timely treatment we should make an accurate diagnosis.

## CHALLENGES ASSOCIATED WITH TREATMENT OF MIH

- A child neglects his oral hygiene because of tooth sensitivity, which make the tooth

more vulnerable to caries. Hence there is a need for early emphasis on preventive measures such as fluoride tooth paste and rinse to avoid post-eruptive enamel breakdown.

- The condition can be associated with chronic pulpal inflammation, and hence, adequate local anesthesia can be difficult to achieve in such cases
- So, in such cases Articaine infiltration can be effective, and inferior alveolar nerve block with buccal articaine infiltration has been shown to be more effective
- In some cases of MIH the retention of dental restorations is a considerable problem and may require pretreatment of the enamel with 5% sodium hypochlorite that removes the proteins encasing the hydroxyapatite crystals.
- In cases of MIH involving the anterior teeth, esthetic is of prime concern.
- Some cases require the use of special management techniques for addressing dental fear and/or anxiety because of some unpleasant experience in previous dental visit.
- Other challenges, that can be encountered is long and/or multiple appointments, need for missing school for some days, and higher treatment costs as some treatments need to be done under general anesthesia.

## TREATMENT MODALITIES

Many factors must be considered before deciding a specific treatment protocol, including the child's age, severity of the MIH, restorability of tooth or teeth involved, presence or absence of pulpal involvement, presence of third molar germs, long-term prognosis, and cost of treatment.

Following are the useful approaches for the management of children with MIH described by William, et al.

### 1. Risk assessment

Assess caries risk and the patient's medical and dental history.

### 2. Early diagnosis

Diagnosis should be as early as possible, which can be done by dental radiograph before eruption.

### 3. Remineralization and desensitization

Adequate oral dental hygiene measures should be maintained at home, including the use of fluoridated toothpaste and rinse. The professional application of remineralizing agents such as topical fluoride varnishes and Casein

phosphopeptide-amorphous calcium phosphate (CPP-ACP) also help in remineralization of teeth.

### 4. Prevent dental caries and post-eruptive breakdown

Emphasis should be given on the importance of adequate oral hygiene strategies, desensitizing agents, reducing cariogenic habits such as avoidance of sugary food and carbonated drinks, and preventive measures such as professional application of pit and fissure sealants should be applied in the dental clinic.

### 5. Restorations or extractions

Management of anterior and posterior tooth affected by MIH have different treatment modalities as for anterior teeth esthetic is of prime concern and for posterior teeth masticatory function is more important.

### Treatment options for MIH of Anterior teeth are-

The severity of the MIH decides the treatment options which are as following:

- a) Micro abrasion
- b) Bleaching - advisable in full-thickness brownish yellow or yellow defects, but not in whitish-cream or creamy-yellow defects that are located in inner part of the enamel
- c) Resin Infiltration- Resin infiltration is more effective, especially in areas with shallow defects.
- d) Defects which involve the entire width of enamel may require conventional approaches, such as composite resin restorations using self-etching adhesive.
- e) Composite veneers

### Treatment options for MIH of posterior teeth are

Based on the severity of the condition following are the treatment options-

- a) Desensitizing toothpaste
- b) Fluoride varnish
- c) Pit and fissure sealants
- d) GIC or RMGIC as temporary restorations (1-2 weeks) to reduce tooth sensitivity until a definitive restoration can be placed
- e) Resin composite restorations - superior in terms of ease of handling, wear resistance,

- fracture toughness, and resistance
- f) Full-coverage restorations (for example, stainless steel crowns)- good options for teeth with severely damaged surfaces.
- g) Extraction- Extraction may be the treatment of choice for non-restorable teeth or those with poor prognoses.
- h) In very young children, if the first molar is extracted then, occlusal guidance can be utilized to move the second permanent molar in position of the first molar.

## CONCLUSION

MIH is a developmental disorder of the dental enamel structure which is frequently associated with permanent incisors and one or more permanent first molars. It is characterized by well demarcated opacities and qualitative defects of enamel caused due to reduced inorganic enamel components, and reduced mineralization.

It can cause esthetic, functional, psychological, and behavioural problems in children. The exact causative mechanisms is unclear, but are thought to be multifactorial.

But it is mostly seen in Children who have systemic problems during the first three years of life or are born preterm. Mothers who have positive medical history during the pregnancy, MIH may develop in their children.

Hence, more emphasis should be given on oral hygiene strategies, prevention and remineralization processes of enamel, to reduce dental hypersensitivity.

To avoid post eruption breakdown, long-term follow-up with close monitoring of the restoration margins is required. In some patients, full coronal coverage restorations are required. Patients where extraction is done, they should be closely monitored by an orthodontist for the development of proper occlusion.

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# Periodontal Pack – A Review Article

## Abstract

Periodontal dressing (pack) is advocated for use, for its protection from mechanical trauma property, post operative in patients of periodontal surgery. Periodontal pack are being developed since 1923, and broadly classified as eugenol containing and non eugenol containing pack. Periodontal pack is also incorporated with antibiotics to stop infection on surgical site. Many factors are required for selection of an optimal pack material such as wound size, intention of healing, patient acceptance. This article is for review of types and advantage and disadvantage of periodontal pack.

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## INTRODUCTION

The periodontal dressings (pack) are protective materials applied over the wound created by periodontal surgical procedures (Glossary of periodontal terminology 2001).

Periodontal dressings were first introduced by Dr. A.W Ward in 1923. He suggested the use of periodontal dressing following periodontal surgery. Periodontal dressings are now widely used for various purposes by periodontists in periodontal surgery.<sup>1</sup> Zentler in 1918 first reported the use of a periodontal dressing in the form of iodoform gauze.<sup>2</sup> This marked the beginning of a trend toward using periodontal dressings after surgery.

A. W. Ward in 1923 invented the Wondrpak, using the word pack in this context for the first time.<sup>1</sup> A surgical dressing allows for uninterrupted healing to occur and also contributes to the protection of the surgical area and prevention of wound damage and infection. The first surgical dressing was patented by E. P. Leshner in 1953 (US Patent 2632443).<sup>3</sup>

A surgical dressing is also utilized after periodontal surgical procedures. These dressings are applied around the necks of the teeth and adjacent tissue to cover and protect the surgical wound after periodontal surgery.<sup>4</sup> They are applied to serve as a bandage over the surgical site with the objective of holding the flap in place; protecting newly formed tissue; minimizing postoperative pain, infection and hemorrhage; protecting the surgical site from trauma during eating and drinking and finally, supporting mobile teeth during the healing process.

In some cases, use of periodontal dressing is really beneficial. Protecting the wound from mechanical trauma and stability of the surgical site during the healing process are among the most important advantages of periodontal dressing application after surgery.

Other advantages include: patient comfort during tissue healing after surgery, good adaptation to underlying gingival and bone tissue, prevention of post-operative hemorrhage or infection, decreasing tooth hypersensitivity in the first hours after surgery, protecting the clot from the forces

applied during speaking or chewing, preventing gingival detachment from the root surface, prevention of coronal flap displacement in apically repositioned flaps, providing additional support in free gingival grafts, and the last but not the least protection of denuded bone during the healing process and splinting of mobile teeth after surgery. In non-surgical procedures, use of periodontal dressing can be helpful in aggressive periodontitis patients.<sup>5</sup>

## Types Of Periodontal Dressing

### Classification

According to Glickman, periodontal dressing are classified as.

- 1) Eugenol based periodontal dressing
- 2) Non eugenol based periodontal dressing

### Zinc oxide eugenol based

- Wards wonder pack
- Orban's pack
- Goldman's pack
- Kirkland's pack
- Modified Kirkland pack

### Non eugenol based

- Coe pak
- Perio care • Peripac
- Vocopac
- Perioputty
- Barricaid- light cure
- Collagen dressing
- Metha acrylic gel dressing
- Cyanoacrylate dressing

On the basis of composition, it has been classified in to:

- A) Zinc oxide and eugenol containing
- B) Zinc oxide without eugenol containing and
- C) Neither zinc oxide nor eugenol containing

### Zinc oxide eugenol based

The Wondrpak was the first periodontal dressing introduced containing eugenol.

It was a 2-component system comprising a powder with zinc oxide, powdered pine resin, talc and asbestos and a liquid containing isopropyl alcohol, clove oil, pine resin, pine oil, peanut oil, camphor and coloring materials.

A modified form of a eugenol dressing was introduced by Kirkland, called the **Kirkland formula**. It consisted of zinc oxide, resin, zinc acetate, eugenol, tannic acid and olive oil. The

composition of such eugenol dressings has evolved over the years; potentially caustic products such as asbestos and tannic acid have been eliminated from the dressings due to possible detrimental systemic effects.

Asbestos was found to have the potential to cause asbestosis, lung cancer and mesothelioma.

Tannic acid was found to cause potential liver damage, if absorbed systemically.

On the other hand, a few components were added to improve the properties – e.g., the addition of zinc acetate as an accelerator to increase the working time.

Zinc oxide and eugenol dressings are supplied as a liquid and powder or paste. These are mixed together on a waxed paper pad using a wooden tongue depressor or spatula. The powder or paste is gradually incorporated into the liquid until it reaches a dough-like consistency. The dressing may be used immediately or wrapped in aluminum foil and refrigerated for use for up to 1 week.

Traditionally periodontal dressing was based on zinc oxide eugenol system. Eugenol was included in these dressing because of its anodyne and weak antiseptic properties. The zinc oxide eugenol - dressings seems to prevent or retard bacterial growth. The obtundent effect of eugenol on the tooth and superficial tissue was considered advantageous.

Eugenol-based dressings were formerly popular, especially following gingivectomy (11), due to their property of obtunding pain and rendering sites less sensitive. Waerhaug and Løe in 1957 (12) commented that zinc oxide– eugenol dressings seemed to prevent or retard bacterial growth based on their antiseptic properties.

Histological evidence has also shown that eugenol-containing dressings produce greater tissue destruction, with more inflammatory cell infiltration and connective tissue response (14, 15). Eugenol has proven to be cytotoxic at higher concentrations and has an adverse effect on fibroblasts and osteoblast-like cells (16). All of these reasons lead to the development of noneugenol dressings in the late 1950s.

Kirkland pack (Kirkland pack, Prudent, Corporation of America-, Brookline, Maes). Powder and liquid: The powder contains zinc oxide, tannic acid, rosin, kaolin, zinc stearate, asbestos and their liquid is composed of eugenol, peanut oil and rosin. The dressing is prepared by mixing the powder and liquid. Zinc oxide (150 grams) is an antiseptic and astringent, tannic acid

(14.0 grams) is hemostatic and zinc stearate acts as an accelerator. Tannic acid has been associated with liver disease. Rosin increases the strength and speed of the reaction and it yields a smooth and more homogenous product. Studies have proved that the presence of asbestos fibers has resulted in chronic destructive lung disease and carcinoma. Eugenol (59.0 cc) is an anesthetic and obtundent, peanut regulates the setting time. It also contains lamp rosin (70.0 grams) that acts as filler and 29.5 cc of sweet almond oil. When the powder and liquid are mixed, setting occurs as a result of chemical reaction between Zinc Oxide and eugenol forming Zinc Eugenolate. Paste form: They are dispensed as two separate pastes. In this, tube1 contains base as Zinc oxide -87%, mineral oil 13% -which acts as a plasticizer and aids in offsetting the action of eugenol as an irritant. The tube 2 contains accelerator oil of clove or eugenol 12%, gum or polymerized rosin 50%, silica type of filler 20%, lanolin- 3%, resinous balsam- 10% - which helps to increase the flow and improve mixing properties. It also contains accelerator solution (calcium chloride) and coloring agent 5%

## **NONEUGENOL DRESSING**

Noneugenol dressings are currently the most widely used periodontal dressings. Commercially available non eugenol dressings include Coe-Pak, Cross Pack, Peripac, Septopack, PerioCare, Perio Putty and Periogenix.

### **Coe Pak**

Coe-Pak is the most widely used noneugenol intra oral dressing in the United States, and is manufactured by Coe Laboratories (Alsip, IL, USA). It consists of 2 pastes (Tab. II): the base paste which contains zinc oxide with added oils and gums, and lorcithidol which is a fungicide related to hexachlorophene. The catalyst paste contains coconut fatty acids thickened with colophony resin or rosin and chlorothymol as an antibacterial agent.

Equal lengths of material are placed on a waxed paper pad and mixed using a wooden tongue depressor until a thick consistency and uniform color is reached. The setting time can be altered by

adding a few drops of warm water during mixing or by immersing the pack into a bowl of warm water just after mixing. Once the paste loses its

tackiness, it can be handled and molded using gloves lubricated with water or petroleum. The pack is then formed into pencil-sized rolls that are then mechanically interlocked in the facial and lingual interproximal areas.

The Coe-Pak is available in regular set and hard and fast set formulations, based on its setting time and consistency, and it is supplied commercially both in manual mix and automix varieties.

### **Cross Pack**

Cross Pack was formerly the powder part of a zinc oxide-eugenol dressing in use in the late 1940s (W.G. Cross, personal communication, 1974). It consists of colophony powder, zinc oxide, tannic acid, bentonite and powdered neomycin sulphate. Cross Pack is added as a filler to Coe-Pak to give more body to the material. Zinc oxide alone can be used instead of Cross Pack if desired.

### **Peripac®**

Peripac (Dentsply, Konstanz, Germany) is a paste containing calcium sulphate, zinc sulphate, zinc oxide, polymethyl methacrylate, dimethoxy tetraethyleneglycol, ascorbic acid, flavor and iron oxide pigment. It reacts on exposure to air or moisture through loss of the glycol, dimethoxy tetraethylene glycol. Peripac is indicated as a dressing following gingivectomies and papillectomies, deep curettage, reattachment surgery and gingival repositioning. It can also be used in treatment of necrotic gingivitis and ulcers; protection of nonspecific lesions or sutured margins, fixation of desensitizing medicaments to cervical areas and temporary rebasing of immediate dentures in periodontal surgery.

### **Septo-Pack**

Septo-Pack (Septodont, Saint Maur-des-Fosses, France) contains amyl acetate, dibutyl phthalate, butyl polymetacrylate, zinc oxide, zinc sulphate and excipient. It is a self hardening plastic paste containing fibers in its mass. It can also be combined, as a neutral medium, with some medicines so that they can be kept in place easily on the gingiva or tooth or at the alveolar ridge level. Neither Peripac nor Septopack contains any specific antibacterial agent.

### **Perio Care**

PerioCare (Pulpdent Corp., Watertown, MA, USA) is a highly elastic periodontal dressing and sets resiliently hard. It comes in a 2-paste system: 1 contains a paste of metal oxides in vegetable oil, and the other contains a gel of rosin suspended in fatty acids. Equal amounts of the pastes are dispensed, mixed and applied.

### **Perio Putty**

Perio Putty (Cadco Dental Products Inc., Los Angeles, CA USA) is another noneugenol dressing containing methylparabens and propylparabens for their effective fungicidal properties and benzocaine as a topical anesthetic.

### **Periocarea**

This product (Voco, Cuxhaven, Germany) is supplied in two tubes (paste and gel). Equal amounts of paste and gel must be mixed on the mixing pad until the color becomes uniform. Setting time of this product is 45-60 seconds and the working time is 4-5 minutes.

## **Periodontal Dressings Containing neither Zinc Oxide nor Eugenol**

### **Cellulose-based periodontal dressing**

#### **Reso-pac**

This product (Hager &Werken Gm bH& Co. KG, Post fach, Germany) is supplied as one hydrophilic paste and is ready for use without mixing. This dressing remains in place for up to 30 hours, even on bleeding wounds, because of its hydrophilic properties. Reso pac swells up to a gel-like consistency after about 3 minutes.

#### **Mucotect**

This product (Hager &Werken Gm bH& Co. KG, Ger many) is supplied in one tube and contains carboxy methyl cellulose, polyvinyl acetate, ethyl alcohol, vaseline and polyethylene oxide resin. Mucotect is a hydrophilic paste and adheres to the area for up to 30 hours. Due to its composition, it adheres very well to damp and even bleeding areas

#### **Barricaid**

Barricaid (Pupdent, watertown, USA) is available in a syringe for direct placement. The syringe is also suitable for an alternate indirect technique. A

visible light-curing unit is required for the setting of this dressing. This product has a translucent character which provides superior esthetics. Barricaid is mainly composed of polyether dimethacrylate, silanized silica, accelerator, VLC photo-initiator and colorant.

## **CONCLUSION**

In this article it has been reviewed regarding different types, availability, and therapeutic effects of periodontal dressings. Studies shows that there is no univocal support for indication of a specific periodontal pack. Till now there is no clear support for periodontal dressing. It has been identified that no periodontal dressing material satisfies all the ideal properties of a material. Choosing an optimal periodontal dressing is surgeon's decision as many parameters are to be considered to employ them at the surgical site.

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# Precision Attachment : A Review Article

## Abstract

Precision attachments, also known as connecting links between fixed and removable partial dentures, address issues with stability, retention, and chewing ability in edentulous patients. These attachments combine functional stability and cosmetic appeal.

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## INTRODUCTION-

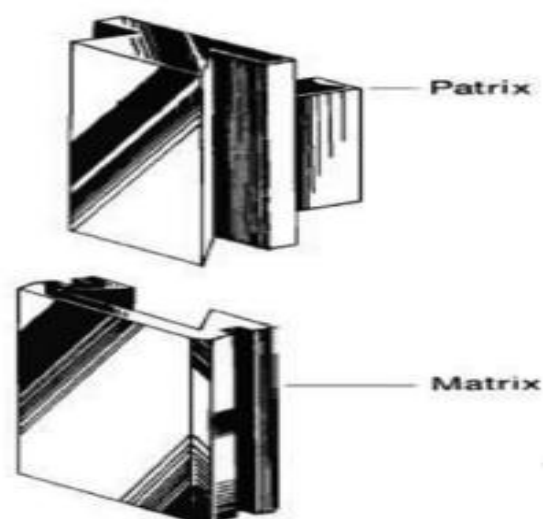
Advancements in technology, such as the internet, enable patients to gain knowledge of their oral environment while also ensuring aesthetic, functional, and comfortable dental restorations. Precision refers to the quality or state of being precise, and serves as a link between fixed and removable partial dentures.<sup>1</sup> Precision attachments are two metal components used to create an articulated joint (Fig. 1). The first component, or matrix, is a metal receptacle or keyway that fits within the clinical contours of a cast restoration. The second component, or patrix, is attached to the removable partial denture. They replace the occlusal rest, bracing arm, and retaining arm of traditional clasp retained partial dentures.<sup>2</sup>



**Fig 1:** Precision Attachment

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**Fig 2:** components of precision attachment

## GOALS<sup>3</sup>

The goals for fabrication of precision attachment prosthesis are as follows:

- a. To be removable and replaceable without stress or stain on abutment teeth
- b. To permit normal anatomic contour to the abutment teeth
- c. To provide many years of comfortable service
- d. To be made of materials that are compatible with oral tissues.
- e. Resistance to abrasion
- f. Resistance to corrosion
- g. To be esthetically acceptable
- h. To require minimal amount of tooth structure to be removed
- i. To be hygienically clean

## Indications

- a) Movable joints in fixed movable bridge work
- b) As stress breaker in free end saddles and bridges
- c) Intracoronal attachments are effective retainers for removable partial dentures
- d) As a connector for sectional dentures
- e) Sections of a fixed prosthesis may be connected with intra coronal attachments
- f) To lock a connector joining a saddle in the opposite side of the arch
- g) As contingency devices for the extension or conversion of existing fixed appliances.
- h) Periodontal involvement that contraindicates fixed partial dentures
- i) Labial clasp arms which would otherwise be displayed in the anterior part of the mouth and would be esthetically displeasing
- j) To retain hybrid denture<sup>4</sup>

## Contraindications<sup>4</sup>

1. Sick and the senile (prosthesis with attachments must be inserted along one precise path of insertion, the patient must possess an average degree of manual skill).
2. Periodontitis.
3. Abnormally high caries rate
4. Inadequate space to employ them (Teeth that are very narrow facio-lingually).

## CLINICAL APPLICATIONS OF PRECISION ATTACHMENTS:

### Precision attachment-retained overdentures:

The attachment-fixation overdenture is far superior to other types of overdentures or other forms of overlay prostheses. It can more closely approximate the results obtained with fixed bridgework and precision partial denture prosthetics than is possible with conventional complete dentures. The patient is more secure in its use.<sup>5</sup> These attachments can also be used with implants. Examples of precision attachments for overdentures are:

### Bar attachments

- Dolder bar
- Hader bar
- Andrews bar
- Ceka bar
- Octalink
- C.M. bar
- M. P. Channels
- Ackerman bar
- Customized bars<sup>6</sup>

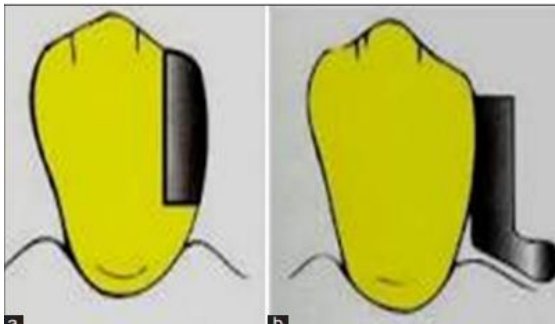
### A. Stud attachments

- Dalla Bona
- Gerber
- Ceka
- Rothermannn
- Gmur
- Huser
- Schubiger
- Ancrofix

### B. Auxiliary attachments

- Schubiger screw system
- VK screw system
- Ipsoclip
- Pressomatic
- IC attachment

### 1. Precision attachments for removable partial dentures:



**Fig 3: a) extracoronal attachment  
b) intracoronal attachment**

### A. Extracoronal attachments

- Spang stabilex and conex
- Crismani resilience joint
- Dalla bona resilience joint (fig 3)
- Steiger axial rotation joint
- Scott External precision attachment
- Hinges

### B. Intracoronal attachments

- Ceka attachment
- Telescope Studs (Push Button Attachments)
- Gerber retention cylinder
- Dalla bona cylindrical anchor
- Schneider anchor
- Baer fah anchor
- Rothermann eccentric

## 2. Precision attachments in fixed prosthodontics:

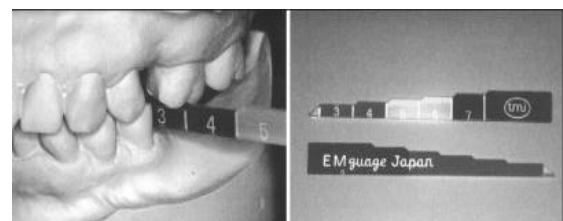
Precision attachments are also used in fixed prosthetics. Splints are reduced in size to facilitate parallelism and cementation. Rationales for employment are as follows:

- Precision attachments make it easier to parallel small sections, reducing the need to parallel up to 14 teeth.
- Lower anterior teeth are typically flared, making it difficult to create a common path of insertion between them and the second molar for a one-piece splint without devitalizing multiple teeth.
- When using porcelain fused to metal, adding more units to the splint causes contraction during baking, resulting in a poorer fit.

- Typically, the second molar is the first to wash out when the cementing medium is removed. Instead of having to rebuild the entire dental arch, the dentist can replace a small section. The rest seat is typically placed in the strongest section (usually the anterior) and the rest in the posterior. Place the rest and seat at the desired occlusal height. Avoid placing porcelain over the attachment. Placing porcelain over an attachment can cause fractures.<sup>7</sup>

## ATTACHMENT SELECTION:

Dr. Merrill Mensor classified it as the E. M. attachment selector (see Fig 15). The 5 charts provide information on tooth type, vertical dimension (minimal and maximum), assembly complexity, rigid or resilient function, resilience type, movement size, and retention type. A color-coded millimetre attachment gauge is used to determine vertical clearance in edentulous regions of occluded casts, allowing for attachment selection. The plastic gauge measures 75mm in length. The measurement ranges from 3 to 8 mm in 1 mm increments, with corresponding colour code.<sup>8</sup>



**Fig 4: EM attachment gauge and selector card**

Red designates 3 to 4 mm,  
Yellow designates 5 to 6 mm  
Black designates 7 to 8 mm.

The tooth that will support an attachment has the gauge positioned between the occluded castings next to it. This means that the measurement is read both numerically and color-wise.

When choosing an attachment system,

- The first step is deciding whether to use an intracoronal attachment.
- The second decision is whether to use resilient or nonresilient types.
- The third thing to think about is that, in order to maximise the prosthesis's stability, retention, and strength, the greatest attachment that can be employed in the available space should be selected.

## Mechanism of Action:

The attachment uses the following processes to resist separation.

1. Friction Friction occurs between contacting parallel walled bodies. It is directly related to the area of the opposing surfaces as well as to the length of axial walls. This can be enhanced by the addition of active retention elements like -Spring – loaded bolts on plungers, Leaf – springs, Ring – springs , Bolts, Rubber devices
2. Binding It create an additional binding effect significantly increasing resistance to withdrawal.
3. Wedging of conical bodies
4. Internal spring loading as produced by a clip within a cylinder
5. Active Retention

## Intracoronaral versus Extracoronaral Attachment:

The size and shape of the abutment teeth determine whether an intracoronaral or extracoronaral attachment is used.

Intracoronaral attachment requires more tooth preparation and reduction compared to extracoronaral attachment.

Insufficient space for intracoronaral attachments can cause over-contoured abutment retainers on the proximal surface, leading to periodontal issues during restoration. For adequate space, intracoronaral attachments are preferred to direct forces along the long axis of abutment teeth.

Extracoronaral attachments are useful in small spaces, but they can be difficult to clean and cause maintenance issues. Extra-coronaral attachment's lever arm may not evenly distribute force along the teeth's long axis.<sup>9</sup>

## Resilient Versus Non-resilient Attachment:

When dealing with distal extension edentulous situations, there are significant philosophical differences on whether to use resilient or non-resilient attachment systems.

Resilient attachment directs functional forces to the tissues and alveolar ridge, while non-resilient attachment focuses vertical forces on the abutment teeth.

During loads, both systems share some functionality.<sup>10</sup>

## INSTRUCTIONS TO PATIENT AND RECALL:

### Instructions to the patient:

Before dismissing a patient, it's important to review potential difficulties and provide proper care for the prosthesis and abutment teeth.

### Return For Post insertion Adjustments:

Patients should schedule their first post-denture appointment 24 hours after insertion. The patient should wear the denture continuously between the first two appointments, except for cleaning. After 24 hours, the patient will have opinions on how the denture feels and functions. Appointments for post-insertion adjustments demonstrate concern for patients' well-being and may require minor adjustments to improve denture fit and comfort.

### Sore spots:

Patients should be informed about potential sore spots and scheduled appointments to address them promptly. After the initial adjustment period, the patient should be informed that additional sore spots may develop. Any persistent sore spots should be examined and adjusted.

### Insertion and removal:

Patients should be shown how to remove and place their removable partial denture. Before dismissal, the patient is asked to insert and remove their partial denture correctly in front of a mirror several times.

### When To Wear The Partial Denture:

Leave the removable partial denture out of the mouth while sleeping to allow tissues to rest and heal. To prevent acrylin resin dehydration, immerse the prosthesis in water after removing it from the mouth. When not wearing the removable partial denture, patients should avoid eating to prevent food from getting stuck in the female receptacle.

### Cleaning The Denture:

Patients who wear removable partial denture prostheses should be encouraged to maintain meticulous oral hygiene. The teeth adjacent to the removable partial denture are especially susceptible to decay, since they no longer receive

the same kind of thorough cleansing action from the cheeks, tongue and saliva. After meals, food must be removed from between the prosthesis and the teeth to avoid the possibility of carious involvement.

The removable partial denture should be rinsed under cool water after each meal and brushed at bedtime with a natural bristle brush along with the regular tooth brushing routine. Most pharmacies sell special partial denture brushes for cleaning the insides of clasps and the area around attachments. Smokers tars that build up on the framework can be removed by immersing the denture overnight in white vinegar. More persistent stains and calculus buildup should be removed at the patient's routine recall appointment. An ultrasonic cleaner with the proper solution for stains and calculus will remove stubborn unsightly deposits.

### **Speech:**

Initially, the patient may have difficulty speaking clearly, especially if the maxillary removable partial denture covers the palate or replaces anterior teeth. The tongue may be restricted and require time to adjust to the new environment. Typically, the condition is temporary and resolves on its own. For patients who struggle with speaking, reading aloud and repeating difficult sounds can help speed up the process.

### **Saliva:**

During the first few days of wearing the partial denture, the patient may experience increased saliva production. As the removable partial denture becomes a permanent part of the oral environment, saliva flow will decrease.

### **Tooth soreness or sensitivity:**

Often, teeth used as abutments for removable partial dentures were not functional before the prosthesis was placed. Restored teeth may experience soreness due to loading and minor orthodontic effects of removable partial dentures. It is important to let the patient know about this potential. Premature occlusal contact could also be the cause. Remount procedures and occlusal adjustment are recommended during and after insertion, with or without tooth soreness symptoms.<sup>11</sup>

### **Materials employed for Precision Attachments:**

Several materials may be utilised for precision attachments depending on the precise type of

attachment system and the dentist's or prosthodontist's preferences. Here are some typical components for precise attachments.

**1.Metal Alloys:** Cobalt-chromium (Co-Cr) and titanium alloys are common metal alloys used in precision attachment machinery. These alloys offer a precise fit, great strength, and better resistance to corrosion. They are utilised to create the framework that holds up the male component and the other parts of the partial denture since they are robust and long-lasting.

**2.Ceramics:** The best option is dental ceramics, like as porcelain or zirconia, because of their outstanding aesthetic properties. These materials can be used for the female component of the precise attachment and provide a natural tooth-like appearance. In addition to being biocompatible and stain resistant, ceramics have an appealing aesthetic.

**3. Composite Resins :** Composite resins, which are materials with a tooth-colored hue, can be used to make the female portion of precision attachments. They link to the natural tooth structure easily and have a lovely appearance. Composite resins are a less expensive alternative to ceramics, but they must be more resilient.

**4.Polymers:** Polymers like acrylic resins are occasionally used to make the male part of precise attachments. During the fabrication process, these materials may be easily modified and are lightweight. Conversely, polymers may require more frequent upkeep or replacement due to increased wear and tear.<sup>12</sup>

### **Recent Developments in Precision Attachments :**

**1.CAD/CAM Technology:** Precision attachment design and manufacture have changed dramatically as a result of computer-aided design/computer-aided manufacturing (CAD/CAM) technology. Accurate imprints of the patient's oral anatomy are captured using digital scanners. 3D printers are then used to print the recorded images, producing precise, customised precision attachments. Accurately creating precise attachments is facilitated by digitally assisted designs.

**2.Integration of Digital Processes:** With the advent of digital technologies, dental professionals can now easily integrate precise attachments into their practices. It includes virtual treatment planning, prosthetic milling, 3D



printing, and digital design. Better fitting precision attachments. They are more dependable as a result of the digital workflow's improved accuracy and efficiency.

**3. New and Advanced Materials:** Newer metal alloys with enhanced corrosion resistance and biocompatibility have been created. Zirconia and other tooth-colored materials are more aesthetically pleasing than traditional metal fasteners. One of the greatest ceramic materials for teeth is zirconia. replacements and is becoming increasingly used in dental procedures.

**4. Advancements in Magnetic Attachments:** Magnetic attachments are now made using better materials and designs. In order to enhance fit and function, new magnetic attachment techniques provide more stability and retention. Magnetic attachments provide versatility and easy maintenance because they are easily repositionable.

**5. Hybrid Attachments:** Hybrid attachments combine a variety of methods with special characteristics. For instance, the optimum retention and stability may occasionally be provided by a sturdy attachment combined with a ball attachment. Customised solutions that take into account the unique needs of each patient are made feasible by hybrid attachments.

**CAD/CAM Designed Implant Attachments:** CAD/CAM technology have made it feasible to design and produce implant attachments for implant-supported prostheses. It enables exact fitting and customisation of dental implant attachments, enhancing the stability and longevity of the prosthesis.<sup>13</sup>

## Pros and Cons with Precision Attachments:

### Pros:

**Enhanced Aesthetics:** Zirconia and other natural-looking materials are used to create the more sophisticated and improved precision attachments, which provide superior aesthetics for teeth replacements.

**Proper Retention and Stability:** Compared to traditional removable prostheses, precision attachments made using cutting-edge digital workflow offer higher retention and stability. It offers a more firm attachment and aids in maintaining the contact between the male and female components suitable.

It lessens the possibility that a prosthesis will shift or come loose during speaking or chewing.

**Extensive Tooth Preservation:** By keeping the tooth structure intact, precision attachments can shield the natural tooth structure. The abutment teeth can be kept when precise attachments are used in place of conventional fixed dental prostheses, reducing the need for tooth reduction.

**Better Chewing ability and patient comfort:** When biting and chewing food, patients are more comfortable and efficient when precision attachments evenly disperse the forces used. It might enhance the patient's overall chewing abilities and dietary choices. They are easier to put on and take off, lighter, and more comfortable.

### Cons:

**Complex Design and Fabrication:** Because the process of creating a precision attachment is intricate and time-consuming, careful planning and effective communication between the dentist and the dental technician are necessary.

**Price:** The design and construction of precision attachments require extreme precision. These accessories are made by skilled experts utilising the newest technologies and premium materials. Higher overall treatment costs with precision attachments are a result of all these considerations.

**Requires proper maintenance:** Precise attachments deteriorate due to strain and pressures from chewing and other functional motions. To provide greater efficiency and longevity for long-lasting effects, it may need to have some components replaced on a regular basis.

**Suitability:** Not all situations may be appropriate for precision attachments. Precision attachments may not be recommended in several clinical circumstances, including as poor oral hygiene, impaired abutment teeth, or unfavourable jaw connections. Alternative therapeutic methods must be taken into consideration in such circumstances.

**Adjustment and Repairs:** It takes time to add and remove parts and fine-tune the fit of precision attachments. To maintain these attachments' functionality and comfort, it is imperative that you constantly check on their state and make the required modifications.<sup>7,8</sup>

## Conclusion

Precision attachment, combined with advanced partial denture construction, allows for aesthetic, retentive, strong, and problem-free prosthesis that do not compromise patients' oral health. Clinicians who become familiar with precision attachments will expand their treatment options and broaden their referral base. To use attachments, dentists must have a solid understanding of basic prosthodontic principles, relevant training and experience, technical skills, clinical ability, and judgement. Precision attachments require technical skills. Understanding the biomechanics of maxillo-mandibular function, attachment types, and material science is crucial for treating precision attachment cases. Precision attachments can effectively retain, distribute stress, and improve aesthetics when properly planned and maintained by both the dentist and the patient.

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