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Ref. No. .....

Date.....

MESSAGE

It is heartening for me to know that the Mithila Minority Dental College & Hospital is bringing out its Journal, for providing the multitude of needful information about Bachelor of Dental Science Programme which is being conducted under the aegis of this Department.

Conducting a professional programme like BDS in a predominantly under-developed region like Mithilanchal is daunting and challenging task. This is primarily because education systems and practices have undergone sea level changes over the past years, so much so that at times it becomes pretty difficult to cope with some of their basic pre-requites for an institute situated at places far flung from the educational conglomerates.

I am happy to note that amidst all such constraints the BDS Programme of our University has been able to carve out a distinct place for itself in the galaxy of Dental Science in the country.

Hope and trust, in the days to come greater attention would be paid to facilitate Dental-academic interface so as to have better feel of the ground realities calling the shots in the highly competitive education world especially in the field of Dental Science.

As the Vice-Chancellor of L. N. Mithila University, Darbhanga, I wish all the best to all the aspirants of BDS programme of the Institute.

(S. K. Singh)
Vice-Chancellor

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,

I am honored to have been chosen as the new editor-in-chief of "The Journal of Oral and Dental Health" and am thrilled to share my vision for the future of our illustrious journal. The journal will continue to publish high quality clinical and epidemiological research in material and dental disease in later life. Original research articles form the bulk of the content, with systematic reviews an important sub-section. The methodological quality of such publications has improved dramatically over the last few years

Every individual is equipped with talent. Nobody is born to be idle. A person will succeed in life only when he identifies the dormat talents within himself when it happens, there will be a change in the attitude followed by a paradigm shift in behaviour. However even the best clinical research publications, subjected to close scrutiny by peer review, often have weaknesses. Here editorials and commentaries play a key role in exploring more contentious issues in a balanced way, allowing the reader to make an informed decision on how or whether their clinical practice should be altered.

It is important we have a good balance of different article type within the journal. I am keen to encourage publication of high-quality evidence-based guidelines in dental practice. Such articles are widely read (and downloaded), can have major impact on clinical practice, and also tend to be highly cited to the benefit of our Impact Factor. The journal also has the potential to (re-) shape thinking on important concepts in clinical care, and here 'new horizons' articles have a particular role.

Every obstacle that we come across gives us an opportunity to improve our circumstances, and while the lazy complain, others are creating opportunities through their kind hearts,generosity, and willingness to get things done

Lastly I should thank all our submitting authors, who have toiled in the production of their work, and have chosen Age and Ageing as the journal they would like to publish in. Those that do have their work accepted should be proud of their achievement.

Dr. Rohit Miglani, MDS
Editor in Chief
Journal of Oral & Dental Health

Dean (Dental Faculty)
Lalit Narayan Mithila University,
Darbhanga (Bihar)

Principal
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MESSAGE FROM THE EDITOR

"Student: Dr. Einstein, Aren't these the same questions as last year's [physics] final exam?

Dr. Einstein: Yes; But this year the answers are different."
– **Albert Einstein**

The quantum of knowledge that we are acquiring everyday is in fact enormous. Dental field is no exceptional. How to implement this knowledge is the onus on us. To carry forward the science and pave future paths for coming generation of aspiring researchers. Journal of Oral and Dental Health , the official publication of L.N.Mithila University has till now tried to maintain its standard in publishing remarkable works in the field of Dentistry. Our endeavour and focus is on making this journal relevant and contemporary with a higher impact and greater significance. Articles from all fields of dentistry from various colleges of the country are incorporated not only get a diversified view but to maximise chances of citations. We scrutinize all articles, get it reviewed by experts following plagiarism checks to deliver authenthic works.

Finally , I would like to thank the management of MMDCH to provide all possible help and continuous support in regular uninterrupted publishing of the Journal. I would like to thank the authors, readers, reviewers for their great help and support and cooperation.

I wish the Journal will reach newer heights in future.

Prof (Dr) Dipto De

Executive Editor
Journal of Oral and Dental Health

MESSAGE FROM THE CO-EDITOR

"***Research is the creation of new knowledge***"

- Neil Armstrong

Greetings to one & all!

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

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

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

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

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

I also take this opportunity to invite faculties in various dental institutes, clinicians, students, etc. to contribute to this journal by sending in their scientific studies and help enhance the scientific content of our discipline of dentistry.

Lastly I congratulate the authors of the articles of this inaugural edition for successful publication of research.

Thank You.

Regards

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PhD Guide
UG & PG Examiner

Executive Committee Member
Maharashtra State Dental Council

Lifetime Senate Member
Lalit Narayan Mithila University, Darbhanga, Bihar

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Hon. Gen. Secretary
Indian Association of Public Health Dentistry – Maharashra Chapter

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CASE SERIES

Original Article Journal of Oral and Dental Health

Evaluation of Success of Dental Implants in Diabetic Patients: A case-control study

Abstract

Diabetes mellitus has long been considered a relative contraindication to dental implant therapy. After loss of tooth, patients stop habit of that kind of food which require more effort to chew which can cause to an poor nutrition with adverse metabolic control. Hence; we planned the present study to assess the success of dental implants in diabetic patients.

Keyword: Diabetic, Dental Implant, Success

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Introduction

Diabetes mellitus is a chronic metabolic disorder that is reaching epidemic proportions. Diabetes mellitus has long been considered a relative contraindication to dental implant therapy.[1, 2] Dental implant survival is initially dependent upon successful osseointegration following placement. Subsequently, as an implant is restored and placed into function, bone remodeling becomes critical to long-term implant survival in responding to the functional demands placed on the implant restoration and supporting bone.[3, 4] The critical dependence on bone metabolism for implant survival may be a vulnerability for patients with diabetes. Recent studies offer indirect evidence for diabetes patients benefiting from oral rehabilitation based on dental implant therapy. After tooth loss, patients avoid food which needs more effort to masticate which can lead to an adverse nutrition with poor metabolic control.[5-7] Hence; we planned the present study to assess the success of dental implants in diabetic patients.

Materials & methods

The present study was planned in the department of oral implantology and prosthodontics of the dental institute and included assessment of success of dental implants in diabetic patients. Ethical approval was taken from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. Inclusion criteria for the present study included:

- Patients with history of diabetes and on medication for the same from minimum of past two years,
- Patients between age group of 25 to 50 years,
- Patients with negative history of any known drug allergy,
- Patients with negative history of any other bone metabolic disorder,
- Patients who underwent prosthetic rehabilitation for missing maxillary permanent first molar

After meeting the inclusion criteria, a total of 15 diabetic patients and 15 healthy non-diabetic controls were included in the present study. Dental implants were placed in all the patients using standard procedures. Complete demographic details were obtained of all the patients. Follow-up details and records of all the patients were obtained and recorded on excel sheet. Evaluation of all the results was done by SPSS software. Univariate regression curve was used for assessment of level of significance.

Results

A total of 30 patients were included in the present study, out of which, 15 were diabetic and the remaining 15 were non-diabetic. Mean age of the diabetic and non-diabetic patients were 36.2 years and 38.1 years respectively. Among diabetic patient group, 10 patients were males while in non-diabetic patient group, 11 patients were males. Among diabetic group, 13 patients had successful

results in relation to dental implants while in 2 patients, failure of dental implant occurred. Among non-diabetic group, 14 patients had successful results in relation to dental implants while in 1 patient, failure of dental implant occurred. Success rate of dental implants in diabetic and non-diabetic group was 86.67 percent and 93.33 percent respectively.

Discussion

In the present study, we observed that success rate of dental implants in diabetic and non-diabetic group was 86.67 percent and 93.33 percent respectively. Systematic review of literature was performed by one of the previous authors, who assessed the researches published in MEDLINE/PubMed in a time period of 27 years. Along with this, they also searched the reference lists of original and review articles. Dental implants, immediate implants osseointegration, periodontal disease, diabetes, hyperglycemia, metabolic control, and glycemic control were the following key words, they used in combination for research. Both human and animal models were included in their research. All levels of evidences were included in their selection criteria. They included only those articles which were published in English language and excluded the unpublished data. Initially, a total of 33 studies were identified. However; later on, 15 studies were found to be unfit after meeting the inclusion criteria. Negative impact of uncontrolled diabetes on the success of dental implants and their osseointegration was reported in all the included studies. From the results, they concluded that in diabetic subjects with optimal metabolic control, successful dental implant osseointegration can be obtinaed. 8 In a previous study conducted by de Molon RS et al, authors assessed the bone healing around dental implants with established osseointegration in experimental diabetes mellitus (DM) and insulin therapy by histomorphometric and removal torque analysis in a rat model. They assessed a total of 80 male Wistar rats, who were given titanium implant in the tibiae proximal methaphysis.

After a healing period of 60 days, the rats were divided into four groups of 20 animals each: a 2-month control group, sacrificed at time (group A), a diabetic group (group D), an insulin group (group I), and a 4-month control group (group C), subdivided half for removal torque and half for histomorphometric analysis. In the D and I groups the DM was induced by a single injection of 40 mg/kg body weight streptozotocin (STZ). Two days after DM induction, group I received subcutaneous doses of insulin twice a day, during 2 months. Groups C and D received only saline. Two months after induction of DM, the animals of groups D, C and I were sacrificed. The plasmatic levels of glucose (GPL) were monitored throughout the experiment. They did histomorphometric and mechanical torque evaluation of bone to implant contact and bone areas. For groups A, C and I, GPL was within normal range, while for group D, GPL was higher.. The means and standard deviations (SD) for histomorphometric bone area showed significant difference between group D (69.34 ± 5.00%) and groups C (78.20 ± 4.88%) and I (79.63 ± 4.97%). Related to bone-to-implant contact there were no significant difference between the groups D (60.81 + 6.83%), C (63.37 + 5.88%) and I (66.97 + 4.13%). The means and SD for removal torque showed that group D (12.91 ± 2.51 Ncm) was statistically lower than group I (17.10 ± 3.06 Ncm) and C (16.95 ± 5.39 Ncm). Bone healing was impaired around dental implants due to DM, with established osseointegration and I resulting in a lowest torque values for implant removal.[9]

McCracken MS et al measured bone response to implants in uncontrolled and insulin-controlled diabetic rats. One hundred and fifty-two rats were divided into control, diabetic, and insulin groups. Rats received streptozotocin (65 mg/kg) to induce diabetes; animals in the insulin group also received a subcutaneous slow-release insulin implant. Titanium alloy implants (1.5 x 8 mm) were placed in the proximal tibiae of animals. Implants were harvested at 2, 7, 14, and 24 days and examined histologically. Mean bone volume peaked at day 7 and decreased over time to day 24. Mean bone volume percent at 2, 7, 14, and 24 days (+/-SD) was 8.2 (+/-8), 22.9 (+/-8), 18.8 (+/-10), and 14.9 (+/-9), respectively. Mean total bone volume percent (adjusted for day) for control, diabetic, and insulin groups (+/-SD) was 12.4 (+/-9), 22.6 (+/-10), and 17 (+/-7), respectively. Bone volume adjacent to implants in diabetic rats was significantly greater than controls ($P<0.05$). Diabetic animals treated with insulin were not statistically different from controls. Induction of diabetes with STZ is associated with increased bone response compared with controls. This response was mediated by treatment with insulin.[10]

Conclusion

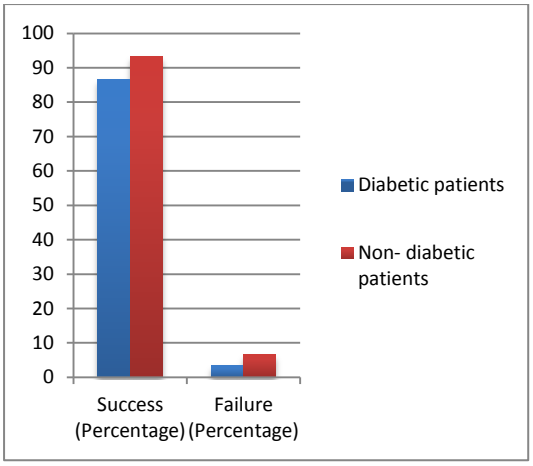
From the above results, the authors concluded the prognosis of dental implant in controlled diabetic patients taking proper medications and measures appears as good as in non-diabetic patients.

Table 1: Demographic details of the diabetic and non- diabetic patients

Parameter	Diabetic patients	Non- diabetic patients
Number	15	15
Mean age (years)	36.2	38.1
Males	10	11
Females	5	4

Table 2: Success rate of dental implants

Parameter	Diabetic patients	Non- diabetic patients
Success (No. of patients)	13	14
Success (Percentage)	86.67	93.33
Failure (No. of patients)	2	1
Failure (Percentage)	3.33	6.67



Graph 1: Success and Failure implants among both groups

References

1. Nobre Mde A, Maló P, Gonçalves Y, Sabas A, Salvado F. Outcome of dental implants in diabetic patients with and without cardiovascular disease: A 5-year post-loading retrospective study. Eur J Oral Implantol. 2016 Spring;9(1):87-95.

2. Levin L, Nitzan D, Schwartz-Arad D. Success of dental Implants placed in intraoral block bone grafts. J Periodontol. 2007;78:18–21.
3. Mellado Valero A, FerrerGarcía JC, Herrera Ballester A, Labaig Rueda C. Effects of diabetes on the osseointegration of dental implants. Med Oral Patol Oral Cir Bucal. 2007;12:E38–43.
4. Santana RB, Xu L, Babakhanlou C, Amar S, Graves DT. A role for advanced glycation end products in diminished bone healing in type 1 Diabetes. Diabetes. 2003;52:150–210.

5. Machtei EE, Frankenthal S, Blumenfeld I, Gutmacher Z, Horwitz J. Dental implants for immediate fixed Restoration of partially edentulous patients: A 1-year Prospective pilot clinical trial in periodontally susceptible Patients. J Periodontol. 2007;78:1188–94.

6. Yang W, Lu J, Wang J, Jia W, Ji L, Xiao J, et al. Prevalence of diabetes among men and women in China. N Engl J Med. 2010;362:1090–101.

7. Vaz NC, Ferreira AM, Kulkarni MS, Vaz FS. Prevalence of diabetes mellitus in a rural population of Goa, India. Natl Med J India. 2011;24:16–8.

8. Javed F1, Romanos GE. Impact of diabetes mellitus and glycemic control on the osseointegration of dental implants: a systematic literature review. J Periodontol. 2009 Nov;80(11):1719-30. doi: 10.1902/jop.2009.090283.

9. de Molon RS1, Morais-Camilo JA, Verzola MH, Faeda RS, Pepato MT, Marcantonio E Jr. Impact of diabetes mellitus and metabolic control on bone healing around osseointegrated implants: removal torque and histomorphometric analysis in rats. Clin Oral Implants Res. 2013 Jul;24(7):831-7. doi: 10.1111/j.1600-0501.2012.02467.x. Epub 2012 Apr 18.

10. McCracken MS1, Aponte-Wesson R, Chavali R, Lemons JE. Bone associated with implants in diabetic and insulin-treated rats. Clin Oral Implants Res. 2006 Oct;17(5):495-500.

Locking Titanium miniplate versus standard Titanium non locking miniplate Fixation in the Management of Mandibular fracture- A randomised clinical trial

Abstract

The purpose of this clinical study was to compare 2mm titanium locking mini plates with 2mm nonlocking titanium miniplates in fixation of mandible fractures and to compare post-operative complications between the two study groups.

Keywords: Mandibular fractures, locking titanium miniplates.

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INTRODUCTION

Mandibular fractures are the most common facial injuries treated by the oral and maxillofacial surgeon. Fractures of the mandible occur more frequently than any other fracture of the facial skeleton.[1,2]

Rigid internal fixation of mandibular fractures eliminates the need for intermaxillary fixation and facilitates stable anatomic reduction while reducing the risk of postoperative displacement of the fractured fragments, allowing immediate return to function.[3,4,5] Various types of bone-plating systems have been developed to provide stable fixation for mandibular fractures and osteotomies.[6] Currently, modifications in miniplates, like locking plate/screw system, have been developed.[7] The introduction of locking plate/screw miniplate has offered certain advantages over other plating systems like it becomes unnecessary for the plate to have intimate contact with the underlying bone, making plate adaptation easier leading to lesser alterations in the alignment of the segments and changes in the occlusal relationship upon screw tightening.[8]

Another theoretical advantage in the locking plate/screw system is that these plates do not disrupt the underlying cortical bone perfusion as much as the conventional plates, which compress the undersurface of the bone plate to the cortical bone.[9] A third advantage of the locking plate/screw system is that the screws are unlikely to loosen from the bone plate. This means that even if the screw is inserted into the fracture line, loosening of the screw will not occur. Main advantage of this locking plate is decreased incidence of screw loosening from infection related to plates.[10] The purpose of this study was to review the efficacy of this new locking bone plate for fixation in mandibular fractures.

MATERIAL AND METHODS

This was a randomized clinical study analyzing 30 patients of an age group of 15-70 years with non communited mandibular fractures (symphysis/ parasymphysis/ body/ angle/ condyle), undisplaced or minimally displaced mandibular fractures, having an insignificant medical history. The data was collected from the patients reporting with mandibular fractures in the Department of Oral and Maxillofacial Surgery, Rungta College of Dental Sciences and Research, Bhilai, Chhattisgarh. - The cases which meet the inclusion criteria were treated by open reduction and internal fixation with 2.0 mm titanium locking miniplates and screws. Inclusion criteria for the study are minimally displaced fractures of mandible. Exclusion criteria were patients with communited fracture, medically compromised patients who are unfit to undergo surgery under general anaesthesia, paediatric patients (age <15 yrs.), geriatric patients (age >70 yrs.).

SURGICAL PROCEDURE

After obtaining informed consent, patients were treated either under general anesthesia under cover of antibiotics

(cephalosporins and metronidazole). Upper and lower arch bars were placed in case of any other associated fractures or multiple mandibular fractures and eyelet wires were placed in both the arches in cases of isolated mandibular fractures. Depending on the location of fracture, the fracture site was exposed either through intraoral lower vestibular incision or extra oral sub-mandibular incision or extra oral through existing cut or laceration if any. Open reduction of the fracture fragments was done. Occlusion was established with maxillo-mandibular fixation and displacement was corrected. Two plates were used for fixation of fractures in the inter-foraminal region. A single plate was used for fixation of fractures in the body and angle region. In case of body and angle fractures, transbuccal trocar was used for the placement of screws perpendicularly. The occlusion was checked. Following fixation, gap between the fractured fragments was re-assessed. Wound toilet was done. Operative site was closed with 3-0 vicryl and 3-0 mersilk. An extra-oral pressure dressing was applied with material like dynaplast. All patients were kept under antibiotic coverage for one week. They were advised to take liquid diet for 2 days and thereafter on a soft diet for 2 weeks. Also they were advised to use chlorhexidine mouth rinse frequently to keep the mouth clean. Sutures were removed on the seventh post- operative day.

FOLLOW UP

All patients were evaluated on the second day, second week and 8th week post-operatively for the following parameters such as lower border continuity, loosening or displacement of screw-radiographically and complications such as pain, malocclusion, infection, mobility of fracture segments and need for plate removal and inter maxillary fixation was done if any. All the clinical facts and incidence were noted, treated if required, and documented.

THE 2mm LOCKING MINIPLATE SYSTEM

The thickness of the plate was 2 mm, and the lengths of the plates and screws were variable depending on the fracture site and other clinical considerations.

RESULT

A total number of 30 patients with simple/linear fractures in the mandible with or without associated fractures of the facial bones who reported to Department of Oral and Maxillofacial Surgery, Rungta College of dental sciences & research, Bhilai Chhatisgarh were included in the study between the periods of January 2013- June 2014. Patients were randomly categorized into two Groups with 15 patients in each Group. Open reduction and internal fixation were carried out in all patients using, 2.0mm locking plates and screws in 15 patients (Group 1) and 2.0mm miniplates and screws in 15 patients (group 2). The comparative results were tabulated as follows.

Table 1 shows the comparison of occlusion between the two Groups preoperatively. On pre-operative day, 9 patient in Group 1 and 10 patients in Group 2 had intact occlusion. 6 patients in Group 1 and 5 patients in Group 2 had deranged occlusion. No statistically significant difference in the pre-operative occlusion status (intact/deranged) between the Groups (P>0.05).

Table 2,3,4 shows Comparison of Postoperative-Occlusion. On the 2nd post-operative day, the number of cases with intact occlusion in Group 1 and Group 2 was found to be 14 and 12 respectively. The number of cases with deranged occlusion was found to be 1 and 3 respectively. No statistically significant difference was found between the two Groups with respect to occlusion (intact/deranged) post operatively (P>0.05).

Occlusion on 2nd weeks post-operatively 14 patients in Group 1 and all patients in Group 2 had satisfactory occlusion. Deranged occlusion was found in 1 patient in Group 1 on the second post-operative week. At the 8nd week follow up, all the patients had what appeared to be a pretrauma occlusal relationship.

Table 5,6,7 shows the number of patients in whom postoperative MMF was required on the second post-operative day in both groups was 1 (6.7%) in group 1 and 4 (26.7%) in group 2. The difference between the two groups was statistically non significant (p > 0.05).

On 2nd week the number of cases in which postoperative MMF was required in Group 1 and Group 2 was found to be 1 and 1 respectively. No statistically significant difference was found between the two Groups with respect to need for MMF post operatively (P>0.05). At the 8th week follow up, all the patients had what appeared to be normal and no MMF was required in both Groups.

Table 8,9,10 show comparison of Post-operative mobility of segment in the two groups. Table 12 shows, on the 2nd post-operative day, one patient in Group1 and one patient in Group 2 had a mobility of fracture segment. No statistically significant difference in the second day of post operative mobility of fracture segment status between the Groups (P>0.05).

On the 2nd week of post-operatively day, the number of cases with mobility of segment in Group 1 and Group 2 was four. No statistically significant difference was found between the two Groups with respect to occlusion (intact/deranged) post operatively (P>0.05).

Table 11 shows the duration of surgery. The mean time duration of surgery in Group 1, was 38.33±8.99 Min. and in Group 2, was 38.00±9.59 Min. Group 1 and Group 2 recorded a minor difference in mean time, the mean difference was not significant (P>0.05).

In this study, none of the patients in both Groups had any complications such as infection, step deformity, loosening of hardware and the need for plate removal.

TABLE 1

Comparison of pre-operative occlusion in the two groups

			Total
	Deranged Number(%)	Intact Number(%)	
Group 1(Locking plates)	6(40%)	9(60%)	15(100%)
Group 2(Non-Locking plates)	5(33.3%)	10(66.6%)	15(100%)

Chi-square = 0.144 with 1 degree of freedom; p > 0.05 (Non-Significant)

Table 2

Comparison of Postoperative - Occlusion in the two Groups on 2nd day

	(2nd Day)		Total
	Deranged Number(%)	Intact Number(%)	
Group 1(Locking plates)	1(6.7%)	14(93.3%)	15(100%)
Group 2 (Non-Locking plates)	3(20%)	12(80%)	15(100%)

Chi-square = 1.15 with 1 degree of freedom; p > 0.05 (Non-Significant)

Table 3

Comparison of Postoperative - Occlusion in the two Groups on 2nd week

	Postoperate-Occlusion(2nd week)		Total
	Deranged Number(%)	Intact Number(%)	
Group 1(Locking plates)	1(6.7%)	14(93.3%)	15(100%)
Group 2 (Non-Locking plates)	0(0%)	15(100%)	15(100%)

Chi-square = 1.0 with 1 degree of freedom; p > 0.05 (Non-Significant)

Table 4

Comparison of Postoperative - Occlusion in the two Groups on 8th week

	Postoperate-Occlusion(8th week)		Total
	Deranged Number(%)	Intact Number(%)	
Group A(Locking plates)	0(0%)	15(100%)	15(100%)
Group B(Non-Locking plates)	0(0%)	15(100%)	15(100%)

Table 5

Comparison of Need of Post-operative MMF in the two Groups on 2nd day

	(2nd day)		Total
	Yes Number(%)	No Number(%)	
Group 1(Locking plates)	1(6.7%)	14(93.3%)	15(100%)
Group 2(Non-Locking plates)	4(26.7%)	11(73.3%)	15(100%)

Chi-square = 2.1 with 1 degree of freedom; p > 0.05 (Non-Significant)

Table 6

Comparison of Need of Post-operative MMF in the two Groups on 2nd Week

	Need of IMF (2nd Week)		Total
	Yes Number(%)	No Number(%)	
Group 1(Locking plates)	1(6.7%)	14(93.3%)	15(100%)
Group 2(Non-Locking plates)	1(6.7%)	14(93.3%)	15(100%)

Chi-square = 0.0 with 1 degree of freedom; p > 0.05 (Non-Significant)

Table7

Comparison of Need of Post-operative MMF in the two Groups on 8th Week

	Need of IMF (8th Week)		Total
	Yes Number(%)	No Number(%)	
Group 1(Locking plates)	0(0%)	15(100%)	15(100%)
Group 2(Non-Locking plates)	0(0%)	15(100%)	15(100%)

Table 8

Comparison of Post-operative Mobility of Segment in the two Groups on 2nd day

	(2nd day)		Total
	Yes Number(%)	No Number(%)	
Group 1(Locking plates)	1(6.7%)	14(93.3%)	15(100%)
Group 2(Non-Locking plates)	1(6.7%)	14(93.3%)	15(100%)

Chi-square = 0.0 with 1 degree of freedom; p > 0.05 (Non-Significant)

Table 9

Comparison of Post-operative Mobility of Segment in the two Groups on 2nd week

	Mobility of Segment(2nd Week)		Total
	Yes Number(%)	No Number(%)	
Group 1(Locking plates)	1(6.7%)	14(93.3%)	15(100%)
Group 2(Non-Locking plates)	0(0%)	15(100%)	15(100%)

Chi-square = 1.03 with 1 degree of freedom; p > 0.05 (Non-Significant)

Table10

Comparison of Post-operative Mobility of Segment in the two Groups on 8th week

	Mobility of Segment(8th Week)		Total
	Yes Number(%)	No Number(%)	
Group 1(Locking plates)	0(0%)	15(100%)	15(100%)
Group 2(Non-Locking plates)	0(0%)	15(100%)	15(100%)

Table11

Comparison of duration of surgery in the two Groups

Group	Duration of surgery(In Minutes)	Std Dev	T	P-value
Group 1	38.3333	8.99735	0.1	p > 0.05 (Non-Significant)
Group 2	38.0000	9.59911		

DISCUSSION

HAUSMANN was probably the first (1886) to describe a method of mandibular fracture stabilization by means of a screw plate system. Since then, several authors have discussed the advantages and disadvantages of bone plating together with indications and contraindications of different methods.[11]

Champy et al and Cawood et al recommended that to achieve low rates of wound dehiscence and infection, miniplate osteosynthesis must be performed soon after injury. Champy et al recommended fixation within 12 hours, whereas Cawood extended this period to 24 hours after injury. All the patients in this study were treated with so called "delayed miniplate osteosynthesis"[12] which was performed later than the recommended time interval, this was due to various other reasons such as a delay in the patient coming to the hospital, associated head injury, various systemic problems etc. In the present study 2mm titanium locking miniplate system was compared with 2mm titanium nonlocking miniplate system for the fixation of mandible fractures. Patient's age as well as etiology of fracture influences the location of fracture. The most frequent location for fracture of mandible was the parasymphyseal region (66.66%), the body was second in frequency (20%) [13,14]

The predominance of mandible fractures in men is a relatively consistent finding in most studies[16,17,18] In a retrospective analysis of 279 patients, it was found that the fractures occurred most frequently in the 20 – 29 yr age group.[19] In the present study, 27 patients were male and 3 patients were female. The mean age of patients in Group 1 was 28.6 yrs and Group 2 was 24.3 yrs.

It is of utmost importance to establish the optimum, pre-existing functional occlusion. The slightest deviation of the fragments may cause premature occlusal contacts and malocclusion, which may necessitate extensive restorative dentistry later.[22] In the present study, Group 1, six patients had deranged and nine patient had intact occlusion pre-operatively. In Group 2, five patients had deranged and ten patients had intact occlusion pre-operatively.

Two plates were used for fixation in the inter-foraminal region and one plate was used for fixation in the body, angle and condylar region in accordance with Champy's principle.[23] In Group 2, one patient with parasymphysis fracture required two four hole plates for fracture stability. The conventional bone plate/screw system requires precise adaptation of the plate to the underlying bone. In case of locking plate/screw system, a precise adaptation of the plate to the underlying bone becomes

unnecessary. As the screws are tightened, they lock to the plate, thus stabilizing the segments without compressing the bone to the plate. This obviates the risk that screw insertion will alter reduction.[5]

In the mini-locking system, loading forces are transmitted directly from the bone to the screws, from there to the plate. Friction between plate and bone is not necessary for stability. On each fracture side, the screws lock into the plate as well as into the bone resulting in a frame construct with high stability.[24]

Ellis et al treated 80 fractures in 59 patients with locking plate/screw system and no post surgical maxillo-mandibular fixation. They concluded that the use of a 2.0mm locking plate/screw system was simple and provided sound fixation in all cases.[5]

Chritah et al assessed 2.0mm locking miniplate screw system in the treatment of mandibular fractures with one week period of maxillo-mandibular fixation. They concluded that a brief period of maxillo-mandibular fixation is needed because it allows reattachment of the soft tissue drape, stabilizes the occlusion, and thereby decreases the incidence of complications.[25]

In our study, 25 patients had satisfactory post-operative occlusion and had no requirement for inter-maxillary fixation. In Group 1, three patients with subcondylar fractures were planned for closed reduction. So, in these patients, inter-maxillary fixation with wires was used for 2 weeks. In Group 2, in one patient with associated maxillary fracture inter-maxillary fixation was done for one week. After 4 weeks, all the patients had a functional occlusion. No statistically significant difference was found between the two Groups with respect to occlusion (intact/deranged) post-operatively (P>0.05).

The mobility of fragments has been shown to predispose to infection.[26] Records of 191 patients who experienced 280 mandibular fractures that were treated with 2.0mm miniplates were clinically evaluated. Infection occurred in 7.85% of the studied fractures, corresponding to 22 fractures in 21 patients.[27] In a study done by Edward Ellis, 80 fractures in 59 patients were treated with the 2.0mm locking plate/screw system. There were no intra operative difficulties associated with their application. Six patients developed post surgical infections. Most were treated in the out patient setting with intra oral irrigation, drainage and oral antibiotics. However, one patient developed a severe infection that required extraoral incision and drainage under general anesthesia.[5]

In our study, none of the patients developed infection and nor was there need for plate removal in either of the Groups as assessed during the 8 weeks follow up period. The complication rates, operating time and occlusion status with the use of locking plate/screw system were compared with the conventional mini plate/screw system.

CONCLUSION

The art of surgery demands that we evaluate the risk and benefits of each treatment modality and apply appropriately to each patient.

Mandible fracture is comparatively commonly seen because of easily available bulky bone for traumatic injury in face. The important factor is the successful reestablishment of functional activity along with minimum or no compromise in aesthetics from treating doctor point of view. To achieve this goal there is constant research activity going on throughout the world with use of different surgical technique and use of different materials. The permutation and combination are constantly trying to achieve the best possible of both of theme. We have studied and compared the use of two systems of plate and screw.

Though statistically there is no significant difference we are convinced that it is much better advantages with the use of mini locking plate and screw. However larger group studied are awaited to confirm our opinion.

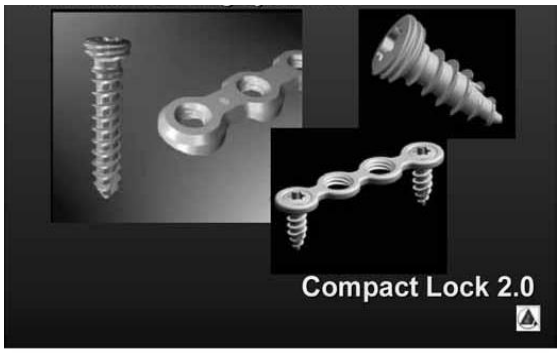

Fig. 1: Locking system

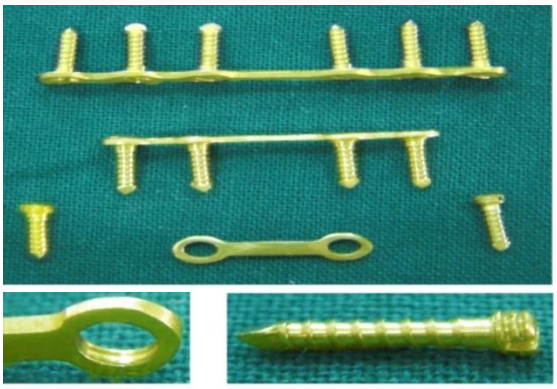

Fig. 2 : 2mm Titanium Locking plate and screw

Fig. 3 : 2 mm Titanium Non Locking plate and screw

Fig. 4: Armamentarium

Fig. 7: Pre-operative occlusion

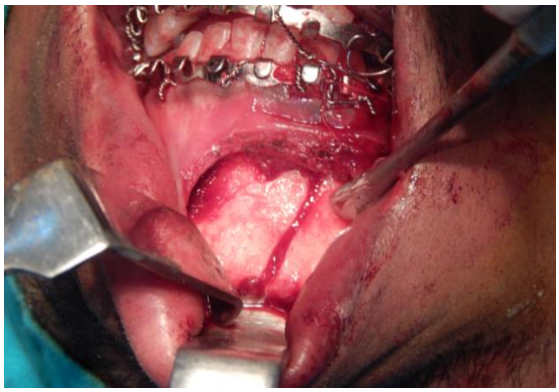

Fig. 5: Fracture site

Fig. 8: Post-Operative Occlusion

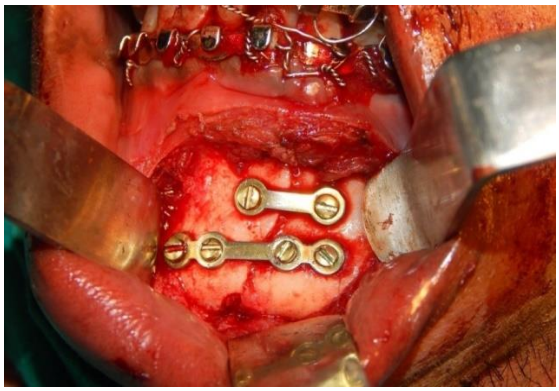

Fig. 6: Locking plate fixation

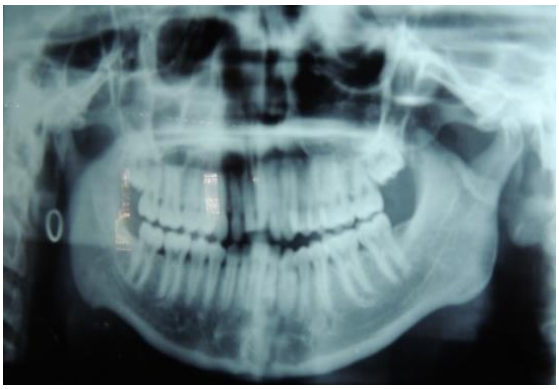

Fig. 9: Pre-Operative Radiograph

Fig. 10: Post- Operative Radiograph

REFERENCES

1. Lindqvist C, Kontio R, Pihakari A, Santavirta S. Rigid internal fixation of mandibular fractures - an analysis of 45 patients treated according to the ASIF method. Int J Oral Max Fac Surg. 1986;15:657–64.
2. Ellis E., 3rd Rigid skeletal fixation of fractures. J Oral Maxillofacial Surg. 1993;51:163–73.
3. Iizuka T, Lindqvist C, Hallikainen D, Paukku P. Infection after rigid internal fixation of mandibular fractures: A clinical and radiologic study. J Oral Max Fac Surg. 1991;49:585–93.
4. Ellis E, 3rd, Walker L. Treatment of mandibular angle fractures using two noncompression miniplates. J Oral Maxillofac Surg. 1994;52:1032–6.
5. Ellis E, 3rd, Graham J. Use of 2.0 mm locking plate/screw system for mandibular fracture surgery. J Oral Max Fac Surg. 2002;60:642–5.
6. Herford AS, Ellis E., 3rd Use of locking reconstruction bone plate/screw system for mandibular surgery.J Oral Max Fac Surg. 1998;56:1261–5.
7. Frigg R. Development of the locking compression plate. Injury. 2003;34:B6–10.
8. Collins CP, Pirinjian-Leonard G, Tolas A, Alcalde R. A prospective randomized clinical trial comparing 2.0-mm locking plates to 2.0-mm standard plates in treatment of mandible fractures. J Oral Maxillofac Surg. 2004;62:1392–5.
9. Mukerji R, Mukerji G, McGurk M. Mandibular fractures: Historical perspective. Br J Oral Maxillofac Surg. 2006;44:222–8.
10. Chuong R, Donoff RB, Guralnick WC. A Retrospective analysis of 327 mandibular fractures. J Oral Max Fac Surg. 1983;41:305–9.
11. Rudolf Seemann, B Frerich: comparision of locking plates in the treatment of condyle fracture [OOO Vol.108 No 3 sep 2009] .
12. Cawood JI: Small plate osteosynthesis of mandibular fractures. Br J Oral Maxillofac Surg 1985;23:77-91
13. Soderholm A-L, Lindqvist C, Skutnabb K, Rahn B: Bridging of mandibular defects with two different reconstruction systems: an experimental study. J Oral Maxillofac Surg 1991:49: 1098–1105
14. Jose C. Moreno, Antoni Fernandez, Jose A.Ortiz: Complication rates associated with different treatments for mandibular fractures. J Oral Maxillofac Surg 2000; 58: 273-280.
15. Ellis E.,3rd Rigid skeletal fixation of fractures. JOral Maxillofacial Surg.1993;51:163-73.
16. Mohammad Hosein Kalantar Motamed: An assessment of maxillofacial fractures: A 5 year study of 237 patients. J Oral Maxillofacial Surgery 2003; 61: 61-64.
17. Edward Ellis III; J Oral Maxillofac Surg 2013; 71:726-733.
18. BR Chandra shekar, CVK Reddy: A five year retrospective analysis of maxillofacial injuries in patients admitted and treated at two hospitals of mysore city. Indian J Dent Res 2008; 19: 304-308
19. Veikko Tuovinsen, Sven Erik Norholt, Steen sindet-Pedersen: A retrospective analysis of 279 patients with isolated mandibular fractures treated with titanium miniplates. J Oral Maxillofac Surg 1994; 52: 931 -935.
20. Raymond J.Fonseca, Robert V.Walker: Oral and Maxillofacial trauma, 3 rd edition, volume 1, Philadelphia: W.B.Saunders company, 1997.
21. Mohammad Hosein Kalantar Motamed: An assessment of maxillofacial fractures: A 5 year study of 237 patients. J Oral Maxillofacial Surgery 2003; 61: 61-64.
22. Champy M, Lode Jp, Schmitt R : Mandibular osteosynthesis by miniature screwed plates via a buccal approach. J Oral Maxillofac Surg 1978; 6:14.
23. Ralf Gutwald, Brian Alpert and R. Schmelzeisen: Principle and stability of locking plates. Keio J Med 2003; 61: 61-64.
24. Marisa Aparecida Cabrini Gabrielli, Mario Francisco Real Gabrielli: Fixation of mandibular fractures with 2.0mm miniplates: Review of 191 cases. J Oral Maxillofacial Surgery 2003; 61; 430-436.

Volumetric computed tomographic evaluation of calcium hydroxide removal using smear clear in combination with canal brush, passive ultrasonic irrigation and retreatment files: An invitro study

Abstract

Context: Calcium hydroxide Ca (OH)2 has been the reliable intracanal medicament in managing various types of endodontic treatment. Various techniques have been tried to remove it from the canals. Smear clear a relatively new chelator has smear layer removal ability. Retreatment files has not been tested in calcium hydroxide removal.
Aim: The aim of this study was to compare the efficiency of smear claear irrigation with different Ca(OH)2 removal protocol.

Keywords: Calcium hydroxide, canal brush, passive ultrasonic irrigation, retreatment files, smear clear, volumetric computed tomography

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INTRODUCTION

The main goal of intracanal medication is to eliminate bacteria in the root canal, prevent bacterial proliferation between appointments, and act as a physicochemical barrier, preventing root canal reinfection and nutrient supply to the remaining bacteria.
Ca (OH)2 intracanal medication has been recommended by many to eradicate the microbes that survive instrumentation and irrigation [1].
The most frequently described method for removing $Ca(OH)_2$ is instrumentation of the root canal with a master apical file at the working length and copious irrigation of sodium hypochlorite (NaOCl) and ethylenediamine tetra acetic acid(EDTA) [2,3].

Smear Clear (Sybron Endo, Orange, CA) (17% EDTA with a surfactant) is recently introduced for smear layer removal. The surfactant has been shown to reduce the contact angle of EDTA solution when placed on dentin surface and hence the cleaning efficacy, thus it can also be used for removal of calcium hydroxide from the canals [4,5].

In most of the studies done to analyze the removal of calcium hydroxide from the root canal, where it has been placed as intra canal medicament, the techniques involved sectioning the teeth longitudinally and analysis of photos of specimens with digital image processor to measure the surface area covered with calcium hydroxide. Calcium hydroxide may be lost during sectioning, which may not help in the correct evaluation of the technique.

Three-dimensional volume analysis with spiral CT is used in the field of medicine in various applications. On the other hand volumetric analysis using spiral CT can also be used in field of dentistry and gives a more accurate measurement of pre and post removal calcium hydroxide from root canals [6].

RESEARCH HYPOTHESIS (H1): There is a difference in efficiency of irrigation by smear clear in combination with other methods like canal brush, passive ultrasonic irrigation and retreatment files in the removal of calcium hydroxide intracanal medicament from root canals.

NULL HYPOTHESIS (H0): There is no difference in efficiency of irrigation by smear clear in combination with canal brush, PUI and retreatment files in the removal of calcium hydroxide intracanal medicament from root canals.

Hence the aim of the study was to compare the efficiency of smear clear along with canal brush, Passive ultrasonic irrigation and retreatment files in the removal of calcium hydroxide intracanal medicament from root canals and assessing the volumetric changes by spiral CT.
Materials and methods

Sixty(60) Single rooted mandibular premolar teeth with completely formed apices, which were extracted for orthodontic reasons were used for the study. Specimens with single root canal, minimum root length of 14 mm and with canal curvature of 05 to 25degree were selected.

Teeth with resorption defects, teeth with any developmental anomalies, presence of caries, root fractures and cracks, root canal calcification, previous endodontic treatment, restored teeth were excluded from the study.
Preparation of specimens:

In the present study total 60 extracted mandibular premolar teeth with completely formed apices and angle of curvature

ranging between 05 and 25 degrees according to the criteria described by Schneider(1971) were selected and stored in 10% buffered formalin. The teeth were decoronated using diamond disc at CementoEnamel junction to standardize the root length to 14 mm. The working length was established by inserting #10 K-file into each root canal until it is just visible at the apical foramen and by subtracting 1 mm from this point. The roots were subjected to standardized instrumentation using rotary instrumentation up to F4 protaper and during the preparation, the root canal were irrigated with 3mL of 2.5% sodium hypochlorite (NaOCl) solution followed by final irrigation with 5 mL of smear clear for 1 minute.

Canals were dried using number 40 paper points.

The sixty teeth were randomly divided into 4 experimental groups containing 15 teeth each.

Teeth were then filled with a paste of METAPEX [$Ca(OH)_2$,iodoform and silicon oil] with a syringe until the material extrudes through the apex and lentulospiral was used to prevent any voids. The access cavities were temporarily sealed with a cotton pellet and type II Glass Ionomer Cement. The teeth were then stored at 37±1ºC and 100% relative humidity for 30 days

After 30 days 1st CT scan was done to assess total volume of medicament in the canal (a)
Then teeth were re-accessed and 4 experimental groups (group I, II, III IV) followed the following protocol for removal of medicament

Table.1 Sample size and its distribution

GROUPS	SAMPLE SIZE	INTERVENTION
I	n=15	SMEAR CLEAR
II	n=15	SMEAR CLEAR AND CANAL BRUSH
III	n=15	SMEAR CLEAR AND PUI
IV	n=15	SMEAR CLEAR AND RETREATMENT FILES

GROUP 1: Conventional syringe irrigation was done by 5 mL of smear clear (17% EDTA with cetrimide and surfactant) using a syringe and a 30-gauge needle (Ultradent, South Jordan, UT, USA) placed 1 mm short of the working length. No additional agitation of irrigant was performed.

GROUP 2: Agitation of 5 mL of smear clear was accomplished using a Canal Brush with a tip diameter of 0.30 mm (Coltene/ Whaledent) in a hand piece set at 600 rpm for one minute. The brush was used with a gentle up-and-down motion at 1 mm short of the working length.

GROUP 3: Smear clear and Passive Ultrasonic Irrigation (PUI) Group: In this group, 5 mL of smear clear was passively agitated using an ultra- sonic device (EMS, Le Sentier, Switzerland). A smooth ultrasonic file (size 15, 0.02 taper) (ESI instrument, EMS) was placed into the canal to 2 mm short of the working length without touching the walls, enabling it to vibrate freely at frequency of 30kHZ. The ultrasonic file got activated at power setting 6 for 1 min.

Group 4: Smear clear and retreatment file group:- In this group, retreatment files D1,D2 and D3 were introduced in to the canals as per manufacturer instruction till the working length along with the smear clear irrigation

After the removal of $Ca(OH)_2$ 2nd CT scan was done to assess residual volume of medicament left in the canal (b)

CT SCANS :

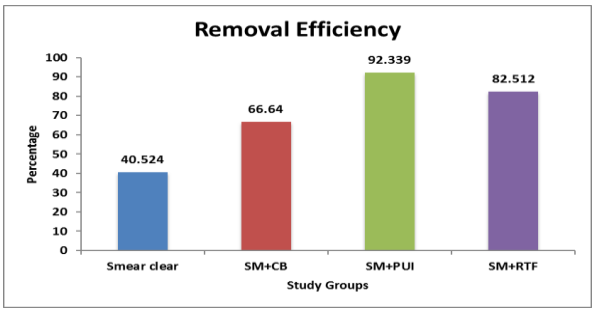
Two CT scans were performed on each sample to get the surgical canal volumes:-
1. Total volume of medicament after 30 days (a)
2. Residual volume of medicament left after removal (b)

Results

Results were calculated as the removal efficiency in coronal, middle and apical third region for each group
Removal efficiency: (a-b) x100/a
a- Volume of material packed in the root canal
b-Volume remaining after retrieval

REMOVAL EFFICIENCY

Fig.1 Comparison of removal efficiency of medicament between the study group



- Agitation of smear clear with PUI showed highest removal efficiency among all the groups (99.339%) on the other hand smear clear used with retreatment files(Group IV) showed 85.12%.
- Canal brush showed lower removal efficiency (66.34%) as compared to retreatment files (85.52%) for removal of calcium hydroxide.
- Conventional syringe irrigation showed inferior results among all the groups (40.52%)

Fig. 2 Comparison of total and remaining volume of medicament between the study groups in coronal middle and apical one third

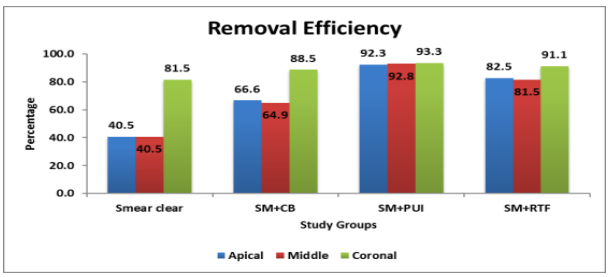
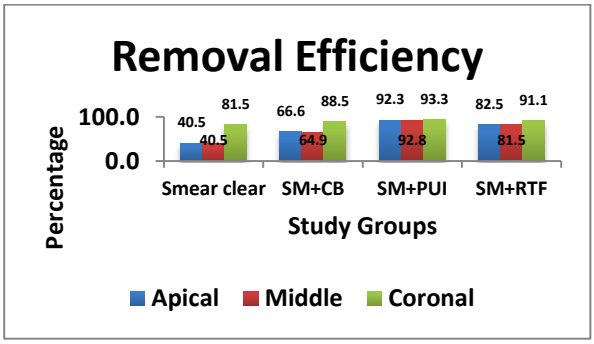


Fig.3 Comparison of total and remaining volume of medicament between the study groups in coronal, middle and apical one third



- In apical one third Passive Ultrasonic Irrigation showed highest removal efficiency than canal brush, retreatment files and conventional irrigation so null hypothesis is rejected.

- In coronal one third there is no statistically significant difference between all the groups and showed almost equal removal efficiency.

DISCUSSION

In endodontics, calcium hydroxide is the most commonly used intracanal medicament in between sessions of root canal therapy. In spite of its numerous favourable benefits fact remains that it must be removed from the root canals after it has served its purpose [1,7, 8]. This is because; it can reduce canal permeability and interfere with the sealing ability of root canal sealers [4.] Numerous studies have aimed to determine the best protocol to remove all the calcium hydroxide medication before root canal obturation.

The vehicle used to mix calcium hydroxide paste has an influencing factor in the complete retrieval of it [9]. Viscous vehicles like polyethylene glycol, propylene glycol, glycerine promote a lower solubility of the paste when compared with aqueous vehicles, probably because of their high molecular weight, which minimizes the dispersion of calcium hydroxide into the tissues [10].

Different techniques have been used to remove $Ca(OH)_2$ from root canals such as canal irrigation with or without files, PUI, sonic activated irrigation, or laser irrigation. However, the complete removal of $Ca(OH)_2$ from root canal walls is a vital task that remains unaccomplished [11].
Thus, this study attempted to evaluate the efficiency of Smear Clear (Sybron Endo, Orange, CA) (17% EDTA with a surfactant), a recently introduced irrigant for smear layer removal. This formulation contains 17% EDTA, cetrimide and a special surfactant. The surfactant has been shown to reduce the contact angle of EDTA solution when placed on dentin surface and hence the cleaning efficacy, thus it can also be used for removal of calcium hydroxide from the canals. Along with the use of a chelator two different strategies can be performed for better removal of $Ca(OH)_2$: increasing the volume of the irrigation solution and using different modes of activation of the solution [12,13].

Summarizing the results of this study; in apical one third activation of smear clear with PUI showed the highest scores for cleanliness (Group III) so the null hypothesis was rejected. In middle and apical one third retreatment files showed superior results than agitation using canal bush but in coronal one third there was not statistically significant difference in both. Syringe irrigation with smear clear without using any agitating techniques showed inferior results as compare to all other groups.

From these results first observation made was that PUI showed the highest scores for cleanliness amongst the 4 experimental groups with statistically significant difference. The acoustic energy which is transmitted from the file to the solution which creates a higher velocity and volume of irrigant flow helps in flushing out loose $Ca(OH)_2$ from root canals [14].

Activation of the irrigant in the ultrasonic system has been shown to be more effective than syringe irrigation and canal brush in removing $Ca(OH)_2$ from the root canal walls according to the previous studies done. [15-17].

Second observation made was that canal brush used for agitation of Ca(OH)2 is less efficient in removal of medicament than PUI and retreatment files in apical one third. The results are similar to the studies done by Gorduysus et al. and Keir et al [18,19].

So we here by propose that the amount of $Ca(OH)_2$ displaced by the chelating solution could be packed again into the canal walls by the brushing effect of the canal brush.

A difference in cleanliness was observed between the apical versus the middle and coronal thirds. It is clear that cleanliness of the coronal part of the tooth is more easily achieved than of the middle and apical thirds. This could be attributed to the fact that coronal area has larger canal diameter which facilitates easier removal of the medicament when compared to middle and apical third.

On considering the techniques that have been proposed to remove the calcium hydroxide dressing from the root canal system, use of endodontic hand files, with or without an irrigating solution, may be inefficient and tedious. Whereas the use of NiTi rotary instruments may enhance the removal procedure [20].

Thus in present study NiTi rotary Protaper universal retreatment files have been used for removal of medicament. None of the studies till now have used these files for removal of calcium hydroxide.

In the present study Protaper universal retreatment files showed more superior results than canal brush in removal of metapex in apical one third. Results may be attributed to its features involving its cross sectional design, cutting edges, flutes, varied taper and varied lengths which enables pulling the root filling material towards the orifice, therefore contributing to the removal of the obturating material. The same reason may be attributed for removal of calcium hydroxide also [21].

Study done by Gomes et al has shown that Protaper retreatment files serves to minimize the engagement between the file and the dentin. Additionally, an offset design facilitates debris removal from the canal and improves flexibility along the active portion of the PTR instruments [22, 23]. Thus In middle and apical one third retreatment files showed superior results than agitation using canal bush.

In only smear clear irrigation group the procedure was not effective because of the fact that the volume of Ca $(OH)_2$ was much more than the chelator which came in contact, also the oily vehicle used in metapex may have also prevented in proper contact of chelator with $Ca(OH)_2$ [24].

In most of the previous studies sectioning the teeth longitudinally and photographic analysis of specimens with digital image processor to measure the surface area covered with calcium hydroxide has been done. Calcium hydroxide may be lost during sectioning, which may not help in the correct evaluation of the technique. Spiral CT volumetric analysis gives a more accurate measurement in field of dentistry if used for pre and post removal calcium hydroxide from root canals without damaging the specimens [6].

CONCLUSION

Within the limitations of this in-vitro study the following conclusions can be drawn:

In coronal one third there was no statistical significant difference among all the three groups in removal of calcium hydroxide.
In apical and middle one third activation of smear clear with PUI showed the highest scores for cleanliness followed by retreatment files and canal brush, on the other hand conventional syringe irrigation showed lowest removal efficiency.

Computed tomography is an excellent method to check the volumetric analysis of root canal systems.

References

1. Ingle JI, Bakland LK, Baumgartner JC. Ingle"s Endodontics 6th ed. BC DeckerInc;Hamilton; 2008. p.999, 1009-11.

2. Mohammadi Z, Dummer PM. Properties and applications of calcium hydroxide inendodontics and dental traumatology. Inter Endod J.2011;44,697–730.

3. Calt S, Serper A. Dentinal tubule penetration of root canal sealers after root canaldressing with calcium hydroxide. J Endod. 1999;25(6):431–3.

4. Margelos J, Eliades G, Verdelis C, Palaghias G. Interaction of calcium hydroxide withzinc oxide-eugenol type sealers: a potential clinical problem. J Endod. 1997;23(1):43

5. Kamel WH, Kataia EM. Comparison of the efficacy of Smear Clear with and without a canal brush in smear layer and debris removal from instrumented root canal using WaveOne versus ProTaper: a scanning electron microscopic study. J Endod. 2014 ;40(3):446-50.

6. Nandini S, Velmurugan N, Kandaswamy D. Removal efficiency of calcium hydroxide intracanal medicament with two calcium chelators: volumetric analysis using spiral CT, an in vitro study. J Endod. 2006;32(11):1097-101

7. Thakur DA, Patil S, Gade V, Jogad N, Gangrade A, Sinkar R. Comparative scanning electron microscopy evaluation of Canal Brushing technique, sonic activation, and master apical file for the removal of triple antibiotic pastefrom root canal (in vitro study). Contemp Clin Dent. 2015;6(4):517-21.

8. Ballal NV, Kumar SR, Laxmikanth HK, Saraswathi MV. Comparative evaluation of different chelators in removal of calcium hydroxide preparations from root canals. Aust Dent J. 2012; 57: 344-8.

9. Wu MK, Dummer PMH, Wesselink P. Consequences of and strategies to deal with residual post-treatment root canal infection. Inter Endod J. 2006;39:343–56.

10. Kasam S, Mariswamy AB. Efficacy of Different Methods for Removing Root Canal Filling Material in Retreatment - An In-vitro Study. J Clin Diagn Res. 2016;10(6):ZC06-10.

11. Lambrianidis T, Margelos J, Beltes P. Removal efficiency of calcium hydroxide dressingfrom the root canal. J Endod. 1999;25(2):85-8.84

12. Spanó JC, Silva RG, Guedes DF, Sousa-Neto MD, Estrela C, Pécora JD. Atomic absorption spectrometry and scanning electron microscopy evaluation of concentration of calcium ions and smear layer removal with root canal chelators. J Endod. 2009;35:727-30.

13. Zorzin J, Wießner J, Wießner T, Lohbauer U, Petschelt A, Ebert J. Removal of Radioactively Marked Calcium Hydroxide from the Root Canal: Influence of Volume of Irrigation and Activation. J Endod. 2016;42(4):637-40.

14. van der Sluis LW, Versluis M, Wu MK, Wesselink PR. Passive ultrasonicirrigation of the root canal: a review of the literature. Int Endod J. 2007;40(6):415-26

15. Maalouf L, Zogheib C, Naaman A. Removal efficiency of calcium hydroxide dressing from the root canal without chemically active adjuvant. J Contemp Dent Pract. 2013;14:188–92.

16. Yucel AC, Gurel M, Guler E, Karabucak B. Comparison of final irrigation techniques in removal of calcium hydroxide. Aust Endod J 2013;39:116-21

17. Çapar ID, Ozcan E, Arslan H, Aydınbelge HA. Effect of different final Irrigation methods on the removal of calcium hydroxide from an artificial standardized groove in the apical third of root canals. J Endod 2014;40(3):451-4.

18. Gorduysus M, Yilmaz Z, Gorduysus O, Atila B, Karapinar SO. Effectiveness of a new canal brushing technique in removing calcium hydroxide from the root canal system: A scanning electron microscope study. J Conserv Dent 2012;15:367-71.

19. Keir DM, Senia ES, Montgomery S. Effectiveness of a brush in removing postinstrumentation canal debris. J Endod 1990;16:323-7.

20. Kuga MC, Campos EA, Faria-Junior NB, Só MV, Shinohara AL. Efficacy of NiTi rotary instruments in removing calcium hydroxide dressing residues from root canal walls. Braz Oral Res. 2012;26(1):19-23.

21. Çiçek E, Koçak MM, Koçak S, Sağlam BC. Comparison of the amount of apical debris extrusion associated with different retreatment systems and supplementary file application during retreatment process. J Conserv Dent. 2016;19(4):351-4.

22. Gomes NN, de Carvalho GM, Sponchiado Júnior EC, Garcia LFR, Marques AAF, de Carvalho FMA. Filling Material Removal with Reciprocating and Rotary Systems Associated with Passive Ultrasonic Irrigation. Eur Endod J 2017; 2:6.(accessed online on 06/03/2017) http://eurendodj.com/eng/index/1/latest-issue

23. Park SY, Cheung GS, Yum J, Hur B, Park JK, Kim HC. Dynamic torsional resistance of nickel-titanium rotary instruments. J Endod 2010;36:1200-4.

24. Arslan H, Akcay M, Capar ID, Saygili G, Gok T, Ertas H. An *in vitro* comparison of irrigation using photon-initiated photoacoustic streaming, ultrasonic, sonic and needle techniques in removing calcium hydroxide. Int Endod J. 2015;48:246-51.

Evaluation of Histological changes in Gingival Tissue when placed in Normal Saline for different time interval.

Abstract

During periodontal procedures requiring soft tissue autografts, after havesting it is usually placed in normal saline before its final placement onto the donor site the present study aims to evaluate the histological status of human gingival tissue after placement in normal saline for 20 minutes, 30 minutes, 40 minutes & 60 minutes. HNE staining and microscopic examinations perfomed to get the result. Result was moderate nuclear and cellular shrinkage along with dissolution. Spongiosis in spinous cell layer was observed. It was concluded from this study that the surgical procedure that warrants gingival tissue extraction should be timed out so that the tissue is to dipped in normal saline for 20 minute or less.

Keywords: Fixation, Carrying media, N.S, HNE, Autograft.

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Introduction

All tissue specimen preparations require complete fixation. The process of tissue handing and processing from patient to harvested tissue to donor site. Fixation may be described in terms of molecular processes such as formation of macromolecular network between the various cellular constituent or in more specific terms, in reaction between the fixation and some chemical group.
Fixation may be described phenomenologically, that is in terms of change using living tissue as a standard. The major processes which tissue fixation must ideally prevent have been listed by Baker (1960): autolysis, attack by bacteria and change in volume and shape, especially during subsequent preparative treatment. Fixation may also be described in terms of molecular processes such as formation of macromolecular network between the various cellular constituents or in more specific terms, in reaction between the fixative and some chemical group. A complete definition of fixation is difficult or even impossible as the changes brought about are necessarily compared with living tissues which themselves are not by any mean completely characterized[2].
Errors in fixation are permanent. Fault in fixation cannot be remedied at any later stage and the finished product can only be as good as its initial fixation[1]. Properly fixed tissue is nearly impervious to abuse during tissue processing and slide preparation[3]. Good fixation requires compromise between rapid tissue stabilization and retention of original physiochemical properties[6]. There is no single fixative that is ideal[5] Good fixation requires a compromise between rapid tissue stabilization and retention of original physicochemical properties Ferdinard Blum has been credited as the first person to use formaldehyde as a tissue fixative[7].

The process of tissue handling and processing from harvesting site to donor site in patients requires carrying media. Many times during graft surgeries, tissues are kept in different carrying media such as normal saline (NS) or local anesthesia till the availability of proper fixative solution. This fixation delay can lead to various tissue architectural changes which can affect the tissue. The effect of delay in fixation on the number of mitotic figures in tissue has received little attention and it was found that the number of observable mitotic figures declined by about30% with a delay of fixation of 2 h and by 50% with a delayof 6 h[8]. Cell preservation and staining ability of under-fixed or delayed fixed tissue show significant variability in cell structure and result in degradation of the tissue architecture which hinders the diagnosis. The present study was conducted to evaluate staining intensity and microscopic analysis of tissues kept in normal saline as at different time intervals followed by standard formaldehyde fixation.

Aim of the study

To evaluate the histological changes of human gingival tissue after placement in normal saline at various time intervals.

Material and methods

Gingival tissues were obtained from the crown lengthening procedure received in the Department of Periodontics and histological study conducted in the department of oral pathology,

Buddha Institute of Dental Sciences and Hospital, Patna during October 2017.

Tissue used for the study

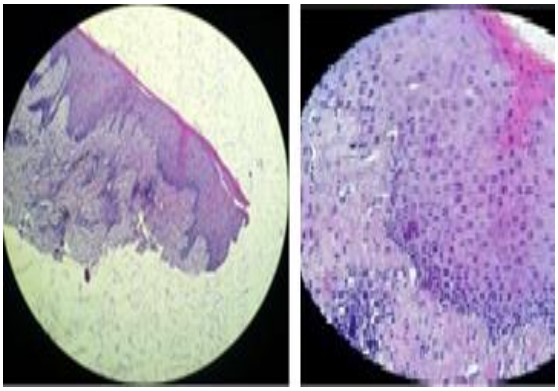
After taking consent samples were taken from the subjects. Fresh human gingival tissue was collected during crown lengthening procedure with scalpel handle bard parker blade no. 15 took out with the tissue holding forcep. 4 specimen from same patient was harvested and immediately transferred to carrying media which is normal saline 0.9% in different sample boxes.
The tissues were labeled A, B, C, D and kept for four different time intervals of 20, 30, 40 and 60 minutes respectively. They all were then fixed, respectively, in 10% formaldehyde for 24 hour followed by hematoxylin and eosin- stain then the sections were observed under microscope at 10 x & 40x magnification for histological feature in the department of Oral pathology.
After reviewing, the sections were further subjected for morphometric analysis, images were captured with a 8MP camera attached to a 307 microscope with 10x, 40x objective morphometric analysis. The images were classified, transferred and stored in the computer.

Scoring

The data hence achieved were statistically analyzed under following headings:

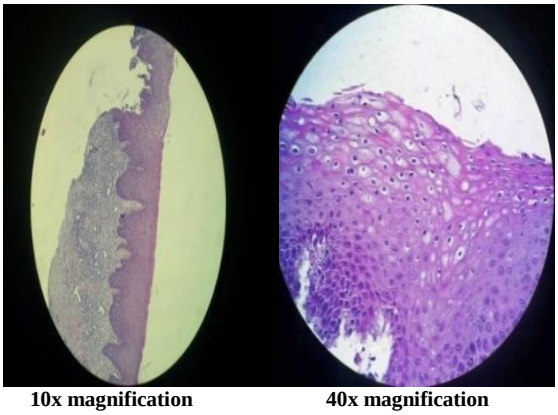
• Staining criteria: It was evaluated under light microscopeat x10, x40 magnification by scoring the slides from 0 to 5 (score - 3 was kept as minimum score for acceptable result) by five independent observers under two parameters; nuclear staining and cytoplasmic staining.

• Microscopic details: It was evaluated under light microscope at x10 x 40 magnification by scoring the slides from 0 to 5 (score - 3 was kept as minimum score for acceptable result) by three independent observer sunder two parameters; nuclear and cellular shrinkage, nuclear and cellular dissolution/distortion of cellular components.
core 0-5, indicates: 0 (very poor), 1 (poor), 2 (average),3 (good), 4 (very good), 5 (excellent).



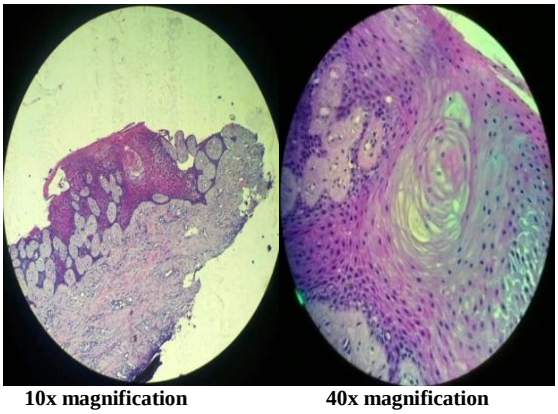
10x magnification **40x magnification**

20 minutes – no significant changes seen in nucleus and cell layer



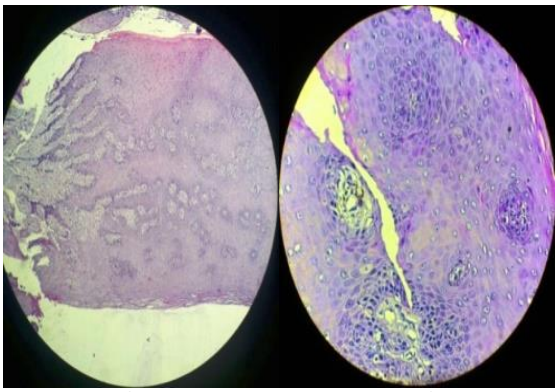
10x magnification **40x magnification**

30 minutes- A very slight changes in the form of nucleus shrinkage and spinous cell layer seen.



10x magnification **40x magnification**

40 minutes - Moderate nuclear and cellular shrinkage along with dissolution seen. Spongiosis in spinous cell layer was observed.



10x magnification **40x magnification**

60 minutes- Moderate nuclear and cellular changes seen along with dissolution.

Results

Nuclear and cytoplasmic staining: it was seen that as the specimens time interval in the carrying media increase the quality of slides decrease, i.e, poor staining intensity. The result were shown in normal saline as they showed acceptable time interval i.e, 20 minutes.

Specimens dipped in normal saline for 20 minutes showed best tissue architecture and can carry the tissue.

Microscopical Examination

20 minutes - no significant changes seen in nucleus and cell layer.
30 minutes - a very slight changes in the form of nucleus shrinkage and spinous cell layer seen.
40 minutes - moderate nuclear and cellular shrinkage along with dissolution seen. Spongiosis in spinous cell layer was observed.
60 minutes - moderate nuclear and cellular changes seen along with dissolution.

Discussion

Carrying media are considered as holding agents rather than fixatives because they do not chemically alter tissues. They are often used to transiently prevent desiccation of tissues. They are used as a buffer system in cell culture media and aid in maintaining the optimum physiological pH and osmotic pressure providing the cells with water and inorganic ions. In our study carrying media were chosen on the basis of their easy available normal saline 0.9%in dental clinics and hospitals.
Normal saline (or N/S) is the commonly used phrase for a solution of 0.90% w/v of sodium chloride (Nacl). The exact mechanism by which sodium chloride act on the tissue is unclear and its precise action on the tissue is unknown. Presumably, it might be a sodium specific chloride-anion and hyperosmolarity effect which leads toosmotic dehydration of cells and intercellular matrix[9].

Specimens in NS for 20 minutes showed the best tissue architecture. Pure an hydricsodium chloride was used as a fixative agent at room temperature for prolonged periods of time was found to preserve the morphological and molecular structure of the studied tissues[10]. Al-Saraj also conducted a study in which the saturated sodium chloride solution was used as a fixative for tissue in pathological or histological procedures[4.] In our study, Normal saline only be used as a carrying media as it is neither in a saturated form nor in pure anhydrous state. The mechanism of preservation of the molecular structure of cells by sodium chloride might be due to sodium specific, chloride anion and hyperosmolarity effect. Osmotic dehydration of cells and the intercellular matrix should also be taken into consideration[9]. It is also conceivable that sodium chloride might exert a direct effect in stabilizing reactions occurring during fixation[11].
Our results showed that specimens kept for more than 20 minutes in normal saline showed poor/unacceptable quality of tissue architecture in form of distortion (splitting of cells) and cell shrinkage seen. This is similar to the findings described by Culling, et al.[12], this finding could also be supported by the fact that, the tissue fixed in calcium carbonate solution used for buffering, exhibited prominent acantholysis of the superficial epithelium, with preservation and attachment of the basal cell layer of the underlying tissue[13].

Conclusion

According to this study, it was concluded that normal saline is considered as a best carrying media. The surgical procedure that warrants gingival tissue extraction should be timed out so that the tissue is to dipped in normal saline for 20 minutes or less. This is the second study on this aspect of certain aqueous-media to be used as holding agents. Being a human gingival tissue study, further investigations are required to be carried out using same as well as other carrying media along with extensive and large sample size to support and standardize the presented facts so that it can become an integral part of the normal day-to-day routine surgical procedure, whenever there is unavailability of a proper fixative at a given time it can be easily preserved in carrying media.

References

1. Ulmer D. Fixation: The key to good tissue preservation. J Plastination1994;8:7-10.
2. Hopwood D. Fixatives and fixation: A review. Histochem J1969;1:323-60.
3. Carson FL. Fixation and processing. In: Brown RW, editor. HistologicPreparations: Common Problems and Their Solutions. 1st ed. Northfield, Illinois: CAP Press; 2009. p. 1-8.
4. Saraj A. Use of saturated sodium chloride solution as a tissue fixative. Iraqi J Vet Sci 2010;24:53-8.
5. Rhodes A. Fixation of tissues. In: Bancroft JD, Gamble M, editors. Theory and Practice of Histological Techniques. 7th ed. China: Churchill Livingstone; 2013.p. 69-93.
6. Prentø P, Lyon H. Commercial formalin substitutes for histopathology. Biotech Histochem 1997;72:273-82.
7. Fox CH, Johnson FB, Whiting J, Roller PP. Formaldehy de fixation. J HistochemCytochem 1985;33:845-53.
8. Cross SS, Start RD, Smith JH. Does delay in fixation affect the number of mitotic figures in processed tissue? J ClinPathol 1990;43:597-9.
9. Olszewski WL, Zolich D, Manokaran G, Tripathi MF. Sodium chloride fixation of tissues under field conditions in tropical countries. J Immunol Methods 2004;284:39-44.
10. Emsen IM. A different and safe method of split thickness skin graft fixation: Medical honey application. Burns 2007;33:782-7.
11. Birge WJ, Tibbitts FD. The use of sodium chloride-containing fixatives in minimizing cellular distortion in histological and cytochemical preparations. J HistochemCytochem 1961;9:409-14.
12. Culling CF, Allison RT, Barr WT. Cellular Pathology Technique. 4th ed. London: Mid-County Press, Butterworth & Co. Ltd.; 1985.
13. Weir JC, Weathers DR. A fixation artifact simulating acantholytic disease. Oral Surg Oral Med Oral Pathol 1976;41:105-8

Review Article Journal of Oral and Dental Health

One for all - A Review on Salivary Biomarkers

Abstract

Saliva has a critical role in maintaining the health and various functions. Salivary diagnostics is a late-comer, but it is catching up popularity because of numerous clinical utilities. According to the National Cancer Institute's (NCI) Early Detection Research Network Biomarkers are defined as cellular, biochemical, molecular, or genetic alterations by which a normal, abnormal, or simply biologic process can be recognized or monitored. Sodium, potassium and chlorine has major role in diagnosing the efficiency of ductal transport system. Nitrate estimation in saliva provides a means of monitoring nitrate uptake and may also predict the future development of carcinoma. A normal healthy adult produces 1-1.5liters/day of saliva composing of mixture of serous and mucinous material at the rate 0.5ml/min. The resting saliva is mainly composed of submandibular secretion while stimulated saliva is made of mainly parotid saliva.

Keywords : Salivary biomarker, Salivary markers, oral cancer, Salivary proteome, Sialic acid, TNF-α

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INTRODUCTION

Saliva has a critical role in maintaining the health and function of the upper gastrointestinal tract. The secretion of saliva by the major and minor salivary glands is tightly regulated through neurotransmitter stimulation in what is classically considered to be a two-step process [1]. The components of saliva act as a ''mirror of the body's health''. Like blood, saliva is a complex fluid containing a variety of enzymes, hormones, antibodies, antimicrobial constituents, and cytokines. Most compounds found in blood are also present in saliva as they pass through cells by transcellular, passive intracellular diffusion and active transport, or paracellular routes by extracellular ultra filtration. So, saliva reflects the physiological, emotional, endocrinal, nutritional and metabolic state of the body[2].

WHAT IS SALIVARY BIOMARKER

According to the National Cancer Institute's (NCI) Early Detection Research Network Biomarkers are defined as cellular, biochemical, molecular, or genetic alterations by which a normal, abnormal, or simply biologic process can be recognized or monitored. Biomarkers are measurable in biological media, such as in tissues, cells, or fluids. A biomarker may be a molecule secreted by a malignancy itself, or it can be a specific response of the body to the presence of cancer. For example, alterations in gene sequence or expression and in protein structure and function can be used to detect cancer, determine prognosis, and monitor disease progression and therapeutic response. A biomarker should possess the qualities of both high sensitivity and specificity for the accurate diagnosis of disease. It is likely that many diagnostic tests of the future will encompass analysis of panels of such discriminatory molecules.

TECHNOLOGIES FOR DISCOVERY OF SALIVARY BIOMARKERS

Salivary Proteome

The capability to identify proteins and to determine their covalent structures has been central to the life sciences. The amino acid sequence of proteins provides a link between proteins and their coding genes via the genetic code, and, principally, a link between cell physiology and genetics. The identification of proteins provides an insight into complex cellular regulatory networks.

Salivary Transcriptome

The salivary transcriptome presented a second diagnostic alphabet in saliva and opened the avenue of salivary transcriptome diagnostics. Al- Tarawneh et al reviewed a total of 243 articles from the data base searches and concluded that there are in all 264 biomarkers of which 86 are for Sjögren's syndrome, 58 for caries (root caries and occlusal), 6 for breast cancer, 65 for type 2 diabetes mellitus, 23 for type 1 diabetes mellitus, 2 for lichen planus, 11 for severe periodontitis, and 13 for oral cancer [3].

COMPOSITION, COLLECTION AND STORAGE[4]

Saliva is composed of 99.5% water and 0.5% solid material which are inclusive of organic and inorganic constituents.The inorganic constituents are made of sodium, potassium, chlorine, bicarbonate, magnesium, calcium, phosphate, Thiocyanate, fluoride, lead, cadmium, copper, nitrite and nitrate. Sodium, potassium

and chlorine contribute to the osmolarity of saliva and their concentration give diagnostic information related to the efficiency of ductal transport system. Nitrate estimation in saliva provides a means of monitoring nitrate uptake and may also predict the future development of carcinoma. A normal healthy adult produces 1-1.5liters/day of saliva composing of mixture of serous and mucinous material at the rate 0.5ml/min.The resting saliva is mainly composed of submandibular secretion while stimulated saliva is made of mainly parotid saliva. Certain approaches to store saliva in order to prevent degradation of salivary compounds include-

•Immediate storage without any processing; if analysis is to be done within 30-90min, saliva can be stored at room temperature; for analysis after 3 to 6hrs from collection, storage is to be done at +40C and if analysis is to done after days to months after collection, storage is to be done at -200C or still better at -800C.

•Snap freezing of saliva in liquid nitrogen
•Inhibition of enzyme activity in saliva by mixing with certain enzyme inhibitors

•Addition of sodium azide to retard bacterial growth

•Addition of trifluor acetate to denature salivary enzymes that could degrade salivary compounds such as proteins and steroid hormones.

SALIVA IN CANCER

Oral cancer is currently the most frequent cause of cancer-related deaths among Indian men. It is preceded by oral pre-cancerous conditions like leukoplakia or oral sub-mucous fibrosis. According to the oral cancer foundation, oral cancer is particularly dangerous because it has a high risk of developing second primary tumours [5]. Molecular markers for the diagnosis of OSCC can be done by observing changes in the cellular DNA, altered mRNA transcripts which leads to altered protein levels [6]. The National Cancer Institute has recognized saliva as a promising cancer biomarker source[7].

Glycoconjugates play an important role in malignant transformation of cells. Glycoconjugates in circulation is due to increased turnover, secretion and/or shedding from transformed cells. Elevated serum levels of Sialic acid[8] and certain glycoprotein in various carcinomas, including oral cavity cancer have been reported [9]. Studies have reported elevated salivary levels of sialic acid in pregnancy, Down's syndrome and diabetes mellitus [10]. Radio therapy is one of the methods of choice in the treatment of cancer. A study conducted on level of sialic acid in saliva of oral cancer patients before and after radiotherapy shows salivary level of total protein, carbohydrate, free and protein bound Sialic acid content significantly increase and decrease respectively.[9,11,12]

Brailo et al also studied alterations in salivary IL-6 and tumor necrosis factor alpha (TNF-a) in patients with oral leukoplakia.2 Hu et al concluded that actin and myosin are promising salivary biomarkers for distinguishing premalignant and malignant oral lesions.

A study by Di-Xia, Schwartz and Fan-Qin (1990) found significant elevation of a glycoprotein complex CA 125, among women with ovarian cancer than with benign tumors[13,14,15,16]. This shows saliva can be the diagnostic medium and Sialic acid in saliva can become a probable tumor marker in diagnosis of oral cancer.

SALIVARY BIOMARKERS IN PERIODONTITIS

Periodontal disease is a common oral infectious disease that is also a leading cause of tooth loss in adults. Periodontal infections are implicated in a variety of other polygenic diseases, such as cardiovascular disease, stroke, and osteoporosis. Numerous biomarkers are indicators of higher levels of cellular damage and their increased activities in GCF. It is a consequence of increased release from the damaged cells of the soft tissues of the periodontium and is a reflection of metabolic changes in inflamed gingiva [17].
A study done by Yoshiaki Namura et al showed increase levels of aspartate aminotransferase(AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH), alkaline phosphatise(ALP), creatinine(CRE), blood urea nitrogen(BUN), urea and free haemoglobin in patients of gingivitis, moderate periodontitis, and severe periodontitis with highest values in severe periodontitis. LDH was found to be the most useful enzyme for the screening of periodontitis.[17,18]

SALIVA IN PRE MALIGNANT LESIONS

Oral cancer is preceded in most cases by pre malignant lesions- leukoplakia, submucous fibrosis and lichen planus. Battino et al concluded that the uric acid, the most important salivary antioxidant and serum gamma glutamyl transpherase (GGT) could be considered in the future as useful markers of oxidative stress in Oral Lichen Planus[19,20,21]. It is seen that in smokeless tobacco users IgA levels are less than normal individuals and OSMF patients have increased IgA levels secondary to disease onset[22].

SALIVA IN DIABETES

Diabetes mellitus is a major global health problem. Periodontitis has been considered as the sixth complication of type 2 diabetes mellitus after retinopathy, neuropathy, cardiovascular disease and peripheral vascular disease. Studies have showed that the proteins may have the potential to be used as biomarkers for the prediction of Type 2 DM patients who may be prone to periodontitis[23].

SALIVARY CORTISONE

Cortisol is the main natural glucocorticoid in humans, and it circulates mostly bound to corticosteroid- binding globulin (CBG) and albumin. The most widely recognized practical implications are in the assessment of patients on estrogens, who have high CBG levels and may have to stop their treatment for 6 wk before their Hypothalamic- pituitary –adrenal axis (HPA) status can be assessed. Stress due to activation of HPA system

increases salivary cortisol[24]. A study by Perogamvros et al concluded that ACTH stimulation increase salivary cortisol, salivary cortisone. Also, very high salivary cortisone levels were observed immediately after the ingestion of oral hydrocortisone[25].

SALIVA IN STRESS

Stress due to microgravity activates the hypothalamus-pituitary adrenocortical system (HPA) and consequently induces significant increases in salivary cortisol and beta-endorphin levels,[26,19]. A study conducted in Belgium which showed that during stress levels of the salivary stress markers alpha-amylase, cortisol, CgA, and beta-endorphin were all significantly higher. Alpha amylase is an important salivary enzyme in humans and is secreted from salivary glands in response to sympathetic stimuli. It is believed to be a useful marker for evaluating activation of the SM system[27].

SALIVA IN INFECTIOUS DISEASES

Viral diseases

Testing for the human immunodeficiency virus (HIV) is an excellent example of the potential usefulness of saliva in infectious disease diagnosis. The development of antibodies directed towards specific viral protein epitopes, and the development of technologies capable of measuring these proteins have facilitated the use of testing for HIV infection. For example, when testing saliva for HIV using an enzyme-linked fluorescence technique in combination with Western blot assays, saliva was superior to serum and urine with regard to both sensitivity and specificity. PCR is also being used to measure the shedding of cytomegalovirus and herpes viruses 6, 7, and 8 in the saliva of HIV infected patients. A new multiplex nested PCR technique can be used with saliva to detect and type lymphotropic herpes viruses including Epstein- Barr, cytomegalovirus, and human herpes virus 6, 7 and 8. In addition, determinations, saliva has also been used for the measurement of Hepatitis C, a leading cause of cirrhosis.13

Bacterial infections

Interest has also been shown in using saliva for the diagnosis of Helicobacter pylori infection, which is the critical pathogen associated with peptic ulcer. A nested PCR assay is available to detect H. pylori DNA in saliva and confirm the presence of H. pylori infection in patients. There is a large and long-standing literature concerned with the use of saliva for the detection of dental plaque-induced diseases, i.e. dental caries and gingivitis.

SALIVA IN CARDIOVASCULAR DISEASES

Cardiovascular disease is a major cause of death world-wide. Markers in saliva may be useful in patients undergoing cardiovascular surgery. For example, evaluation of total serum amylase and salivary amylase activity before and 6 hours after cardiovascular surgery helps in indicating the success of the surgery or mortality rate in patients.

SALIVA IN PHARMACOGENOMICS

Pharmacogenomics is the study of the impact of genetic variation on the efficacy and toxicity of drugs. A pharmacogenomic test result can inform physicians on the best therapeutic selection for an individual, including dose adjustment based upon a metabolic profile.
An excellent example of this is warfarin, which is used as an anticoagulant to protect against heart attack or stroke. A suboptimal dose of warfarin will not prevent the formation of embolisms, while an overdose can cause excessive bleeding[28]. Saliva can be used to detect and/or monitor various drugs for example cocaine, opioids, diazepines etc.

SALIVA IN ORTHODONTIC TREATMENT

1. Orthodontic treatment has been shown to induce inflammation, followed by bone remodelling in the periodontium. These processes trigger the secretion of various proteins and enzymes into the saliva. It is important to identify the changes in the oral environment in patients undergoing orthodontic treatment with fixed appliances, because in some cases involving long treatment duration and the clinicians are committed to preserving the oral health of the patient. Risk markers are biologic markers that either indicate disease or disease progression but are not causal or represent historical evidence of the disease, risk factors are characteristics of the person or environment that, when present, directly result in an increased likelihood that a person will get a disease and, when absent, directly result in a decreased likelihood of disease. In a study, a total of eight proteins were found to have changed in expression. Out of eight proteins, four of these have known roles in inflammation and bone resorption namely Protein S100-A9, immunoglobulin J chain, Immunoglobulin alpha-1 chain C region, and CRISP- 3[29].

SALIVA IN PRETERM BIRTH

Preterm birth is a major complication of pregnancy and remains a leading cause of neonatal morbidity and mortality worldwide (Bettendorf et al, 1998), Currently two FDA-approved biochemical tests are available in the United States: (1) fetal fibronectin and (2) salivary oestriol. The presence of a positive fetal fibronectin test in the mid trimester of pregnancy is strongly associated with early spontaneous preterm birth. In contrast, a positive salivary oestriol test is associated with late preterm birth, thus limiting its clinical use. Both tests have low test sensitivity and are currently used clinically for their negative predictive values[30].

SALIVA IN RHEUMATOID ARTHRITIS

Systemic inflammation may influence concentrations of salivary constituents. In a study, levels of three biomarkers which are known to be associated with periodontal disease in whole saliva were measured. It was found that Salivary levels of IL-1β and TNF-α were significantly elevated in arthritis patients not receiving anti-TNF-α antibody therapy compared with arthritis patients receiving anti-TNF-α therapy and healthy controls. Rheumatoid arthritis in the absence of disease modifying anti-rheumatic drugs appears to influence levels of select salivary biomarkers of periodontal disease. Rheumatoid arthritis patients have higher levels of periodontal inflammation than healthy controls.

Others

The protein product of the oncogene called HER-2/neu, is found to be elevated in the saliva of women with breast cancer. These studies demonstrated that this salivary marker is reliable and may also be used in patient postoperative follow up.13, 28 Salivary leptin is present in high amount in salivary gland tumors than in healthy parotid tissue. It has been reported that gastric cancer can also be identified at an early stage by using saliva proteome analysis. Salivary creatinine concentrations show a high sensitivity and specificity for determining the presence of renal disease.

Recent reports also showed that the saliva is a very good source of both hormones and biochemical and that their levels changes in accordance with the menstrual cycle. As ovulation approaches, the high level of circulating estrogens stimulates the breakdown of glycogen and other materials into glucose. This glucose will be utilized for energy release in the cell. A study by S. Alagendran et al, 2010, evaluated the changes in salivary sialic acid glycosaminoglycans in the regular menstrual cycle and observed a decrease in sialic acid concentration during the pre-ovulatory phase in saliva and cervical mucous[31].

There are four salivary biomarkers KRAS, MBD3L2, ACRV1 and DPM1 which could differentiate pancreatic cancer patients from non-cancer subjects.

These assays can be useful in evaluations of mood and cognitive emotional behavior, to predict sexual activity in adolescent males to study child health and development, in considerations of premenstrual depression13

YET TO EXPLORE

The use of salivary diagnostics is just beginning. A factor of primary importance in furthering clinical applications of salivary diagnostics is further clarification of the underlying physiological mechanisms by which these analytes enter the saliva.

CONCLUSION

Salivary testing is non invasive, making it an attractive, effective alternative to serum testing, and the possibility of developing home testing kits would further facilitate it as a diagnostic aid, enabling patients to monitor their own health at home and is important for those who live far from their treatment centres and especially for those at risk of developing OSCC. It is known that the efforts in salivary diagnostics will ultimately result in the detection of diseases, including cancer, optimally at the premalignant stage, supporting the management of cancerous diseases by enhancing the survival rate[32]. Evaluation of salivary gland function should therefore be a routine part of any oral examination in order to manage and prevent serious oral and pharyngeal consequences of salivary gland dysfunction.

REFERENCE

1. B.J. Baum, J.R. Yates II, S. Srivastava, D.T.W. Wong4, and J.E. Melvin, Emerging Technologies for Salivary Diagnostics, Advance Dental Research, 23(4) 2011, page no. 360 -368

2. Franky D. Shah, Rasheedunnisa Begum, Bhairavi N. Vajaria, Kinjal R. Patel, Jayendra B. Patel, Shilin N. Shukla, Prabhudas S. Patel, A Review on Salivary Genomics and Proteomics Biomarkers in Oral Cancer, Indian Journal of Clinical Biochemistry (Oct-Dec 2011) 26(4):326–334

3. Sandra k. Al- Tarawneh, Michael B. Border, Christopher F. Dibble, Sompop Bencharit, defining salivary Biomarkes using mass spectrometry- Based proteomics : A systemic review, A journal of Integrative Biology, Volume 15, Number 6, 2011

4. S. Gokul (2012). Salivary Diagnostics in Oral Cancer, Oral Cancer, Dr. Kalu U. E. Ogbureke (Ed.), ISBN: 978-953-51-0228-1, InTech, Available from: http://www.intechopen.com/books/oral-cancer/salivary-diagnostics-inoral-cancer

5. David T wong, Towards a simple, saliva based test for the detection of oral cancer, Expert rev Mol. diagnostics6(3), 2006

6. Ji-Ye Ai, Barry Smith and David TW Wong, Bioinformatics advances in saliva diagnostics, International Journal of Oral Science (2012) 4, 85–87

7. Feijoo C, Paez-de-la, Cadena M, Rodriguez – Berrocal FJ, Martinez Zorzano VS, Sialic acid levels in serum and tissue from colorectal cancer patients,; Cancer Lett, (1997), 112, 155-160

8. Dr. Dhiraj j. Trivedi, Ms. Chhaya d. Trivedi, Dr. Kaveri hallikeri, Dr. Ravindra udupa, Salivary sialic acid as marker of oral cancer, International Journal of Integrative sciences, Innovation and Technology, April. 2012, vol. 1, issue 1, page 48-50

9. Ayşen Yarat, Serap Akyüz, Leyla Koç, Hülya Erdem, Nesrin Emekli, Salivary sialic acid, protein, salivary flow rate, pH, buffering capacity and caries indices in subjects with Down's syndrome, Journal of Dentistry, Volume 27, Issue 2 ,February 1999, Pages 115-118,

10. Sanjay PR, Kaveri Hallikeri, Evaluation of salivary sialic acid, total protein and total sugar in oral cancer: A preliminary report, Indian Journal of Dental Research19(4)

11. Zimmermann BG, Wong DT. Salivary mRNA targets for cancer diagnostics, Oral Oncology 2008; 44:425–9.

12. CF Streckfus, LR Bigler, Saliva as a diagnostic fluid, Oral Diseases (2002) 8, 69–76

13. Shen Hu, Martha Arellano, Pinmanee Boontheung, Jianghua Wang, Hui Zhou, Jiang Jiang, David Elashoff, Roger Wei, Joseph A. Loo, and David T. Wong, Salivary Proteomics for Oral Cancer Biomarker Discovery, Clinical Cancer Research, 2008 October 1; 14(19): 6246–6252

14. Rafael Nagler, Gideon Bahar, Thomas Shpitzer, et al, Concomitant Analysis of Salivary Tumor Markers□A New Diagnostic Tool for Oral Cancer, Clinical Cancer Research, 2006;12(13) July 1, 2006

15. Pujari M, Bahirwani S, Balaji P, Kaul R, Shah B, Daryani D, Saliva as a diagnostic tool in oral Cancer, Journal of Minimal Intervention Dentistry, 2011; 4 (4)

16. Sarita Dabra and Preetinder Singh, Evaluating the levels of salivary alkaline and acid phosphatase as biochemical markers for periodontal disease: A case series, Dental Research Journal, 2012 Jan-Mar; 9(1): 41–45.

17. William Michael Sexton, Yushun Lin, Richard J. Kryscio, Dolphus R. Dawson III, Jeffrey L. Ebersole, and Craig S. Miller, Salivary Biomarkers of Periodontal Disease in Response to Treatment, Journal of Clinical Periodontology, 2011 May ; 38(5): 434–441

18. Yoshiaki Namura, Yoh Tamaki, Tomoko Tanaka, Hirohisa Arawaka, Akihisa Tsuromoto, kazuko kirimura, Tsutomu Sato, Nobuhiro Hanada, and Kyuichi kamoi, screening of periodontitis with salivary enzyme tests, Journal of oral science, Volume 48, no. 4, 177-183, 2006

19. Battino M, Greabu M, Totan A, Bullon P, Bucur A, Tovaru S, Mohora M, Didilescu A, Parlatescu I, Spinu T, Totan C, Oxidative stress markers in oral lichen planus.

20. Noha A. Ghallab,1 Naglaa El-Wakeel,2 and Olfat G. Shaker3, Levels of Salivary IFN-gamma, TNF-Alfa, and TNF Receptor-2 As Prognostic Markers in (Erosive) Oral Lichen Planus, Mediators of Inflammation Volume 2010, Article ID 847632, 7 pages

21. Sonja Pezelj-Ribaric, Ivana Brekalo Prso, Maja Abram, Irena Glazar, Gordana Brumini and Marica Simunovic-Soskic, Salivary levels of tumor necrosis factor-a in oral lichen planus, Mediators of Inflammation, 13(2), 131-133 (April 2004)

22. Prashant Gupta, Shantala R. Naik, SangameshNC, Astha Durgavanshi, Nupur Agarwal, Salivary Ig A levels in patients with oral sub mucous fibrosis, A study, Journal of Indian academy of oral medicine and radiology, October-December2011; 23(4): 536-538

23. Hang Haw Chan, Zubaidah H. A. Rahim , Kala Jessie, Onn H. Hashim, and Tara B. Taiyeb-Ali, Salivary Proteins Associated with Periodontitis in Patients with Type 2 Diabetes Mellitus, Int. J. Mol. Sci. 2012, 13, 4642-4654

24. Balwant Rai1, and Jasdeep Kaur, Salivary stress markers and psychological stress in simulated microgravity: 21 days in 6° head-down tilt, Journal of Oral Science, Vol. 53, No. 1, 103-107, 2011

25. Perogamvros, B. G. Keevil, D. W. Ray, and P. J. Trainer, Salivary Cortisone Is a Potential Biomarker for Serum Free Cortisol, Journal of Clinical Endocrinol Metab, November 2010, 95(11):4951–4958

26. Ahmadi Motamayel, F., Davoodi, P., Dalband, M. Hendi, S.S., Saliva as a Mirror of the Body Health, DJH 2010; Vol.1, No.2

27. Chaker Tlilia, Lakshmi N. Cellaa, Nosang V. Myunga, Vivek Shettyb, and Ashok Mulchandania, Single-walled carbon nanotube chemoresistive label-free immunosensor for salivary stress biomarkers, The Royal Society of Chemistry 2010, Analyst. 2010 October 20; 135(10): 2637–2642.

28. W.V. Giannobile1,2, J.T. McDevitt3,R.S. Niedbala4, and D. Malamud, Translational and Clinical Applications of Salivary Diagnostics, Advance Dental Research 23(4):375-380, 2011

29. Mohd Faiz Ellias,1 Shahrul Hisham Zainal Ariffin,1 Saiful Anuar Karsani,2 Mariati Abdul Rahman, Shahidan Senafi,1 and RohayaMegat AbdulWahab, Proteomic Analysis of Saliva Identifies Potential Biomarkers for Orthodontic ToothMovement, The ScientificWorld Journal,Volume 2012

30. Ramsey PS, Andrews WW. Biochemical predictors of preterm labor: fetal fibronectin and salivary estriol, Clinical Perinatology, 2003;30(4):701–33. [PubMed: 14714920]

31. Jeffrey Mirrielees, Leslie J. Crofford, Yushun Lin, Richard J. Kryscio, Dolphus R. Dawson III, Jeffrey L. Ebersole, and Craig S. Miller, Rheumatoid Arthritis and Salivary Biomarkers of Periodontal Disease, Journal of Clinical Periodontology 2010 December ; 37(12): 1068–1074

32. S. Alagendran, G. archunan, S. velayutha prabhu, Enrique-A, Orozco B, Rosalinda Guevara Guzman, Biochemical evaluation in human saliva with special reference to ovulation detection, Indian journal of dental research, 21 (2), 2010.

33. Nadine Spielmann and David T. Wong, Saliva: diagnostics and therapeutic perspectives, Oral Diseases, 2011 May, 17(4): 345–354.

Fabrication of Silicone Digital Prostheses with custom made nail –A simplified approach

Abstract

This report describes the prosthetic rehabilitation of a 25 years old male patient with partial finger amputations using a thimble type silicone prosthesis which retained by vacuum effect on the stump. A simplified two-part plaster mold was used for optimal circumferential reduction of the residual stump to achieve good prosthetic fit. For a life-like look, a custom-made nail with high translucency was used. This stimulated the anatomic nail bed by allowing the underlying color of the finger to show through. The patient was satisfied with the retention of the finger prosthesis and comfort of use. The finger prosthesis was aesthetically acceptable to the patient

Keyword : finger amputation, silicone, finger prosthesis, custom nail

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INTRODUCTION

Both form and function are important attributes of the hand.[1] Hands may be affected by many conditions varying from congenital abnormalities to disease, but the greatest cause of functional impairment is trauma [2] Finger and partial finger amputations are some of the most frequently encountered forms of partial hand loss.[3]Traumatic amputation of the fingers results in dramatic impairment of hand function and affects psychologic status [4, 5]

Currently many severely injured and traumatically amputated digits can be saved by various microsurgical reconstruction techniques, however, the aesthetic form of the hand may not always be satisfactorily restored. Also in some patients reconstruction is contraindicated or unsuccessful. An aesthetic prosthesis with passive function can assist in the rehabilitation of the patient and his return to the society, socially as well as psychologically. [1, 2, 5]

Prosthetic replacement of the fingers with a standard digital prosthesis can be satisfactory in patients who have at least 1.5 cm of residual stump.[1, 6] This paper presents a simplified step by step procedure for the fabrication of custom-made silicone finger prostheses in a patient with partial finger amputations.

CASE REPORT

A 25 year old male patient who had lost his right ring and little finger was referred from the department of general surgery for prosthetic rehabilitation. The patient had suffered a burn injury 15 years back, following which the severely affected right ring and little finger had to be amputated (figure 1).

Figure 1: Right hand with missing fingers

On examination of the remaining stumps, the length of the stumps was found to be adequate. The surrounding area appeared normal with no signs of infection over the digits. After taking an informed consent from the patient to ensure his willingness and cooperation the case was taken up for prosthetic rehabilitation.
First, the impression of the remaining stumps was made. The patient's hand was lubricated with a thin layer of petroleum jelly to prevent the adherence of the impression material to the skin and hair. Irreversible Hydrocolloid impression material (Tropicalgin, Zhermack, Italy) was mixed in thin consistency and was painted over the impression area. The remaining impression material was poured in the container large enough to encase the hand. The patient was instructed to place the hand in the container in a normal resting position without stretching. The impression was poured in dental stone (Type III, Kalstone, Kalabhai, Mumba , India) [3,7]

Then the impression was made of the contralateral digits of the patients using irreversible hydrocolloid to obtain wax patterns that closely duplicated the size, shape and contours of the lost digits. [1, 2] Molten wax was then poured into the impression and was left for a minute. Then the impression was emptied allowing a thin layer of residual wax to harden in the impression. This procedure was repeated to get hollow wax patterns of 3 to 4mm thickness (figure 2). [7]

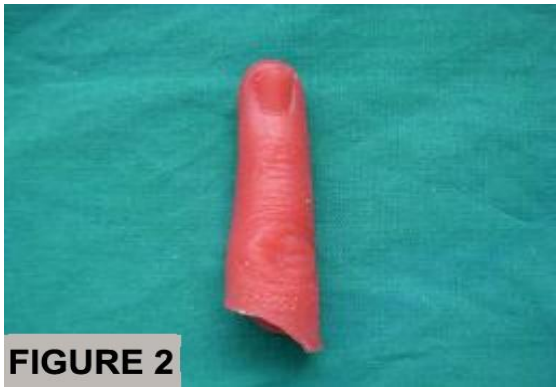

Figure 2: Donor wax pattern

The wax patterns were then tried on the patient's hand and were evaluated for proper size, shape, contours and angulation. Any modifications required were done. The margin of the wax patterns was thinned to achieve seamless visual integration with the surrounding tissue. [2, 3, 7]

As the prosthesis was to be made 'hollow thimble type', it was essential to ensure a tight fit of the silicone to the tissue. Thus the residual stump was required to be accurately reduced by approximately 2 to 3 mm so that the silicone stretches and flexes over the stump providing good retention. For this, first a two-part plaster mold was made. Keyways were made in order to orient the second part of the mold. Following this, the two-part mold was then adapted with wax to a thickness of 2mm and a plaster core was poured in order to produce the correct size, reduced stump model (figure 3) [7]

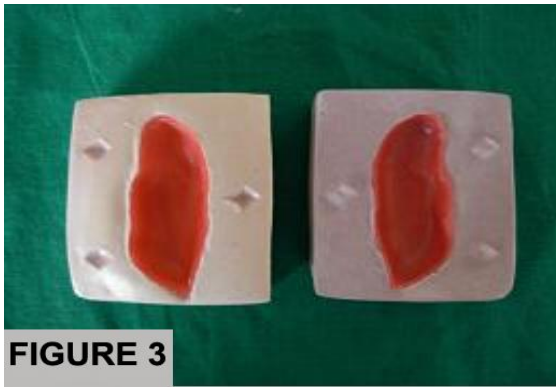

Figure 3: Two-part mold adapted with wax for reduced stump preparation

The nail bed on the wax pattern was reduced 2 to 3 mm to provide space for the custom acrylic nail. An undercut was created beneath the cuticle margin that would function to retain the acrylic resin nail. The wax patterns were then sealed to the reduced stump models. [2, 7]

Prior to investing, a 'v' shaped orientation notch was made at the base of the reduced stump models for easier replacement into the mold after dewaxing. The stump models along with the wax pattern were then invested. The first pour was done until the junction of dorsal and ventral surface. Separating medium was then applied and a second pour was done to cover the entire wax pattern. Dewaxing was carried out. Thus a three-part mold was obtained. The three-part mold helps in the easy placement of silicone into the mold and facilitates colour matching. (Figure 4). [3,7]

Figure 4 : Three part mold obtained

Medical grade silicone (M.P Sai Enterprise, Mumbai, India) was used for fabrication of the prosthesis. First the base color was determined on the undersurface of the finger as it tends to be the lightest area of the of skin. The silicone was then colored intrinsically using dry earth pigments to achieve the desired base color. Different color swatches were made by adding color to the base color to match the color of the knuckle joints and tips of fingers which usually exhibit a different color. Mold surface was then characterized by placing swatches of localized color in the desired areas (figure 5). The remainder of the mold was then filled with base color and the stump model was inserted in its position with the help of orientation notch. The other half of the mold was packed in a similar manner.

Figure 5: Mold characterised by swatches of localised colour.

The two halves were closed and the mold was transferred to a clamp. [1, 2, 3, 7]The mold was allowed to remain under bench press for 24 hrs. The finger prosthesis was then retrieved, the residual flash was trimmed with sharp scissors and the final finishing was done using silicone burs. [7]

Custom made nail was fabricated using standard crown and bridge acrylic along with transparent cold cure acrylic resin. First, a readymade nail of appropriate convexity was selected and trimmed to the size and shape of the nail bed of the finger prosthesis. Then a putty impression was made of the trimmed nail. The half-moon of the nail was built by placing a layer of crown and bridge acrylic on the nail impression surface. Over this, a layer of translucent acrylic resin of sufficient thickness was then applied in order to form a nail closely matching those of the corresponding normal hand (figure 6).The acrylic resin nails were then finished and polished. A cynoacrylate adhesive was then applied on the under surface of the nail for bonding with silicone surface [2, 7, 8]

Figure 6 : Custom acrylic nail

The prosthesis was finally delivered to the patient. (figure7) The patient was given instructions regarding prosthesis maintenance. The retention, shade and margin integrity of the prosthesis with the surrounding tissue was found to be good. The patient was recalled after a month for follow up. The patient was quite satisfied with the aesthetic result and was able to perform activities like holding light objects, writing in a satisfactory manner, resulting in a more optimistic outlook and enhanced self-confidence.

Figure 7: Prosthesis in lieu of missing fingers

DISCUSSION

Prosthetic rehabilitation of an amputee with a standard digital prosthesis has the advantages of being reversible, medically uncompromised, less time consuming, cost effective and good patient compliance

The prosthetic fit of a thimble-type silicone prosthesis which is retained by vacuum effect on the stump is achieved primarily by making the prosthesis circumferentially smaller than the segment of the residual stump over which it "cups". The simplified two- part plaster mold, used for reduced stump preparation helps in optimal reduction of residual stump for adequate retention with no localized pressure points. [7]

Wax was preferred over clay to make the pattern because residual oils from clay contaminate the mold surface, which interferes with the platinum catalyst employed in silicone prosthesis materials.[9]

Silicone was used for the fabrication of the prosthesis due to its accuracy in recording fine details; life like appearance, excellent stain resistance, elasticity and biodurability thinness of the silicone prosthesis allows good sensibility through it. Also gentle constant pressure of an elastomeric prosthesis helps to protect and desensitize the sensitive stump [2,3,10]

The use of intrinsic coloration increases the service life of the prosthesis since colour is less vulnerable to environmental conditions and handling and it does not interfere with sculpted surface texture or planned translucencies which are often compromised by application of extrinsic color.[11]

The patient was advised to wear a ring at the skin prosthesis junction to diffuse the colour difference at the interface and conceal the edge of the prosthesis. [1, 2]The technique described for the fabrication of finger prosthesis is simple and gives a high quality aesthetic prosthesis with adequate retention. It not only helps to restore form and function of the hand but allows the patient to expose his hand with confidence in public.

REFERENCES

1. Pereira BP, Kour AK, Leow EL, Pho RW. Benefits and use of digital prostheses. J Hand Surg Am. 1996; 21(2):222-8
2. Aydin C, Karakoca S, Yilmaz H. Implant-retained digital prostheses with custom- designed attachments: a clinical report. J Prosthet Dent. 2007; 97(4):191-5.
3. Kini AY, Byakod PP, Angadi GS, Pai U, Bhandari AJ. Comprehensive prosthetic rehabilitation of a patient with partial finger amputations using silicone biomaterial: A technical note. Prosthet Orthot Int. 2010; 34(4):488-94.
4. Aydin C, Karakoca S, Yilmaz H, Yilmaz C, Yamalik K. The use of dental implants to retain thumb prostheses: a short-term evaluation of 2 Cases Int J Prosthodont 2008 ;21(2):138-40.
5. Lundborg G, Brånemark PI, Rosén B.Osseointegrated thumb prostheses : a concept for fixation of digit prosthetic devices.J Hand Surg Am. 1996 ;21(2):216-21
6. Heitmann C, Levin LS Alternatives to thumb replantation Plast Reconstr Surg. 2002; 110(6):1492-503
7. Thomas KF: Prosthetic rehabilitation. Quintessence Publishing 1994: 51-137.
8. Leow ME, Ng WK, Pereira BP, Kueh KA, Pho RW. A technique of acrylic nail fixation in multilayered silicone finger prostheses. Prosthet Orthot Int. 1997; 21(3):199-201.
9. Kumar L, Saloni, Rao J, Mattoo KA, Yadav Finge - r prosthesis with an alternative approach. J Coll Physicians Surg Pak. 2012 Jan;22(1):58-60
10. Leow ME, Pho RW
RTV silicone elastomers in hand prosthetics: properties, applications and techniques Prosthet Orthot Int. 1999; 23(2):169-73.
11. Taylor T. Facial Prosthesis fabrication; coloration techniques. Chicago: Quintessence Publishing Company;2000. p 245.

Tuberculous Osteomyelitis of Maxilla- A Diagnostic Dilemma (A Case Report)

Abstract

Tuberculosis (TB) is a chronic granulomatous disease that can affect various systems of the body. In humans, mycobacterium tuberculosis, mycobacterium bovis and atypical mycobacteria cause the disease. Although primary lesion occurs as a pulmonary infection, extrapulmonary infections have also shown an increase over the past few years. These generally involve the head and neck, mandible and oral cavity. TB of the jaws can present as apical osteitis, periodontitis with horizontal bone loss or as a widespread destructive lesion of bones, and the latter may often be mistaken for a dental abscess. In this article patient reported with pain in the maxillary back region and underwent dental treatment without any relief. Then detailed investigations revealed that he is positive for the TB tests. With myriad presentations and sometimes lack of specific systemic symptoms, oral tuberculous lesions may present as puzzle for us and mislead to diagnosis of case. This case was managed by antitubercular therapy.

Keywords: Granulomatous disease, Tuberculosis, Osteomylitis, Tubercular osteomyelitis

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Introduction

Tuberculosis (TB) is a chronic granulomatous disease that can affect various systems of the body. In humans, mycobacterium tuberculosis, mycobacterium bovis and atypical mycobacteria cause the disease[1].
Although primary lesion occurs as a pulmonary infection, extrapulmonary infections have also shown an increase over the past few years.

These generally involve the head and neck.[2] Tuberculosis of the mandible has been reported in the literature, as these authors did not find any primary focus in the lung, it is probable that either spread from the oral cavity had occurred from after dental extraction or a trivial trauma could have made an occult focus in the mandible[3].

Oral clinical presentations could be as ulcers, erythematous patches and indurated lesions with granular surfaces, nodules and fissures or as jaw lesions. The most common sites involved are tongue, gingiva, tooth sockets and jaw involvements may present as osteomyelitis[4]. The oral lesions of the disease, although not very common, occur in various forms. Orofacial presentation of tubercular disease includes swelling, pain, loosening of teeth and even the displacement of tooth buds.

In the literature reviewed, the various presentations of TB of the jaws that are reported range from apical osteitis and periodontitis with horizontal bone loss to a widespread destructive lesion, and the latter may often be mistaken for a dental abscess. Other manifestations may include an ulcer, granulomas, involvement of the salivary glands and TMJ, and tuberculous lymphadenitis.[1]

With myriad presentations and sometimes lack of specific systemic symptoms, oral tuberculous lesions may present as puzzle for us and may escape our eyes[5].

Case Report

A 51 year old male patient came to the department of oral and maxillofacial surgery with a chief complaint of pain in the upper right back tooth region for two months and loosening of the same tooth. According to the patient, he was apparently alright a year back, and then he experienced pain in the upper right back tooth region and loosening of the tooth in the same region (Fig 1). He underwent extraction of the same, which was uneventful and the socket healing was also satisfactory. After 5-6 days he complained of dull intermittent pain in the same region and required IOPA radiographs were done to diagnose the cause for the complaint. On radiographic examination a well-defined periapical radiolucency was found associated with the extraction socket, measuring approx. 0.5 X 0.5 cm in diameter suggestive of a periapical cyst.

Figure 1: intra-oral view

Under all aseptic precautions, complete enucleation of the cyst was done with complete removal of the cyst lining under LA and closure was done with suturing. Routine follow up was done and the patient's complaint was resolved. After about a month, the patient came with the same complain of dull intermittent pain in the same region. IOPA and PNS view were taken to diagnose the problem. There was no abnormality found clinically and radiographically. The patient was referred to ENT surgeon to rule out sinusitis. As per the ENT specialist's opinion, sinusitis was not present clinically and radiographically.

Approximately four months later, the patient came to the department with the complaint he had previously and was advised a CT scan. No other abnormality was found except a slight loss of bone in the region of extraction. He was advised RCT with the adjacent tooth and was given appointment for the same. After a month, the patient was referred to the department again for the loosening of the tooth in which RCT was advised. Extraction was done under LA of the same tooth and complete curettage was done of the extraction socket (Fig.2 & 3). A small amount of bone and fibrous tissue that was found at the site was sent for biopsy and was reported as normal bone and fibrous tissue with no abnormality.

Figure 2: Incision planning

Figure 3: Exposure of defect and removal of granulation tissue, bone loss seen

The patient was immediately taken for the RCT of adjacent tooth (maxillary right canine) and was relieved of pain for 2-3 months. The patient came with the same complain of pain and loosening of the root canal treated tooth. He was advised for the required radiographs again.

The OPG (Fig4) and CT scan (Fig.5) revealed a great loss of bone in the right maxilla extending from the mesial aspect of 13 to the retro-molar region of the same side involving the floor of the maxillary sinus which was deficient along its antero-inferior and medial aspect. Thinning of the right half of the palate was also noted.

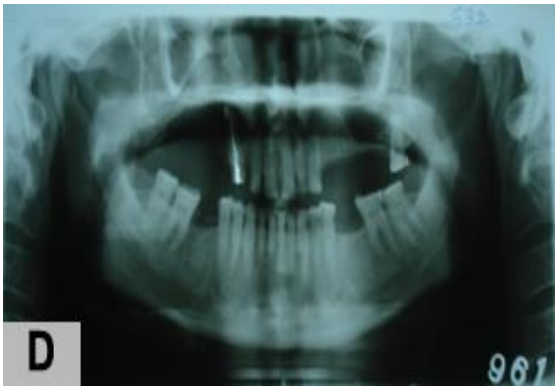

Figure 4 :OPG showing RCT done and bone loss around canine

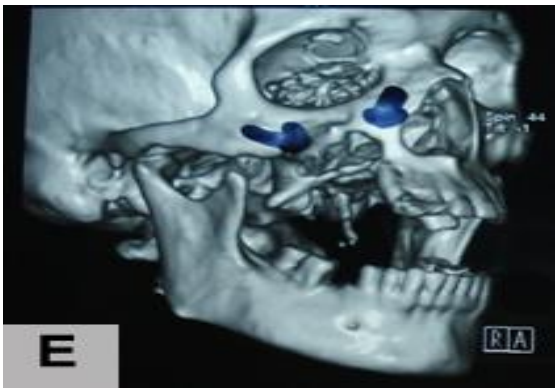

Figure 5 : CT scan shows bone loss in maxilla

A provisional diagnosis was made of osteolysis with right maxilla and the patient was sent for further investigations. The chest radiograph showed no opacification of any abnormality or any signs of consolidation of foci (Fig.6). Montoux test were found positive. But as we cannot only rely on montoux test, scrape cytology was done which did not show any signs of

tuberculosis. The patient was then sent for acid fast bacilli test which revealed tuberculosis. After a year of investigations, the patient was given final diagnosis of tuberculous osteomyelitis of the right maxilla.

Figure 6 : Chest X-Ray

After the final diagnosis, the patient was shifted to the oral anti-tubercular regime for 6 months which gave him relief (Fig.7). The patient was treated in the hospital for 16 days, followed by an anti-TB regimen comprising isoniazid 300 mg/day, rifampicin 600 mg/day, pyrazinamide 2,250 mg/day, ethambutol 1,800 mg/day, pyridoxine 100 mg/day, and pantozol 40 mg/day for 2 months, then isoniazid 300 mg/day and rifampicin 600 mg/day for another 4 months. Major problems associated with antibacterial TB treatment are the numerous side effects.

Figure 7: Intrao-oral healing after TB therapy

Discussion

Tuberculous osteomyelitis is quite rare and consists of less than 2% of total tuberculosis. Jaw involvement is even rarer and usually affects older individuals[6].

Osteomyelitis is defined as an inflammatory process involving cortical and cancellous bone. In the maxillofacial region, the mandible is by far the most frequently affected bone. In the vast majority of cases, an odontogenic infectious aetiology is apparent. However, in some cases, no clear causal factor can be found[7].

Primary oral tuberculosis is very rare, as an intact oral mucosa, cleansing action of saliva, salivary enzymes, tissue antibodies and oral saprophytes act as barriers to infection. Any breach of these defense mechanisms, such as abrasions, tares, chronic inflammation, poor oral hygiene, tooth eruption, extraction sockets, periodontal disease, and carious teeth with pulp exposure may lead to the infection by tubercle bacilli. Poor socio-economic conditions with inadequate nutrition and lack of hygiene are predisposing factors to infection[5]. Tuberculous osteomyelitis of mid-facial bones is extremely rare, although tuberculosis of long bones and the vertebral column is not uncommon[7].
Because of its rarity and variable presentation, this condition is difficult to diagnose, unless a high index of suspicion is kept in mind, which is more likely in an endemic area[8].

Treatment of tuberculous osteomyelitis is mainly medical. Surgery is indicated in cases with extensive destruction, the presence of secondary infection, and intracranial involvement. Surgery is not indicated for small lesions, and the presence of sequestrum is also not a definite indication for surgery. Radiological evidence of repair usually lags behind clinical evidence of improvement during treatment. The prognosis is usually good if effective chemotherapy is available[9].

This case illustrates the difficulties associated with diagnosing TB in the oral cavity. Because TB is rarely seen in the oral region, it was not initially considered as a cause of the patient's chief complain. In all cases of uncommon and therapy-resistant swelling, infection with mycobacteria should be ruled out by PCR or cultural techniques.

Radiographically tuberculous osteomyelitis resembles non-specific osteomyelitis. The first demonstrable change is a small translucent area due to decalcification that may be seen in any bone in response to tuberculous infection. The lesion is clinically undetectable at this stage. With the progression of the disease, the calcified area increases in size along with the occurrence of bone destruction as also seen in our case. Similar radiological features, with an area of erosion and sclerosis, were seen on the CT scan of this patient[9].
The radiographic picture of tuberculous osteomyelitis usually presents as a blurring of bone details, producing a diffuse radiolucency and erosion of cortical plate or even a mixed radiolucent-radiopaque lesion[2]. Unless there is a high degree of suspicion in all the drug resistant infection of the osteolytic lesion of the oral region, there is every chance of missing the diagnosis of tuberculous osteomyelitis. This kind of cases gives us a great challenge for the diagnosis.

Conclusion

Tuberculous osteolytic lesions are very rare occurrences in the oral and maxillofacial region. When reported, it gives a great challenge for the diagnosis. Social history as well as high amount of suspicion of a drug resistant osteolysis will help in the proper diagnosis of a case of tuberculous osteomyelitis.

References:

1. AD Dinkar and V Prabhudessai; Primary tuberculous osteomyelitis of the mandible: a case report: Dentomaxillofacial radiology (2008) 37, 415-420

2. Sunil Chaudhary, Namita Kalra: Tuberculous osteomyelitis of the mandible: A case report in a 4 year old child: Oral surg Oral Med Oral Pathol Oral Radiol Endod 2004; 97: 603-6

3. Gupta K B, Manchanda M, Yadav SPS, Mittal A. Tubercular osteomyelitis of mandible. Indian J Tuberc: 52: 147-150

4. Quinn PD, Rose LF, Silverman S. Jr. Microbial diseases-dental correlations: tuberculosis. In: Rose LF, Kaye D, editors. Internal Medicine for Dentistry. 2nd edition. St Louis mosby: 1990. P.268

5. P. Venkat Bhagirath, A. Bhargavi Krishna: Primary tuberculous osteomyelitis of the mandible- A rare case

report; Oral and Maxillofacial Pathology Journal, vol 2 No 1 Jan-Jun 2011

6. Fukuda J, Shingo Y, Miyako H; Primary tuberculosis of mandible. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1992;73:278-80

7. Marc Baltensperger; Is primary chronic osteomyelitis a uniform disease? Proposal of a classification based on a retrospective analysis of patients treated in the past 30 years Journal of Cranio-Maxillofacial Surgery(2004) 32; 43-50

8. A. Sethi, D. Sareen, A.K. Agrawal; Primary tuberculous osteomyelitis of zygoma: Int. J. Oral Maxillofacial Surg. 2006; 35: 376-377

9. A. Sethi, D. Sareen, A. K. Agarwal, R. Bansal: Primary tuberculous osteomyelitis of zygoma. Int. J. Oral Maxillofac. Surg. 2006; 35: 376–377

Hemangiopericytoma of the floor of the mouth – An Unusual Occurrence : A Case Report

Abstract

Hemangiopericytoma most commonly occurs in the extremities and retroperitoneum. Its occurrence in head and neck region is very rare (16%).It is a soft tissue tumour arising from pericytes of Zimmerman. The clinical behavior of hemangiopericytoma is complex, and can lead to malignant form. The treatment of choice is surgical excision within careful dissection of adjacent tissues. Hemangiopericytoma in the floor of the mouth is very rare, and this rare occurrence becomes more relevant in the oral cavity since the clinical features are non specific.

Keywords: Hemangiopericytoma, solitary fibrous tumour, oral cavity tumour

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Introduction

Hemangiopericytoma is a rare neoplasm which was first described by Stout and Murray in 1942 as a vascular tumor derived from the pericytes.[1] It is a soft tissue tumor that occurs most commonly in the soft tissues of upper and lower extremities and the retroperitoneum. Location in the head and neck region is uncommon, *but few cases have been reported in the tongue, floor of the mouth, cheek and gingiva*.[2]

Hemangiopericytoma (HPC) cells usually have a uniform, ovoid nuclei and indistinct cell borders. They are located outside the reticulin sheath of the epithelium.[3] In the 2006 World Health Organization (WHO) fascicle of soft tissue tumors, it is stated that the histological appearance and clinical behavior of HPC and solitary fibrous tumor are similar, a view widely shared. Accordingly, the unifying term 'hemangiopericytoma/solitary fibrous tumor' (HPC/SFT) has been proposed.[4]

Here we are presenting a case of 25 year old female patient with a growth on the floor of the mouth which was clinically diagnosed as salivary gland tumor, later histologically diagnosed as hemangiopericytoma.

Case report

A 25 year old female patient reported to the department with a chief complaint of swelling in the anterior portion of the floor of the mouth for one year. There was no pain and discomfort.

On clinical examination, there is no evidence of facial asymmetry extraorally. Intraoral Examination: Bimanual palpation showed a solitary, smooth, non fluctuant, pinkish blue colored mobile swelling of about 2x1.5cm crossing the midline from right alveolingual sulcus of the first molar region to left alveololingual sulcus of the canine region has been noticed, which was non tender on palpation and firm in consistency with well defined borders. Displacement of the tongue to the opposite side is noted. Salivary flow from submanibular duct is normal (Figure 1).

Figure 1

Our treatment plan is marsupilisation of the cyst along with Sublingual gland removal as the provisional diagnosis is Ranula.

Routine hematological investigations revealed normal values. Under aseptic conditions, surgical excision was done (Figure 2,3) and the specimen has been sent for histopathological examination, which was suggestive of haemangiopericytoma

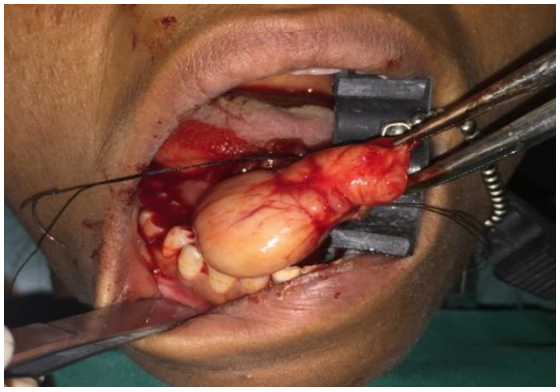

Figure 2

Figure 3

Discussion

Hemangiopericytoma is a soft tissue tumour arising from pericytes of Zimmerman. The term pericyte was introduced by Zimmermann in 1923 to describe cells encircling the blood vessel wall, consisting of thin processes and a prominent nucleus embedded in the basement membrane surrounding the capillaries.[5]

It can occur in any age group with no sex prediction and usually presents as a painless slow-growing mass, which is often nodular and well-circumscribed. The overlying skin or mucosa is generally normal in appearance and without obvious

Conclusion

Swellings in the floor of the mouth are very common and most commonly present as Ranula of varied sizes. In this present case we thought it could be Ranula based on clinical findings but histologically reported as Hemangiopericytoma. The treatment in most of these tumors is simple excision or enucleation with chances of recurrence at the primary site. There has been as yet no evidence of recurrence in the present case.

References

1. Deshmukh S, Kalele KP, Patil KP, Nayyar AS. Hemangiopericytoma: A rare case. Int J Case Rep Images 2015;6(8):517–22.

2. Maresi E, Tortorici S, Campione M, Buzzanca ML, Burruano F, Mastrangelo F, Tetè S. Case Report: Hemangiopericytoma of the Oral Cavity after a Ten-year Follow-up. Annals of Clinical & Laboratory Science 2007;37:274-9.

3. Brar R, Kulkarni S, Sheikh S, Jindal S, Brar P. Hemangiopericytoma associated with multiple keratocystic odontogenic tumors in an adolescent patient: A case report. J Oral Sci 2008;50:233-7.

4. Angiero F, Signore A, Benedicenti S. Hemangiopericytoma/Solitary Fibrous Tumor of the Oral Cavity. Anticancer Research 2011;31:719-24.

5. Ruta Shanmugam Vellavedu Umapathy Shanmugam Rajagopalan Mariappan Balaji Swaminathan Srikanth Nandipati Dony Manattu Mathaikutty. Haemangiopericytoma - A Rare Sino-Nasal Mass. Otolaryngology online journal 2015

Glandular Odontogenic Cyst of Mandible: Case

Abstract

Glandular odontogenic cyst is rare cyst affecting the jaw bones and is known to be of odontogenic origin. This cyst bears an unpredictable and potentially aggressive behavior with high incidence of recurrence. This high rate of recurrence could be because of improper and incomplete removal of cystic lining following conservative treatment modality. Clinically, it is most commonly encountered in the mandibular anterior region and has a slight male predilection. It occurs primarily in middle-aged patients. This cyst bears strong resemblance to various other cystic lesions and is difficult to distinguish clinically as well as radiologically. Therefore, histopathological analysis aids us to arrive at a definite diagnosis. This article presents a rare case of glandular odontogenic cyst in a 23-yearold female patient in the posterior region of the mandible, with emphasis on its histological nature, and reviews based on various available literatures.

Keywords: Glandular odontogenic cyst, recurrence, mandible, diagnosis

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Introduction

Glandular odontogenic cyst (GOC) is an uncommon developmental cyst of the jaw thought to arise from remnants of the dental lamina [1, 2]. In 1987, Padayachee and Van Wyk presented multilocular cystic lesions that were similar to botryoid odontogenic cysts and suggested the name ‘‘sialo-odontogenic cyst due to the presence of mucous cells and pools of mucin in the epithelial lining, and due to the fact that mucous pools are often lined by eosinophilic cuboidal cells which resemble salivary gland ducts [3, 4].

A year later in 1988 Gardner et al. [5] reported eight other cases and called the lesions glandular odontogenic cysts (GOCs) because there was a mucin structure in the cyst epithelium that had no finding of salivary gland origin. Glandular odontogenic cysts are usually misdiagnosed with other lesions such as botryoid odontogenic cysts and low-grade central mucoepidermoid carcinomas due to similarities microscopic features [4]. Subsequently In 1992, GOC was included in the WHO (World Health Organization) typing of tumors under the term GOC or sialo-odontogenic cyst [3].

GOC comprise about 0.2% of all odontogenic cysts, with the majority of cases occurring in the 5th–7th decade of life. 85% of cases affect the mandible, occurring mostly in the anterior region, and has a slight male predilection. The minimum recurrence rate is 20%, but it could be as high as 50%. Thus, this entity is at least as likely to recur as the odontogenic keratocyst (Keratocystic odontogenic tumour) [6, 7].

Clinically, this lesion is generally painless, slow growing and its size can vary from less than 1 cm in diameter to large dimensions. Small cysts are usually asymptomatic, but the ones that are large could result in expansion of bone along with pain

and paresthesia. Impacted tooth, resorption of roots and malaligned teeth commonly occur with this cyst [7, 8]. Radiographically, radiolucent unilocular or multilocular cystic area is visible. There could be loss of cortical integrity too [4].

The histological features of GOC strongly suggest an origin from the remains of dental lamina. The microscopic features are a cystic cavity lined with non-keratinized, stratified, squamous epithelium, localized plaque-like thickenings of the epithelium, variable numbers of mucous-secreting cells in the surface layer of the epithelium, a tendency to sub epithelial fibrous tissue formation, multiple cysts and the absence of inflammation. The superficial layer of the epithelium consists of eosinophilic cuboidal cells (which are sometimes vacuolated) that makes the surface irregular [7, 8]. The histologic features are therefore similar to those of lateral periodontal cyst (LPC), botryoid odontogenic cysts (BOCs), radicular and residual cysts with mucous metaplasia, and low-grade mucoepidermoid carcinoma. Thus, posing a challenge in making the diagnosis. Although GOC is encountered rarely it has been found to have an aggressive potential, with a high incidence of cortical perforation, and a high rate of recurrence, especially in cases which are treated conservatively [9].

Enucleation with peripheral curettage or marginal excision is the most common treatment modality, although some authors claim marginal resection is a more reliable treatment due to the tendency of the cyst to recur after enucleation with curettage [10].

Case Report

A 23-year-old female patient reported with chief complaint of asymptomatic swelling on lower left tooth region since the last 4 months. Other medical history of the patient was insignificant.

Extra oral swelling revealed diffuse hard swelling on the left side of the face causing facial asymmetry. The swelling extended inferiorly from the lower border of the mandible to the middle third of the face superiorly. Anteriorly it extended from

corner of mouth to tragus of ear posteriorly. The overlying skin was normal and submandibular lymph nodes on the affected side were not palpable. (Figure 1)

Figure 1: Extraoral photograph of the patient, showing facial asymmetry, swelling extending from lower border of the mandible to the middle third of face

Intra oral examination revealed a swelling extending from 31 regions traversing through 34, 35 regions and extending till the 37 regions. The overlying mucosa was smooth and was erythematous. On palpation the swelling was found to be firm, non-mobile and non-tender. The swelling was around 3cm x 2.5cm from the attached gingiva and obliterated into the buccal vestibule. (Figure 2)

Figure 2: Intraoral examination reveals bony hard swelling of the mandible extending from 31-37 regions.

Radiological examination revealed well–defined, unilocular radiolucency with sclerotic borders around the 34–37 region and 36 was missing.(Figure 3)

Figure 3: Panoramic radiograph reveals a cystic lesion with unilocular radiolucency and well-defined borders, extending from 34-37 regions and 36 is found to be missing

A provisional diagnosis of odontogenic keratocyst was deduced based on clinical and radiological findings.

Enucleation of the cystic lesion was performed and was sent for histopathological analysis.

Histology revealed non-keratinized squamous epithelium of variable thickness with moderately cellular connective tissue stroma. The epithelial lining showed cuboidal cells and in few places columnar cells were also visible. The epithelial connective tissue interface was relatively flat. The epithelial lining showed few eosinophilic cells and numerous goblet cells. The connective tissue stroma had numerous fibroblasts with delicate collagen fibrils and a few blood vessels. Based on these histopathological findings, it was concluded to be a glandular odontogenic cyst. (Figure 4, 5)

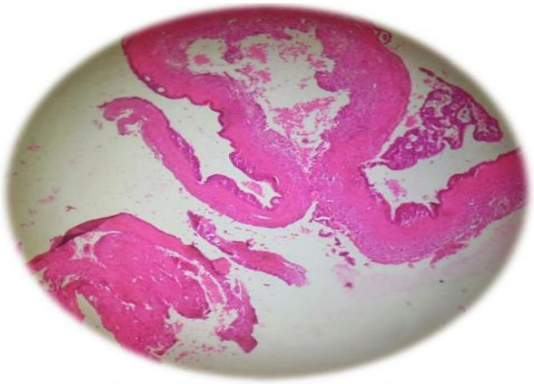

Figure 4: Photomicrograph showing a cystic lesion with papillary projections lined by pseudostratified columnar epithelium with some mucous pools and pseudo glandular areas (H & E stained section X10)

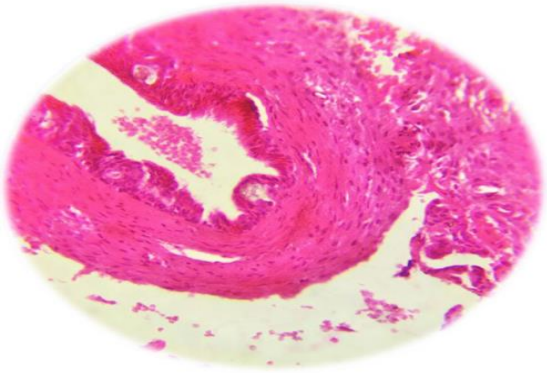

Figure 5: Photomicrograph showing cystic lining exhibiting variable thickness of epithelium, some areas of papillary projection and formation of microcysts (H & E stained section, X40)

Discussion

GOC is an uncommon odontogenic cystic lesion of the jaw with a frequency rate of only 0.012% - 1.3%. The main clinical feature is nonspecific, although painless local edema maybe present. Sometimes pain maybe associated due to compression of neurovascular bundles or due to secondary infection. Inflammation is quite rare, but paresthesia maybe associated with the lesion [8, 11, 12].
As mentioned earlier GOC develops in the maxillofacial region wherein involvement of mandibular regions is three times more as compared to maxillary regions [12].

But these clinical features according to various literatures define a wide spectrum of disease ranging from lateral periodontal cyst to destructive malignant neoplasm, viz. mucoepidermoid carcinoma [8, 11].

Radiographic examination of GOC does not really reveal any particular feature. It usually shows unilocular or multilocular radiolucency with well-defined margins, suggestive of various lesions, *viz.* Odontogenic keratocyst, radicular cyst, dentigerous cyst, ameloblastoma [2].
Therefore, the need and accuracy of histopathological examination is even more important as this only reveals definite diagnosis of GOC.
Distinguishing GOC from LPC and mucoepidermoid carcinoma, histologically requires thorough examination of the microscopic features.
GOC can be distinguished from BOC and LPC due to presence of ciliated epithelium and duct like spaces with mucous [8, 11].

But difficulty arises in distinguishing GOC with mucoepidermoid carcinoma. Various authors suggest that the demarcating feature between GOC and mucoepidermoid carcinoma is the presence of a typical thin epithelial lining without any epithelial proliferation [2]
Also, superficial cuboidal cells, epithelial whorls, ciliated cells and duct like structures are also not associated with mucoepidermoid carcinoma [8].

Immunohistochemical analysis and several molecular markers reveals the actual diagnostic feature of GOC. Pires et.al demonstrated that CK18s and CK 19s could be useful in differentiating between GOC and Central mucoepidermoid carcinoma (CMEC) [14]. Kaplan et.al showed positivity of p53 and Ki-67 for GOC. [13 [15] Vered M et.al found MASPIN (Mammary serine protease inhibitor) higher in mucous epithelial cells of CMEC than GOC [15, 16]. Tosios KI et.al demonstrated increased Bcl2 and suggested dysregulation of cell death in the lining epithelium GOC [17].

Various treatment modalities GOC varies from conservative surgical approach to segmental resection, including procedures of curettage, enucleation, local block excision and partial osteotomy. Despite all these treatment method, prognosis of GOC is still in doldrums due to rarity of the case and aggressive nature of the lesion. Recurrence rate is directly related to size of the lesion, 14.4% recurrence is observed in smaller lesion, whereas the percentage shoots upto 85.6% for larger lesions [13, 15].

While arriving at a diagnosis it must be remembered that GOC is a very rare odontogenic lesion and its diagnosis is quite cumbersome owing to its strong resemblance to CMEC. Due to its high recurrence rate, long follow up of patients should be rendered after surgery. Several molecular markers provide an additional tool for aiding in diagnosis.

References

1. Fatih Asutay, Ahmet H. Acar, Ümit Yolcu, Neşe Karadağ, Orhan Geçör: Glandular Odontogenic Cyst Mimicking Dentigerous Cyst: A Case Report, JIUFD 2014 48(1): 65-70,http://www.journals.istanbul.edu.tr/iudis/article/view/5000013382

2. Salehinejad J, Saghafi S, Ghazi N. Glandular Odontogenic Cyst Associated with Impacted Tooth: A Case Report. J Dent Mater Tech 2013; 2(3): 99-103, DOI: 10.22038/JDMT.2013.1053

3. Nigel Roque Figueiredo, Ajit Dattatray Dinkar, Manisha Maruti Khorate, Glandular odontogenic cyst of the maxilla: a case report and literature review, The Pan African Medical Journal. 2016; 25:116, doi:10.11604/pamj.2016.25.116.10879

4. Ismail Akkas, Orcun Toptas, Fatih Ozan, Fahri Yılmaz, Bilateral Glandular Odontogenic Cyst of Mandible: A Rare Occurrence, J Maxillofac Oral Surg. 2015 Mar; 14(Suppl 1): 443–447. doi: 10.1007/s12663-014-0668-y

5. Gardner DG, Kessler HP, Morency R, Schaffner DL (1988) The glandular odontogenic cyst: an apparent entity. J Oral Pathol 17(8):359–366

6. Barrett, A.W., Abdullakutty, A., Norris, P.M., Coombes, D.M., Shelley, M.J., Bisase, B.S et.al., Molecular diagnostics in the differential diagnosis of glandular odontogenic cyst and mucoepidermoid carcinoma – case reports. Oral Surgery, 2016, 9: 193–200. doi: 10.1111/ors.12195, http://online-library.wiley.com/wol1/doi/10.1111/ors.12195/full

7. H.H. Araújo de Morais et al. Journal of Cranio-Maxillo-Facial Surgery 40 (2012) e46ee50, http://dx.doi.org/ - 10.1016/j.jcms.2011.03.018

8. Anuthama Krishnamurthy, Herald J. Sherlin, Karthikeyan Ramalingam, Anuja Natesan, Priya Premkumar, Pratibha Ramani, Thiruvengadam Chandrasekar, Glandular Odontogenic Cyst: Report of Two Cases and Review of Literature, Head and Neck Pathol (2009) 3:153–158, DOI 10.1007/s12105-009-0117-2

9. Amisha A. Shah, Amit Sangle, Smita Bussari, Ajit V. Koshy, Glandular odontogenic cyst: A diagnostic dilemma, Indian J Dent. 2016 Jan-Mar; 7(1): 38–43., doi: 10.4103/0975-962X.179371

10. Boffano P, Cassarino E, Zavattero E, Campisi P, Garzino-Demo P (2010) Surgical treatment of glandular odontogenic cysts. J Craniofac Surg 21(3):776–780

11. Shah M, Kale H, Ranginwala A, Patel G. Glandular odontogenic cyst: A rare entity. J Oral Maxillofac Pathol, 2014;18:8992. http://www.jomfp.in/text.asp?2014/18/1/89/131922

12. Michelle Manzini, Christian Deon, Liliam Dalla Corte, José Carlos Bertotto, Luciana Boff de Abreu, Glandular odontogenic cyst: an uncommon entity, Braz J Otorhinolaryngol, 2009;75(2):320.

13. Ilana Kaplan, Gavriel Gal, Yakir Anavi, Ronen Manor, Shlomo Calderon, Glandular Odontogenic Cyst: Treatment and Recurrence, J Oral Maxillofac Surg 63:435-441, 2005

14. Marco Mascitti, Andrea Santarelli, Antonio Sabatucci, Maurizio Procaccini, Lorenzo Lo, Muzio, Antonio Zizzi, et.al. Glandular Odontogenic Cyst: Review of Literature and Report of a New Case with Cytokeratin-19 Expression, Open Dent J. 2014; 8: 1–12, doi: 10.2174/1874210601408010001

15. Purohit S, Shah V, Bhakhar V, Harsh A. Glandular odontogenic cyst in maxilla: A case report and literature review. J Oral Maxillofac Pathol 2014; 18:320-3, http://www.jomfp.in/text.asp?2014/18/2/320/140923

16. Vered M, Allon I, Buchner A, Dayan D. Is maspin immunolocalization a tool to differentiate central low-grade mucoepidermoid carcinoma from glandular odontogenic cyst? Acta Histochem 2010; 112(2): 161

17. Tosios KI, Kakarantza-Angelopoulou E, Kapranos N. Immunohistochemical study of bcl-2 protein, Ki-67 antigen and p53 protein in epithelium of glandular odontogenic cysts and dentigerous cysts. J Oral Pathol Med. 2000; 29:139–44.

A clinical case report on management of MIH in twins

Abstract

This case report presents a clinical case of twins with molar-incisor hypomineralisation. MIH is defined as hypomineralization of systemic origin of one to four permanent first molars frequently associated with affected. Presently only limited data are available to describe the magnitude of the phenomenon. Several aetiological factors have been mentioned as the cause of the defect. Children at risk should be monitored very carefully during the period of eruption of their first permanent molars. Treatment planning should consider the long-term prognosis of these teeth.

Keyword: Molar Incisor Hypomineralization, Twins

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Introduction

Molar Incisor Hypomineration is acquired developmental dental anomaly which mostly affects one or more first permanent molars and permanent incisors. The prevalence of MIH varies widely from 4-25% as reported in different countries but the data collected was mostly from European countries.[1] In Indian population, very few prevalence studies were conducted with prevalence varying from 2.9% to 10.48%.[2,3] Depending on the severity the clinical presentation of MIH varies greatly, ranging from white, creamy white, yellow to yellowish brown spots with the smooth border between sound and affected enamel to posteruptive breakdown. This stained enamel is porous and brittle which can easily fracture under masticatory forces soon after the eruption of permanent teeth leaving them sensitive to thermal, chemical and mechanical stimuli. In affected incisors, the severity of hypomineralization is usually less than that of the affected molars and the probability of permanent incisor involvement appears to be higher in cases with a greater number of affected permanent first molars.

A variety of systematically acting medical factors is proposed as contributing to or causing MIH including prenatal, perinatal and postnatal illnesses. Prenatal conditions are maternal pyrexia, maternal diabetes, hypocalcemia, prolonged maternal nausea and vomiting. Postnatal conditions such as low birth weight, infectious childhood illnesses, frequent high fever, consumption of medication such as amoxicillin (antibiotics), environmental toxicants, toxins from breastfeeding, respiratory acidosis, hypoxia, abnormal oxygen levels resulting from hypoventilation in various respiratory diseases and use of fluorides can lead to hypomineralisation. Illnesses such as cyanosis, otitis media, pneumonia, asthma, urinary tract infections, chicken pox, vaccines administration in infants and vitamin D deficiency have been positively associated with MIH. Accidental exposure to high levels of dioxins or polychlorinated biphenyls (PCBs) in early childhood has been found to be associated with demarcated opacity and/or hypoplasia. However, no confirmatory data is still available on the etiology of MIH.

Children having any systemic health problems in the first three years of life, which is considered to be the critical period for the crown formation of permanent of first molars and incisors, are more likely to suffer from MIH. Genetic factors such as Enamelysin protein (MmP20), Kallikrein (Klk4), D1X genes, RUNX2 gene may also be a contributing factor.[4,5] Many cases of MIH with different possible etiological factors and presentation have been reported in the past however the manifestation of MIH in twins have been rarely reported. This paper presents the clinical management of MIH in twins with the best possible treatment modalities.

Case Report

Monozygotic healthy male twins aged 7 years reported to the Department of Paedodontics and Preventive Dentistry, Institute of Dental Studies and Technologies, Modinagar. Both the twin children reported with the chief complaint of multiple decayed teeth with yellowish discoloured front teeth soon after eruption.

On intra-oral examination, the presence of MIH in both the twins was observed with the different clinical presentation. In the first twin (X) all the four permanent first molars and erupted maxillary central incisors and mandibular central and right

lateral incisors showed a various degree of MIH involvement. 26, 36 and 46 were observed with severe MIH with enamel breakdown and dental caries. 16 showed mild MIH. (Figure 1,2) All the erupted incisors showed demarcated yellowish opacities extending to middle thirds of buccal surfaces.

Figure 1 - Moderate hypomineralization in 46
Severe hypomineralization in 36 with cavity due to mild structural loss.
Carious 74,75 .

Figure 2 - Moderately hypomineralized 16
demarcated yellowish brown opacity of enamel (Severe hypomineralization) in 26
Carious 55,64,65

(Figure 3) Second twin child (Y) presented with severe MIH in 16 and 36. 36 with enamel breakdown and carious involvement. Mild MIH was seen in 26, 46 and 55.

Figure 3 - Whitish yellow demarcated opacities on the middle third of 11, 21, 42 and white opacity in the incisal third of 41.

(Figure 4,5) Four out of six erupted incisors presented with yellowish opacities extending to middle thirds of crowns without any enamel breakdown.

Figure 4 - Yellowish opacity showing signs of Mild hypomineralization in 16.
Moderately hypomineralized 26 with Cuspal involvent
carious 54,55,64

Figure 5 - 36 showing yellowish demarcated opacity.
46 showing mild MIH
Reverse crown and loop on 84
Carious 74,75

(Figure 6) Reverse crown and loop space maintainer for premature loss of 85 was present.(Figure 5) Besides some of the other primary teeth showed carious involvement but no MIH. History of normal full term birth with normal weight and no prenatal complication or medicament was given by the parents.

Figure 6 - Demarcated whitish opacity on incisors

No history of any long term illness, any long term antibiotic intake for medical illness was obtained. Both the children were breast fed for 6 months after birth followed by bottle fed for next 2 years. Mother gave the history of same type of defect for her first permanent molars and incisors and had undergone dental treatment with full coverage porcelain fused to metal crown. After thorough history and oral examination, diagnosis of MIH affecting both the twins was done. Genetic susceptibility was found to be the only etiological factor associated with MIH in these twins. After proper explanation consent was obtained from parents and treatment was planned. In the first twin (X) stainless steel crowns were given in 26, 36, 46. Pit and fissure sealant was applied in 16, glass ionomer restorations were done in carious primary molars. Stainless steel crown was delivered in pulpotomised 85. (Figure 7,8) In the second twin (Y) glass ionomer restorations were done in carious molars, stainless steel crown was given irt 16 and 46 and pit and fissure sealant was applied in 46.

Figure 7 – Upper arch with pit and fissure sealant applied in 16 and stainless steel crown in 26.

Figure 8 – Lower arch with stainless steel crown in 36, pulpally treated 75 and in 46

(Figure 9,10) Besides, topical fluoride application using fluoride varnish and CCP-ACP (Casein Phosphopeptide – Amorphous Calcium phosphate) cream was recommended for daily use for both the twins. As there was no enamel breakdown in erupting incisors, no invasive treatment was planned with only regular monitoring and recall visits.

Figure 9 - Upper arch with stainless steel crown in 16

Figure 10 - Lower arch with stainless steel crown in 36

Discussion

MIH is a widespread and serious dental condition affecting children. Its etiology is indistinct and generally is not caused by any one specific etiological factor. The risk of MIH increases if several conditions or agents act synergistically. Particularly, the risk increases if a child is genetically susceptible. The genetic and environmental factors act systemically and affect the developing enamel during prenatal, perinatal, or the early childhood period i.e. the first year after birth. In this case, it could be assumed that some genetic factors were responsible for MIH in these twins as the mother have given the history of the same pattern of molars and incisors involvement and no significant history of any environmental factor during prenatal, perinatal and postnatal periods was found associated. The twins were monozygotic, yet the clinical presentation was different in both in terms of severity of MIH and no. of involved molars and incisors. The second twin showed less no. of teeth with MIH. Early diagnosis with management is essential to lower down the complexities related to treatment needs of the involved teeth.

Different treatment approaches have been proposed in the literature. The complexity of the treatment required increases both for the dentists and patients in cases of increased severity of MIH and rapid breakdown of enamel with unpredictable nature of intact opacities. Generally, the treatment option depends on the extent and type of the defect, the degree of tooth eruption, the dietary and oral hygiene habits of the patient. Treatment approach varies widely depending upon the severity, ranging from preventive therapy like topical fluoride and sealant application, restorative procedures using restorative materials and crowns to extractions. The patients usually present with clinical problems of function and aesthetic associated with MIH involved teeth. The twins of the present case were also presented with clinical problem of function related to some of the involved molars and showed only a little concern of aesthetics.

In this case of twins, some of the molars showed posteruptive breakdown and dental caries. Moreover, in both the children many of the other primary teeth had dental caries making them susceptible to further caries attack. Therefore, both preventive, as well as full coverage restorations were preferred as the final restorative treatment strategy for molars. The first permanent molars that were presented with moderate to severe MIH and posteruptive breakdown the desired treatment modality was the placement of stainless steel crown (SSC). SSC is preferred for restoring the areas where enamel breakdown has already occurred, preventing sound hypomineralized areas from further decay, provides proper occlusal and proximal contacts, ensuring control over sensitivity, and cost effective with a faster application. Molars without posteruptive enamel loss and with mild MIH with deep pit and fissures, pit and fissure sealant was applied. All the other teeth with dental caries were restored with Fuji type IX GIC. The incisors of both twins did not present with posteruptive enamel loss or caries, only preventive treatment with topical fluoride varnish application followed by daily use of CCP-ACP remineralizing cream was recommended.

Also, the opacities on incisors appeared to be involving the whole thickness of enamel and incisors were not completely erupted, therefore, microabrasion, bleaching or resin infiltration techniques were not preferred. The topical fluoride varnish application was done for full mouth followed by recommendation of regular daily application of CCP-ACP cream application and strict regular follow- up for preventing the development of carious lesions in weak enamel regions.

The genetic susceptibility was found to be only related to etiological factors for the present twins, therefore we strongly recommend genetic studies to rule out the role of genes in MIH. Whatling and Fearne proposed need of genetic studies for assessing the possibility of genetic susceptibility of individuals to this disease.[6] This would further help in early diagnosis and formulation of preventive strategies for MIH cases. Thus genetic studies are needed to assess the aetiology of MIH as the clinical practice suggests the possibility of a genetic susceptibility to this disease

Conclusion

Molar Incisor Hypomineralization (MIH) is becoming one of the common clinical entity that needs immediate concern in terms of early diagnosis, preventive and corrective treatment procedures to reduce the negative impact on child's quality of life. Genetic studies related to genes involved and their effect on proteins on enamel secretion and maturation is urgently required that will aid in manipulating genetic and environmental factors related to MIH.

References

1. Meligy OAESE, Alaki SM, Allazzam SM. Molar Incisor Hypomineralization in Children : A Review of Literature. Oral Hyg Health.2014;2(4):1-5.

2. Babu V, Jha S. Prealence and Characteristics of Molar Incisor hypomineralization in children Residing in South Bangalore, India. Int J Sci study. 2014; 2(9):74-78.

3. Mittal N, Sharma BB. Molar incisor hypomineralization: prevalence and defect characteristics in Indian school children.J cranio-max dis.2015;4(1):49-56.

4. William V, Meser LB, Burrow MF. Molar Incisor Hypomineralization: Review and Recommendations for Clinical Management. Paedtr Dent 2006; 28(3): 224-32

5. Krishnan R, Ramesh M. Molar incisor hypomineralisation: A review of its current concepts and management. SRM J Res Dent Sci.2014;5(4):248-252.

6. Fragelli CMB, Jeremias F, Santo-Pinto Lourdes. Manifestration of molar-incisor hypomineralisation in twin : Clinical case reports. Braz Dent Sci. 2013;16(3):90-94.

A Three-rooted Mandibular Second Premolar: A Case Report

Abstract

Presence of extra roots and canals should be considered before initiation of root canal treatment for the success of endodontic treatment. The Incidence of three root as well as canals in mandibular second premolar is very rare and prevalence has been reported to be 0.46- 0.5%. present case report explains endodontic treatment of a mandibular second premolar with three separate roots and three separate canals. endodontic treatment of a mandibular second premolar with three separate roots and three separate mesiobuccal, midbuccal, and lingual canal orifices. Close attention to anatomic variations, thorough radiographic examinations, thorough evaluation of the pulp chamber floor, and use of magnifying and optical devices have been recommended for the success of endodontic treatment of mandibular second premolars with complicated root canal system anatomy.

Keywords: Dental pulp cavity/abnormality, bicuspids

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Introduction

Thorough knowledge of the anatomy and morphology of the root canal system is necessary
for successful endodontic treatment. Slowey3 found that due to the variations in root canal anatomy, and its root configuration mandibular premolars are the most difficult teeth to treat endodontically; they have a high flare up and failure rate.

Mandibular premolars have gained a popularity for having aberrant anatomy. Different studies have concluded that the morphology of mandibular premolars over the years, high percentage of these teeth to have more than one canal. The main purpose of doing endodontic therapy is thorough mechanical and chemical debridement of the entire root canal followed by to get a hermetic seal with an inert filling material and last post endodontic restoration. Among the major causes of endodontic treatment, failure such as incorrect canal instrumentation, incomplete obturation and untreated major canals, failure to recognize the presence of an additional root canal may result in unsuccessful treatment and may be the origin of acute flare ups during and after treatment.

In a study by Cleghorn et al almost all the mandibular second premolars had one root (99.6%), 0.3% of them had two roots, and only 0.1% had three roots. Anyway, a thorough knowledge of the anatomy of root canal, a meticulous radiographic interpretation, and a proper access cavity are necessary to increase the success rate of endodontic treatment of these teeth.

The present case report explains therapeutic recommendations and the procedural steps of the endodontic treatment of a rare case of mandibular second premolar with three separate roots.

Case report

The patient was a 30-year-old female with no history of any systemic diseases. The patient had referred to the Department of Endodontics with a chief complaint of pain in the posterior
area of the right lower arch. Clinical evaluations revealed a carious lesion in the mandibular second premolar. Pulp vitality tests showed sensitivity to heat, cold, and electric pulp tests. Sensitivity to percussion was in the normal range. Radiographic evaluation revealed normal periodontium and presence of more than one root. (Figure 1a)

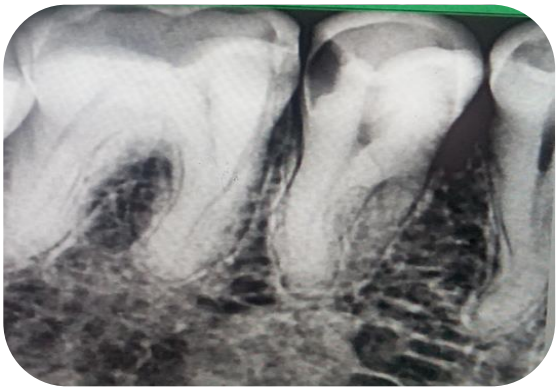

Figure 1a: Diagnostic radiograph showing three roots in mandibular left first premolar

The pulp was diagnosed with irreversible pulpitis with normal periradicular tissues. A two-session endodontic treatment was planned. Isolation was achieved by rubber dam after local anesthesia with 2% lidocaine and 1:100,000 epinephrine.To gain sufficient access to the canals, the conventional access opening was modified in the way that it was wider mesially.

Evaluation under a surgical microscope (OPMI Pice Dental Microscope, Zeiss, Oberkochen, Germany) at a magnification of ×10 revealed three separate mesiobuccal, midbuccal and lingual orifices (Figure 1b).

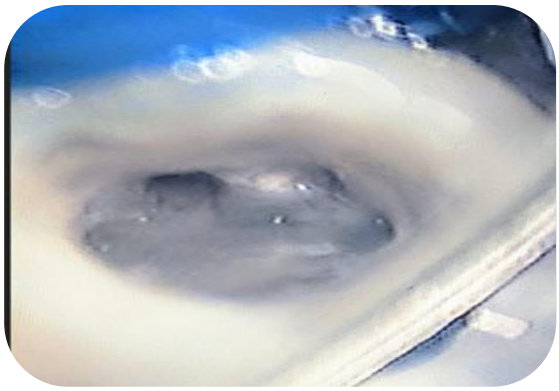

Figure 1b: Evaluation of access cavity under a surgical microscope reveals two buccal orifices and one lingual orifice.

Radiographically, the mid-root diameter appeared to be almost equal to the crown diameter. Tactile examination of the walls of major canals was done with a small precurved pathfinder file (Dentsply, Maillefer, USA) which was advanced slowly down each wall of the major canal, probing for a catch. A slight catch may signify the orifice of an additional canal especially in the case of the buccal and lingual walls because these are the unseen dimensions on the radiograph.

Orifice location was difficult as the coronal pulp chamber was unusually long and the separation of roots was from the middle third of the root. Finally, the three canal orifices were located under the patency was ascertained with a small size 15 K-file (Dentsply, Maillefer, USA). The working length radiograph was taken (Figure 1C, 1D).

Figure 1c : Working length radiograph of three rooted mandibular left first premolar was taken with size 10 K files

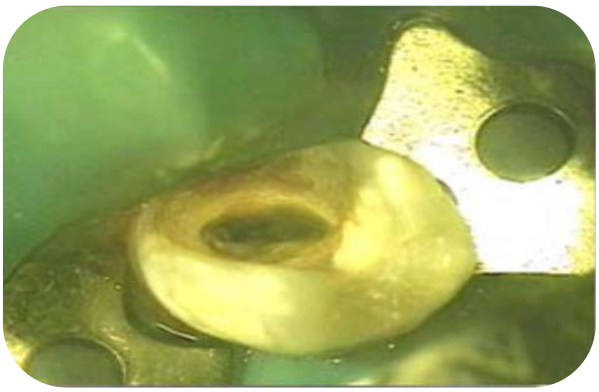

Figure 1d: Clinical photograph after access opening

The canals were cleaned and shaped sequentially with Hand files (Dentsply, Maillefer, USA), irrigated using 3% sodium hypochlorite and a final rinse of saline. The canals were dried with paper points (Dentsply, Maillefer, USA), cotton was placed in the pulp chamber and Cavite (3M ESPE, St. Paul, MN, USA) was used to close the access cavity. At the second appointment the canals were obturated with 2%gutta-percha cones (Dentsply, Maillefer, USA) using zinc oxide eugenol (Figures 1E and 1F).

Figure1e: Master cone radiograph of three rooted mandibular left first premolar was taken with 2% gutta-percha

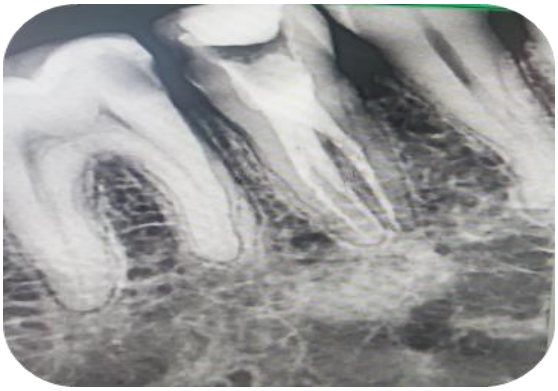

Figure1f: Radiograph showing obturation of all the three canals of mandibular left first premolar.

The access cavity was filled with GIC. The tooth was asymptomatic with normal radicular conditions.

Discussion

Mandibular second premolar is one of the most difficult teeth for endodontic treatment due to wide variations in the morphology

of its root canal system. Radiograph also showed the presence of two roots with a shadow of a third root in between the first two. But for the evaluation of third root we should take a radiograph from more than two angulation which will help for making a correct diagnosis.
Published studies citing the anatomy and morphology of mandibular premolars report that approximately 98% of the teeth in these studies were single rooted. The incidence of two roots was 1.8%.Three roots when reported were found in 0.2% of the teeth studied. Four roots were rare and were found in less than 0.1% of the teeth studied.

In the present case, before the initiation of the treatment, the tooth was determined to have two mesial and distal roots on the radiograph with direct tube angulation; however, a change in the horizontal angulation of the x-ray tube revealed three separate roots (Figure 1a).

Straight and angled preoperative radiographs using parallel technique are essential in providing insight into the number of existing root canals [1]. The analysis indicated that bifurcation identified on the mesiodistal view exhibited the best diagnostic accuracy (91.5%) with the highest sensitivity (94.7%) and second highest specificity (88.6%) for identifying a complicated root canal. The reason that bifurcation identified on the mesiodistal view had the best diagnostic accuracy is likely because mandibular premolars have two root canals, which are in a buccolingual direction. However, the mesiodistal view is clinically impossible and X-ray films from different angles are necessary for diagnosis.[2,3] Therefore, careful interpretation of the periodontal ligament space and angled views many suggest the presence of an extra root or canal. In the presented cases, unusual root shape was observed in pretreatment radiographs, which recommended the possibility of extra roots and canals.

Use of magnification with the help of a loupe or a microscope and visual enhancement with the use of fiber optics, use of sodium hypochlorite bubble technique and staining might help locate additional canals.
In this case, a surgical microscope was used to enhance visualization, and the anatomic map of the pulp chamber floor was used to locate canal orifices (Figure 1b).

Previous studies have shown the presence of one orifice on the lingual aspect and two orifices on then buccal aspect. In the present case, one canal orifice was on the lingual aspect, one canal orifice was on the buccal aspect, and the third orifice was located mesial to the two other orifices (Figure 1b).
The following suggestions can help the clinician identify multiple root canal systems in the mandibular first premolar.
Multiple preoperative parallel radiographs, as well as a mesial or distal shift radiographs, can help to determine the type of canal system present.

• A sudden change in radiographic density of a root canal space may suggest a second canal and the level of canal bifurcation[2]. • If a working length file appears off center on radiograph, the possibility of a second canal exist [3] • Indistinct definition of root anatomy on several radiographs probably indicates a second root or even possibly a third [4].

A basic guideline is that if the mid-root image diameter appears equal or greater than the crown radiographic image diameter, then the tooth most likely has a variation in root canal configuration. It should also indicate to be presence of additional canal. Whenever an instrument demonstrates an eccentric direction on deeper penetration into the canal, termed directional control, or if the working length file appears off center in the radiograph Use of magnification has been demonstrated to improve the clinician's ability to visualize and access canals. Although they are difficult to negotiate because of canal curvature and narrowing , most canals in a tooth with three root canals can be located and instrumented using current endodontic technique . In the present case all the three canals could be found and negotiated. Bifurcation of roots among lower premolars usually occurs buccoligually, in this case, the mesiodistal branching is quite significant and rare.

Moreover, during exodontias, if multi-rooted premolar teeth are rotated during extraction there is an increased likelihood of root fracture. Hence, good quality radiographs are of paramount importance in determining both external and internal root morphology. Two radiographs at 20 degree horizontal angulation should be available for preoperative evaluation of any mandibular premolar. However, radiographs produce only a two dimensional image of a three dimensional object resulting in superimposition of images. Therefore they are of limited value in cases with complex root canal anatomy.
All the root canals had separate apical foramina. However, in general, the high cost, accessibility and availability to patient and extra radiation as compared to standard radiographic methods makes its routine use limited.
We can conclude that a thorough knowledge of root canal anatomy and its variations, careful interpretation of the radiographs, close clinical inspection of the floor of the chamber and proper modification of access opening along with adequate magnification are essential for successful treatment outcome.

Conclusion

It is well established that the presence of extra roots and root canals in these teeth may occur far more than one can expect. The clinician should be astute enough to identify the presence of unusual numbers of roots and their morphology.

References

1. Nallapati S. Three canal mandibular first and second premolars: a treatment approach. J Endod . 2005;31:474–6. [PubMed]

2. Silha RE. Paralleling long cone technic. Dent Radiogr Photogr. 1968;41:3–19. [PubMed]

3. Slowey RR. Root canal anatomy. Road map to successful endodontics. Dent Clin North Am. 1979;23:555–73. [PubMed]

4. Baisden MK, Kulild JC , Root canal configuration of mandibular first premolar, J. Endod. 1992; 18:505-508

5. Slowey RR, Root canal anatomy – road map to successful endodontics. Dent. Clin of N. Amer. 1979; 23:555-573.

6. Kusai Baroudi Morphology of root canals in lower human premolars Nigerian Medical Journal | Vol. 53 | Issue 4 | October-December | 2012

Connective Tissue Graft – A way to Salvation for Doomed Tooth

Abstract

Mucosal fenestration is an entity which is rarely seen, so is their treatment rarely reported. Their treatment might be further complicated due to a communication with the oral environment, making them more susceptible to accumulation of debris, plaque and calculus thereby reducing the probability of mucosal renewal. The aim of the present case report is to highlight one such rare clinical scenario and its apt and effective management

Keyword: Mucosal fenestration, Connective tissue graft

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Introduction

The desire for cosmetic dentistry and enhanced aesthetics has increased tremendously in contemporary society. Cosmetic procedures have become an integral part of periodontal treatment. Aesthetics is compromised in patients with clinical root exposure which can be attributed to various reasons such as gingival recession, fenestration/dehiscence etc. Recession defects are treated to resolve a variety of patient-centred concerns including aesthetics, root sensitivity, increased potential for root caries, difficulty in plaque control[1]. Furthermore, it must be remembered that exposed roots are more prone to abrasion and erosion. The rationale for procedures involving root coverage is to achieve a stable function of the periodontium and esthetically satisfying gingiva.[2] Over the past few years, multiple surgical techniques have been employed in obtaining effective root coverage such as: pedicle grafts, autogenous free gingival grafts, connective tissue grafts (CTG) combined with pedicle grafts, guided tissue regeneration and acellular dermal matrix (ADMA).[3]

The following case report describes a rare clinical scenario of an isolated apical soft tissue fenestration with concomitant localized gingival recession in relation to the maxillary canine which was surgically corrected by placement of CTG resulting in successful closure of the defects with 2 years follow up period.

Case report

A male patient aged 27 years, came to the Department of Periodontics, JCD Dental College, Sirsa, India, with the chief complaint of receded gums in relation to the upper left canine causing an aesthetic concern. The patient had undergone root canal treatment followed by periapical surgery in relation to 23, four years ago which was asymptomatic. In addition to which, he had undergone orthodontic treatment for his labioverted anterior teeth two years back. The patient's medical history was noncontributory. On intraoral examination, the patient presented with good oral hygiene. The periodontal status of other teeth were normal. The gingiva in relation to 23 was erythematous with grade I (Silness and Loe) bleeding and was edematous in consistency. There was Miller's class II gingival recession in relation to concerned tooth with mucosal fenestration exposing the apex of tooth. (Fig. 1A).

Fig1. A - Preoperative view of mucosal fenestration associated with localized gingival recession in relation to 23.
Fig1. B - A Split full thickness flap was elevated in relation to 23.
Fig1. C - Exposure of the root apex following flap reflection and removal of old root end filling material.

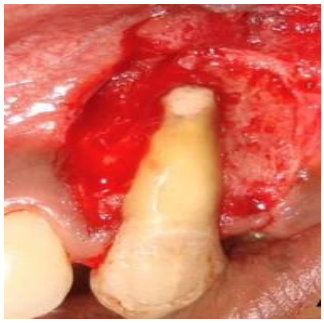

Fig1. D - Complete periradicular debridement done in relation to 23 along with placement of light-cured glass ionomer cement as a root end filling.

The tooth was also labioverted, nontender on percussion and showed physiologic mobility. Radiographic examination revealed obturated 23 along with a slight radiopaque retrograde filling indicative of an eroded silver amalgam at the root end. During the first appointment, oral prophylaxis was performed and the patient was referred to the Department of Endodontics to seek an opinion regarding the integrity and status of root canal treated 23. Ideally, the preferred line of management is re-intervention of root canal treated 23 in an orthograde manner followed by periapical curettage and replacement of root end filling material. As the patient was unwilling and asymptomatic, plastic periodontal surgical procedures following only replacement of the root end filling was proposed. Clinical parameters such as gingival recession, probing depth, width of keratinized gingiva were assessed and various treatment options regarding the closure of the defects were explained to the patient. The gingival defects were planned to be treated with connective tissue graft (CTG).[4,5]

Surgical procedure

The surgical site was anaesthetized with 2% lignocaine with 1: 1,00000 adrenaline. (LIGNOX 2%A, INDOCO REMEDIES LTD). Two horizontal incisions were given at the level of the CEJ in relation to 23 extending slightly beyond the midpoint of the interdental papilla followed by two vertical incisions beyond the muco-gingival junction (Fig. 1B). A split full-thickness flap was elevated exposing the apical portion of the root. Root surface debridement was done followed by complete debridement of the periapical region, removing the granulation tissue (Fig. 1C). Following debridement, the apical portion of the root was completely visible with the residual retrograde amalgam filling. Rough serrated margins of the root were smoothened followed by replacement of the root end filling with light-cured glass ionomer (GC Fuji II LC; GC America, Alsip IL) cement (Fig. 1D).

Connective tissue graft was procured from palate (Fig. 2).

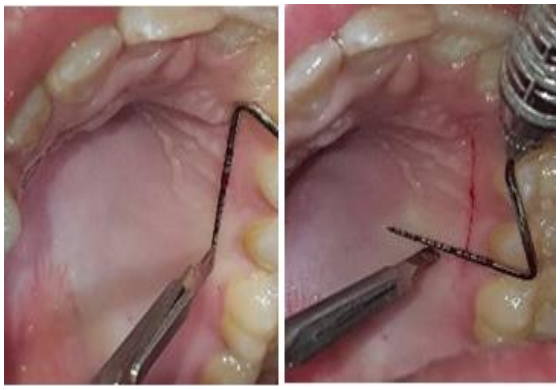

Fig. 2- Graft Procurement from palate

Firm pressure was applied on the graft with a sterile moist gauze pack for few minutes facilitating proper adaptation of the graft. It was then secured with 4-0 vicryl sutures (Coated VICRYL™ Polyglactin 910, ETHICON, Johnson and Johnson, New Brunswick, NJ). Before suturing the flap, a thin band of epithelium around the soft tissue defect was removed and it was sutured over the CTG with 3-0 black silk sutures (PERMA-HAND™ Silk Sutures, ETHICON, Johnson and Johnson PVT LTD, New Brunswick, NJ) by vertical mattressing and sling suturing technique followed by placement of a periodontal pack. (COE-PACK™, GC America, Alsip, IL) (Fig. 3). Antibiotic, Amoxicillin 500 mg (Cap IDIMOX™, IDPL) one capsule three times a day for 5 days and analgesic, ibuprofen and paracetamol combination (TAB COMBIFLAM™ Sanofi Aventis Pharma) one tablet three times a day for 3 days was prescribed, after which, post-operative instructions were given. The patient was advised chlorhexidine mouth wash 0.2% (Hexidine, ICPA health products) and review after two weeks, when the sutures were removed (Fig. 3).

Fig 3- Graft placed and sutured with two Weeks follow up

The patient was asymptomatic and healing was uneventful. The patient was advised to report to clinic regularly for periodic follow up.

Six months follow up

The patient was reviewed after 6 months. The patient was asymptomatic. There was complete closure of the fenestration with limited exposure of the root surface at the cervical aspect of gingiva with slight inflammation in interdental region (Fig. 4).

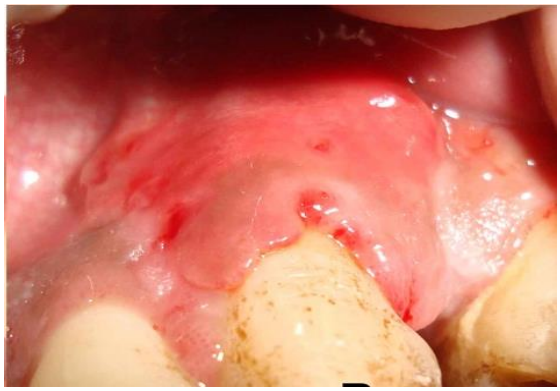

Fig. 4 - Six months follow up.

Two years follow up

Two years postoperative visit revealed that the patient was asymptomatic and did not show any clinical signs of recurrence of the fenestration and gingival recession. There was almost complete coverage of the root with a significant increase in the width of keratinized gingiva, in addition to, the absence of any pathological probing depth. (Fig. 5)

Fig. 5- Two years follow up with complete closure of the mucosal fenestration and gingival recession.

Discussion

The morphological features of the bone are altered during periodontal disease with various osseous defects having been reported in dental literature. Two commonly encountered alveolar defects are dehiscence and fenestration.[6] An alveolar dehiscence denotes a lack of facial or lingual cortical plate resulting in a denuded root surface, while alveolar fenestration is a circumscribed defect of the cortical plate, which expose the underlying root surface, without involving the alveolar margin.[7] Fenestration is an isolated area in which the tooth is denuded of bone and is covered only by the periosteum with an overlying gingiva, whereas in gingival fenestration, tooth is devoid of overlying soft tissue also. It seems to have a multifactorial origin with relation to decreased thickening of the alveolar housing, labioversion of the tooth in the dental arch, contour of the root apex, orthodontic tooth movement, occlusal factors, periodontal and endodontic pathology, and aberrant frenal attachment.[8] Gingival fenestrations are not common and are rarely encountered in clinical practice than dehiscence. It was first reported by Menedez OR (1967)[9] and is usually reported in the anterior region, particularly incisors. It is considered as an uncommon complication of pulpo-periradicular pathosis.[10,11] On the contrary, gingival recession is a common clinical condition encountered in regular practice. The present case report is a rare entity of both localised gingival recession with an isolated apical soft tissue fenestration, not very often seen in relation to the maxillary canine. Once the root is exposed to the oral environment, it is susceptible to the formation of plaque, calculus and debris which prevented the reformation of mucosal covering, as seen in the present case.

Various treatment modalities advocated in the literature for managing mucosal fenestrations are root planing along with chlorhexidine mouth rinsing, full thickness mucogingival flap with primary closure, pedicle flap surgery, guided tissue regeneration with resorbable or non resorbable membrane, free gingival grafting.[12,13] A variety of surgical techniques have also been suggested to achieve root coverage in periodontics. Among them, subepithelial connective tissue grafting is considered to be the gold standard procedure.[3]

Chong et al[14] have reported that glass ionomer cement was successful in achieving a good apical seal when it was used as a retrograde filling material. Hence in the present case, since isolation was achievable, light cured glass ionomer cement was used as the root end filling material. This emphasizes that adequate cooperation, regular follow up, maintenance of proper oral hygiene and good postoperative care is essential in addition to proper diagnosis, meticulous treatment planning and expertise skill.

The treatment regimen reported with the use of CTG in the present case resulted in successful closure of both mucosal fenestration and gingival recession in relation to 23. However, a lack of histologic evidence would be a limitation of this case study. Hence, more cases need to be reported to validate the success and predictability of this approach in management of mucosal fenestrations.

Conclusion

The present case report represents a rare clinical scenario of an isolated apical soft tissue fenestration with concomitant localized gingival recession which was successfully managed by the combined use of CTG and coronal flap repositioning ensuring successful root coverage of maxillary canine with two years follow up period. This case report showcases a viable and alternative treatment option that can be effectively considered in management of such cases.

References

1. McGuire KM and Nunn M. Evaluation of human recession defects treated with coronally advanced flaps and either enamel matrix derivative or connective tissue.Part 1: comparison of clinical parameters. J Periodontol 2003; 74(8): 1110–1125

2. Thomas DS, Benic GI, Zwahlen , Hammerle , Jung RE.A systematic review assessing the soft tissue augmentation technique. Clin oral implant res 2009; 20(4):146-165.

3. Francetti L , Del Fabbro M , Calace S. Microsurgical treatment of gingival recession – A controlled clinical study . Int J Periodontics and Restorative Dent 2005;25(2):181-188.

4. Goldman HM, Cohen DW. Periodontal therapy; St Louis, Mosby, 6th edition:795 – 796.

5. Cohen ES. Atlas of cosmetic and reconstructive periodontal surgery. Philadelphia, Williams and Williams, 2nd edition: 65-135.

6. Elliot JR, Bowers GM. Alveolar dehiscence and fenestrations. Periodontics 1963; 1:245-48.

7. Edel. Alveolar dehiscences and bone fenestrations in dry Bedouin jaws. J Clin Periodontol 1981; 8:491-99.

8. Chen G, Tang CT, Tong C. The management of mucosal fenestration; a report of two cases. Int Endod J 2009;42(2):156-64.

9. Menedez OR. Bone fenestration by roots of deciduous teeth. Oral Surg Oral Med Oral Pathol 1987;24(5):654-58.

10. Serrano J. Gingivo-osseous pathologic fenestrations. Oral Surg Oral Med Oral Pathol 1971; 32(5):697-700.

11. Santos-Pinto LAM, Sue Seale N, Reddy KA , and Cordeiro RCL. Fenestration gingival defect in erupting permanent mandibular incisors: a case report. Quintessence International 1998; 29(4):239–42.

12. Ling LJ. The treatment of fenestrated root: case reports. J Dent Sci 1989;9:137-40.

13. Yang ZP. Treatment of labial fenestration of maxillary central incisor. Endod Dent Traumatol 1996;12:104-8.

14. Chong BS, Pittford TR, Kariyawasam SP. Tissue response to potential root end filling materials in infected root canals. Int Endod J 1997;30:102-14.

Mandibular Reconstruction in a case of Ameloblastoma

Abstract

Treatment of mandibular discontinuity defect has been changed over last three to four decades and continues to evolve with the introduction of newer technologies and technique. To get an excellent long term functional and aesthetic outcome there are there are few osseous or osteocutaneous free flap available for reconstruction of mandible, out of them free fibula has several advantages over other donor site. These include long segment of bone length, ease of flap harvesting, ease of contouring, long pedicle, and two team approach and minimal donor site morbidity.

Keywords : Mandibula reconstruction, free flap, ameloblastoma

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INTRODUCTION

Immediate reconstruction of mandibular defect using free fibula has been performed from last 3 to 4 decades. Free fibula was first described by Taylor et al in 1975 [1] and then Hidalgo [2] first used his for mandibular reconstruction in 1989.
Free fibula has several advantages over other donor sites. These include long bone stalk, long pedicle length, ease of flap harvesting, multiple osteotomy, two team approaches, less donor site morbidity.

The fibula is nourished by both periosteal and endosteal blood supply, so multiple osteotomy of free fibula is possible to shape the mandible without devascularising individual small bone segments. Moreover, free fibula offers bicortical bone stocks for placement of implants, and the cutaneous portion based on septocutaneous perforator can be used for intra oral or extra oral lining

Incidence of ameloblastoma in mandible is one of the most common cause of mandibular defect. Aim of the surgery is resection of mandible and immediate reconstruction with vascularized bone graft to maintain facial contour, mastication, deglutition, and oral competence.

Case report

A 50-year-old man sustained right lower alveolus cancer, well differentiated squamous-cell carcinoma, with involvement of gingivobuccal sulcus and skin in submandibular region (T4N2bM0). Wide resection of tumor , hemimandibulectomy with right side modified radical type III neck dissection was carried out and a 10 × 10-cm through and through defect was left [Figure 1].

Figure 1

The defect was reconstructed with ipsilateral side anterolateral thigh flap including two musculocutaneousperforators [Figure 2].

Figure 2

Bi-paddling with a de-epithelialized segment in between or two paddles based on two perforators can simultaneously replace the lining and cover defects. Immediate follow-up revealed good vascularity and viability of the flap [Figure 3].

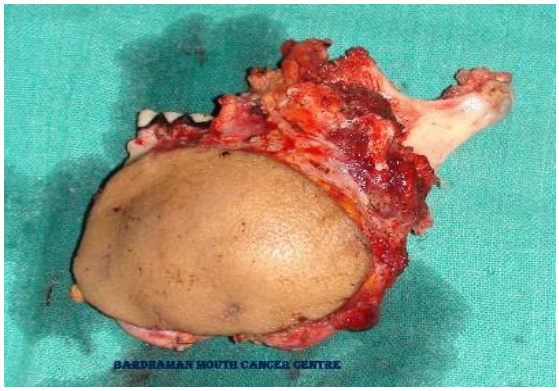

Figure 3

After one year of follow-up, satisfactory results were obtained with adequate mouth opening [Figure 4,5].

Figure 4

Figure 5

DISCUSSION

The anterolateral thigh flap was originally described as a septocutaneous artery flap by Song et al. in 1984,[1] the vascular variations of which were also reported by Koshima et al. in 1989. It was found that the blood supply of the anterolateral thigh flap was based on the septocutaneous or musculocutaneous perforators, or both. As such, this flap has the ability to cover a variety of large cutaneous or mucosal defects. In addition, the flap can easily be harvested using a two-team approach without patient repositioning. The donor site can easily be closed primarily without functional deficit if the donor size width less than 10 cm, if more than 10 cm then skin graft may be required. Despite skin graft concerns, donor site morbidity is limited. The anterolateral thigh flap is useful for any soft tissue reconstruction including facial skin, oral cavity, partial or total glossectomy, large defects such as through and through defect or following burn-scar contracture release and trauma. The application of the anterolateral thigh flap, which is specially focused on the reconstruction of the head and neck defects, was described by Koshima et al.[5] in 1993 and Kimata et al.[6] in 1998. This flap has many advantages and disadvantages [Tables 1and 2] when compared with other conventional free flaps. It is suitable for a two-team approach. In this manner, the duration of the operation can be reduced at least 1.5 hrs. Koshima et al.[10] reported their maximum dimension of the anterolateral thigh flap as 25 × 18 cm in their series. In our case, the dimensions of the flap were 16× 10 cm. This flap can be used as a combined flap to reconstruct composite defects as chimeric flap. It can be thinned safely to 2 to 3 mm depending on perforators location. In our case, we could achieve to get a thin anterolateral thigh flap which was used successfully for intraoral lining. When obliteration of cavities with bulky flaps is needed, the anterolateral thigh flap can be used by planning the flap in the upper half of the leg, where the subcutaneous tissue is thicker. If a thin flap is required, the flap can be planned in the lower half of the leg. The length of the vascular pedicle was 10 to 16 cm (average, 12.5 cm). In this case, it did not require any extremely long vascular pedicles. No vascularity problems were observed in this flap as it is based on 3 excellent perforators maintaining the vascularity. The average diameter of the vascular pedicle was 2.1 mm for the artery and 2.6 mm for the vein in this patient. The large-caliber vascular pedicle facilitates microvascular anastomoses and provides a high anastomotic success rate. Vascular anastomoses can be performed successfully with loupe magnification (4.3x) except in children. The flap can be used as a sensate flap by including the lateral femoral cutaneous nerve.[7] A donor site defect less than 10 cm in width could be closed primarily. The lateral and medial flaps of the donor site should be dissected approximately 8 to 9 cm in the suprafacial plane and, subsequently, primary closure should be tried. If the fascia lata is not harvested with the flap, there is no muscle herniation and primary closure can be attempted easily. The variations in the vascular pedicle and the difficulty of the perforator dissection are the chief reasons that the anterolateral thigh flap has not become popular despite its advantages. In this case, an average of three perforators (range, two to five perforators) derived from the lateral circumflex femoral artery were identified. All perforators were determined to lie within a circle with a radius of 3 cm. The center of this circle was the midpoint of the line marked between the anterosuperior iliac spine, the intermuscular septum, and the superolateral border of the patella. We think that the anterolateral thigh flap can be elevated without locating the perforators preoperatively with a hand-held Doppler probe if the flap includes the entire circle or a medial incision is made at least 3 cm from the midpoint of this line [Figure 4]. Following the initial description of this flap as based on the septocutaneous perforators,[1] Xu and associates[3] reported only 40% of the perforators were septocutaneous and 60% were musculocutaneous. In this case, all the perforator were musculocutaneous perforators. Although Shief et al.[9] reported that 27% of musculocutaneous perforators arise from the transverse branch of the lateral circumflex artery, we found that most of the musculocutaneous perforators are derived from the descending branch of the lateral circumflex femoral artery. We think that the variations in the vascular pedicle are not important for successful flap elevation if the possible variations are known by the surgeon, because the elevation of the flap is based on the "find-the-perforator-and follow it" principle in all circumstances. Retrograde dissection of the perforator to the main pedicle is accepted as a difficult and time-consuming

procedure. The presence of hair in the flap for men and an unacceptable scar in the donor area (especially for women) are other minor disadvantages of this flap. If needed, laser or other conventional techniques can be used successfully to remove these hairs. We also think that the large scar of the donor site is not a major concern because it can be hidden easily. We think these disadvantages are very few when compared with the advantages of this flap. In conclusion, anterolateral thigh flaps may be combined with other free flaps using the chimeric or mosaic principle. This concept involves anastomosing the vessels of a second flap to a branch of the lateral circumflex femoral system. The technique is useful for large, complex wounds. The anterolateral thigh flap can be combined with fibula, radial forearm, iliac crest, groin, anteromedial thigh, and latissimus dorsi flaps, in composite defect. Because of its size, vessel quality, and low donor site morbidity, the anterolateral thigh flap is aptly suited and has emerged the "workhorse" flap for soft tissue head and neck reconstruction.

Anterolateral thigh free flap

Disadvantages

1. Difficult dissection due to variable anatomy
2. Hair bearing in males
3. Donor defect needs resurfacing
4. Bulky flap in fatty patient

Anterolateral thigh free flap

Advantages

1. Minimal functional cosmetic donor site morbidity
2. Two team approach simultaneously
3. large area of skin25 X 10cm of tissue can be harvested
4. Good pliability
5. long vascular pedicle
6. Can be used as thinning flap
7. 2-5 mm diameter artery
8. Sensate flap based on lateral femoral cutaneous nerve
9. Color matching satisfactory

REFERENCES

1. Song YG, Chen GZ, Song YL. The free thigh flap: A new free flap concept based on septocutaneous artery. Br J Plast Surg 1984;37:149-59.
2. Koshima I, Fukuda H, Utunomiya R, Soeda S. The anterolateral thigh flap: Variations in its vascular pedicle. Br J Plast Surg 1989;42:260-2.
3. Zhou G, Qiao Q, Chen GY, Ling YC, Swift R. Clinical experience and surgical anatomy of 32 free anterolateral thigh flap transplantations. Br J Plast Surg 1991;44:91-6.
4. Koshima I, Fukuda H, Yamamato H, Moriguchi T, Soeda S, Ohta S. Free anterolateral thigh flaps for reconstruction of head and neck defects. Plast Reconstr Surg 1993; 92:421-8.
5. Luo S, Raffoul W, Luo J, Luo L, Gao J, Chen L, *et al*. Anterolateral thigh flap: A review of 168 cases. Microsurgery 1999;19:232-8.
6. Wei FC, Çelik N, Chen HC, Cheng MH, Huang WC. Combined anterolateral thigh flap and vascularized fibula osteoseptocutaneous flap in reconstruction of extensive composite mandibular defects. Plast Reconstr Surg 2002;109:45-52.

Case Series Journal of Oral and Dental Health

Gingival recontouring in anterior implants using lab-independent, cement-free provisional restorations

Abstract

Achieving a healthy and aesthetic peri-implant soft tissue in anterior maxillary implants is a challenge for the implantologist. Placing a provisional implant restoration to achieve an ideal emergence profile by recontouring the gingiva has been used on many occasions. These were most commonly laboratory made provisional crowns that are cemented on to the implant abutments. This presentation highlights a case series of gingival recontouring using cement-free, in-office provisional restoration to achieve aesthetic results, along with maintaining healthy gingiva during healing period.

Keywords : Anterior Implant, Provisional Implant Restoration, Emergence Profile, Gingival Contour

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INTRODUCTION

Implant restorations in maxillary anterior region is challenging for the clinician as the residual ridge is susceptible to resorption that may necessitate hard and soft tissue grafting specially on the facial aspect.[1,2,3]

Traditionally, one of the main objectives of an implant treatment has been to ensure osseointegration [4,5]. On the other hand, the achievement of implant osseointegration does not always correlate with a successful aesthetic outcome [6]. Providing aesthetic anterior maxillary implant restorations may be more difficult to accomplish than achieving implant osseointegration.

Traditional anterior implant placement requires extraction of non-restorable teeth and grafting with a healing period of 3-4 months. Following healing, surgical implant placement is performed and an additional healing time allowed for osseointegration. This protocol requires multiple surgical appointments and extended treatment time [7,8]. Immediate implant placement (IIP) protocol that allows placement of implants and bone grafting simultaneously, shortens treatment time, reduces the number of surgical procedures, and increases patient compliance [9,10]. An immediate implant provisional restoration (IIPR) has significant benefits when compared to the traditional delayed protocol. These include establishing an ideal emergence profile with maximum tissue volume, preserving mid-facial gingiva, and enhancing patient comfort and acceptability [11, 12]. IIPR serves as a guide for designing an aesthetic definitive restoration that facilitates adequate hygiene. Therefore, IIP together with IIPR helps develop the desired aesthetics for anterior implant restorations [13].

Commonly used provisional restorations are cement retained that can sometime lead to inflamed tissue. This presentation highlights the sculpting of gingiva using single visit approach (in-office) and tissue heals in a cement-free environment.

Case 1

A 21-year female presented with broken upper front teeth with a history of trauma 2 days back. Intraoral examination revealed fracture 11 apical to CEJ, and 21 with an Ellis class III fracture (figure 1).

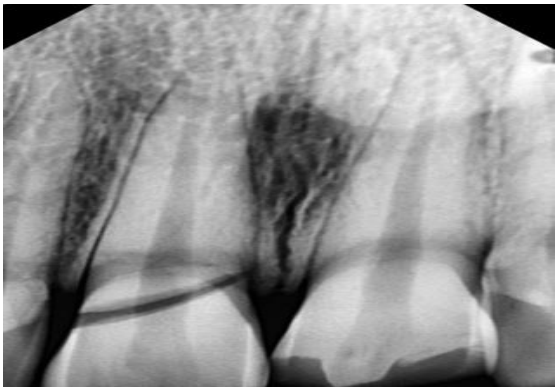

Figure 1 – Pre-Operative radiograph

Treatment plan was discussed with the patient. These included extraction of 11 with immediate implant placement (IIP) & immediate provisional restoration (IPR). Root canal treatment (RCT) of 21. Systemic Antimicrobial & chemical plaque control agents were prescribed and patient scheduled for next day for implant surgery. RCT started with 21 in the same visit. On the day of surgery, 11 was atraumatically extracted using periotome. A self-threading implant (3.75 mm x 11.5 mm) was placed in the alveolar socket with an achieved torque of 40 Ncm (figure 2).

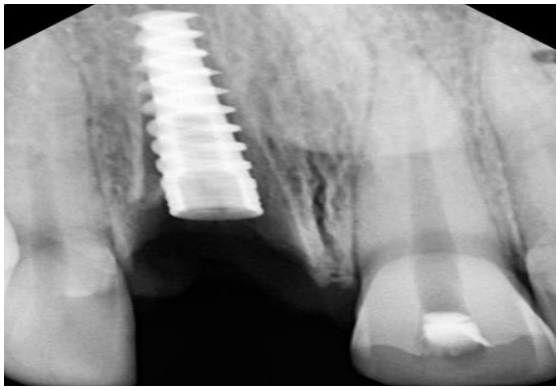

Figure 2 – Radiograph showing Immediate implant placement

An implant level impression was made with a transfer coping using poly vinyl siloxane impression material. Healing abutment was screwed on to implant to maintain soft tissue support for 1 hour until provisional is fabricated in the clinic. An implant analogue was attached into the impression and cast poured. An appropriate abutment was selected and fitted onto the analogue in the cast, it was then layered upon by composite resin (3M universal bond and Filted Z 250 XT) to achieve a provisional restoration that can be screw retained (figure 3A). Opaque resin to be used in deep layers so as to mask the colour of abutment. Advantages of using composite resin are:

- Biocompatible
- Color and shade matching.
- Good strength.
- Structural durability.
- Easy relining
- Easy removal and replacement of the provisional restoration.

Figure 3A – Prepared provisional restoration

The polished provisional restoration is then screwed on to the implant and radiograph taken to check the optimal fit. Screw access hole is then masked with Teflon and composite resin (figure 3B).

Figure 3B – Radiograph of Immediate implant provisional restoration

Patient is recalled after 3 weeks to check for changes required in provisional and healing of tissues. At 3 weeks recall radiographic fill of the bone is satisfactory (figure 4).

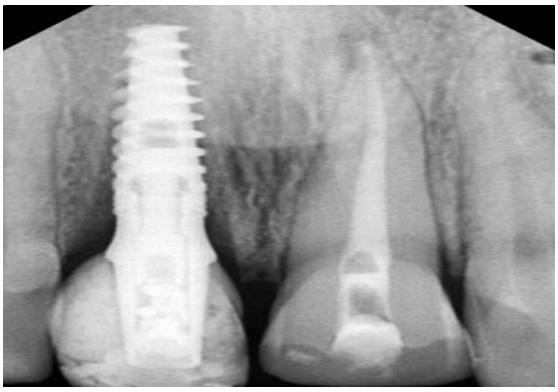

Figure 4 - 3 weeks post-operative

The final impression was made at 6 months post-operatively. Complete radiographic bone fill was observed figure.. Healthy and contoured gingiva around interim restoration can be seen (figure 5A, 5B). Small amount of composite and Teflon was removed to uncover the screw access hole to remove the provisional. An implant level impression was made with polyvinylsiloxane material and sent to laboratory. Provisional was again refixed on to the implant.

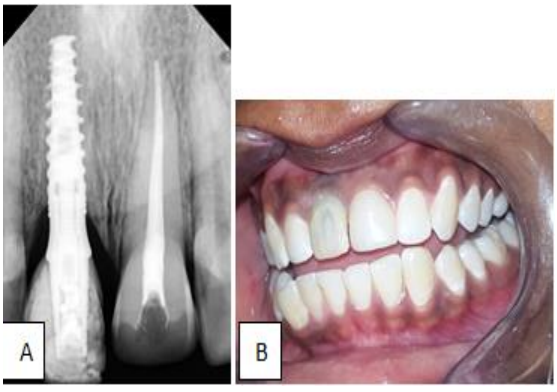

Figure 5 – Post-operative 6 months

Final prosthesis is a PFM Crown that is cemented on to abutment. Provisional is removed, abutment is screwed on to implant with a torque of 30 Ncm (figure 6A), and final crown cemented on to the abutment (figures 6 B, 6C). Thanks to the wonderful lab support, beautiful crown with good emergence profile can be seen.

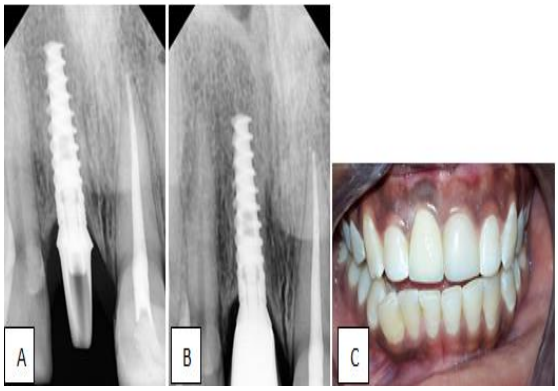

Figure 6A – Final abutment in place
Figure 6B – Radiograph with final prosthesis
Figure 6C – Clinical picture of final prosthesis showing excellent gingival contour

One year recall shows stable radiographic bone levels, and by the grace of god the esthetic results are stable and pleasing with healthy and nicely scalloped gingival tissue complex(figures 7A, 7B)

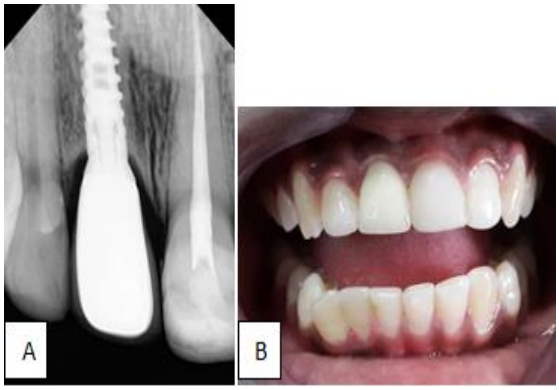

Figure 7 – one year follow-up

Case 2

A 26 year old male reported with small lower front teeth that are becoming mobile over last 2 weeks. Clinical and radiographic examination revealed retained deciduous lower central incisors with no evidence of permanent incisors (figure 8).

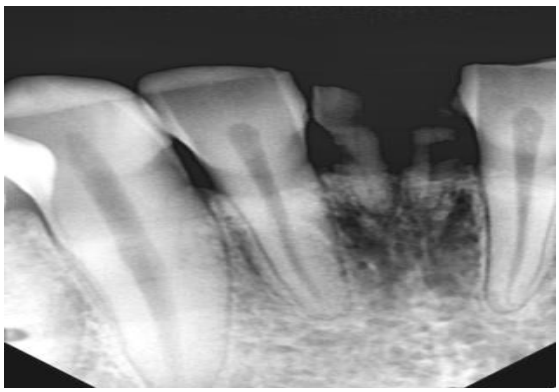

Figure 8 – Pre-operative radiograph

Treatment plan involves extraction of both deciduous and replacement with one implant and single incisor restoration according to the space available. Under antimicrobial coverage both deciduous teeth were atraumatically extracted. An immediate implant (3.75 X 10, self threading) was placed in the space available. An implant provisional restoration (IIPR) was placed within an hour by method described in case one (figures 9A, 9B).

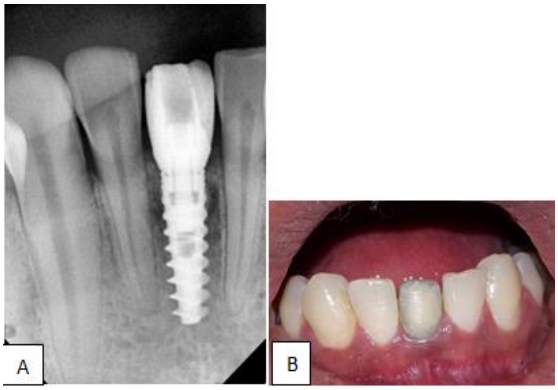

Figure 9 – Immediate implant with provisional restoration

Three months follow up showed adequate tissue and radiographic healing. When Provisional restoration was removed for final impression nicely contoured gingival tissue bed could be seen (figures 10A, 10B).

Figure 10 – Clinical picture of healthy and contoured gingiva

Final crown was cemented on to the permanent abutment 2 weeks later (figure 11A, 11B). Patient was happy with pleasing and esthetic outcome. Six month follow-up showed stable and healthy gingival architecture with complete papillary height.

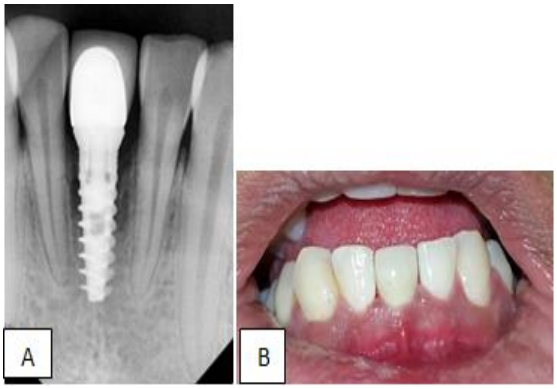

Figure 11 – Final prosthesis

DISCUSSION

Garber & co-workers[14] proposed three parameters for healthy and esthetic implant restorations that includes residual alveolar bone, Peri-implant soft tissue, Physiological crown form. An emergence profile concept in implant therapy was proposed by Davarpanah et al. [15] Emergence profile is the portion of the restoration that emerges coronally from the free gingival margin to replace the crown form of the extracted tooth. The use of provisional restorations in the above case reports improves the emergency profile during the intermediate abutment stage.

- A provisional restoration is used as a healing matrix for the soft tissues in much the same manner as that used with the ovate Pontic technique [16,17] . Provisional restoration directs the available volume of soft tissue to its most optimal levels before proceeding to definitive restorations. It does not stimulate growth of soft tissue; redirect a set volume of gingiva to set up optimal papillary and sulcular profiles. Final Crown can be atraumatically seated in its sulcus already established by the provisional restoration, instead of attempting to force the restoration into a small cylindrical space developed only by a healing abutment
- The provisional restoration also serves as a blue print for definite prosthes in terms of patient's comfort, aesthetics & phonetics.

Al-Harbi and Edgin [18] recommended a screw-retained provisional restoration that allows easy retrievability and eliminates the remaining cement to prevent soft tissue irritation, especially in the subgingival site. Another advantage of using screw retention is the elimination of a rough surface created at the crown abutment junction by providing a highly polished surface that facilitates tissue healing.

Majority of case reports have used preformed polycarbonate/ plastic crowns, or laboratory made acrylic crowns. Some of authors have used composite resins for relining and recontouring the base of provisional restorations to the abutment shoulder [1]. In this case series, we have used layering of composite resin on the selected abutment. This can be done chairside with in short duration. It allows a completely polished surface at the implant end of the abutment without any junction (figures 12A, 12B).

Figure 12 – Radiographs of Highly contoured provisional restorations

This technique offers a time saving, non-sensitive method for gingival shaping. The final restoration with optimal emergence profile can give long-term functional and aesthetic results.

REFERENCES

1. Priest G. Esthetic potential of single-implant provisional restorations: selection criteria of available alternatives. J Esthet Restor Dent. 2006; 18: 326-338.

2. Becker W, Goldstein M. Immediate implant placement: treatment planning and surgical steps for successful outcome. Periodontol. 2000. 2008; 47: 79-89.

3. Becker CM, Wilson TG, Jr., Jensen OT. Minimum criteria for immediate provisionalization of single-tooth dental implants in extraction sites: a 1-year retrospective study of 100 consecutive cases. J Oral Maxillofac Surg. 2011; 69: 491-497.

4. Andersson B, Odman P, Lindvall AM, Lithner B. Single-tooth restorations supported by osseointegrated implants: results and experiences from a prospective study after 2 to 3 years Int J Oral Maxillofac Implants 1995;10:702-11.

5. Avivi-Arber L, Zarb GA. Clinical effectiveness of implant-supported single-tooth replacement: the Toronto Study. Int J Oral Maxillofac Implants 1996;11:311-21.

6. Levine RA. Soft tissue considerations for optimizing implant esthetics. Funct Esthet Restor Dent 2007;1:54-62.

7. Albrektsson T, Branemark PI, Hansson HA, Lindstrom J. Osseointegrated titanium implants. Requirements for ensuring a long-lasting, direct bone-to-implant anchorage in man. Acta Orthop Scand. 1981; 52: 155-170.

8. Branemark PI. Osseointegration and its experimental background. J Prosthet Dent. 1983; 50:399-410.

9. Becker W, Becker BE, Israelson H, Lucchini JP, Handelsman M, Ammons W, et al. One-step surgical placement of Branemark implants: a prospective multicenter clinical study. Int J Oral Maxillofac Implants. 1997; 12: 454- 462.

10. Barone A, Rispoli L, Vozza I, Quaranta A, Covani U. Immediate restoration of single implants placed immediately after tooth extraction. J Periodontol. 2006; 77: 1914-1920.

11. De Rouck T, Collys K, Cosyn J. Single-tooth replacement in the anterior maxilla by means of immediate implantation and provisionalization: a review. Int J Oral Maxillofac Implants. 2008; 23: 897-904.

12. De Rouck T, Collys K, Cosyn J. Immediate single-tooth implants in the anterior maxilla: a 1- year case cohort study on hard and soft tissue response. J Clin Periodontol. 2008; 35: 649- 657.

13. Wohrle PS. Single-tooth replacement in the aesthetic zone with immediate provisionalization: fourteen consecutive case reports. Pract Periodontics Aesthet Dent. 1998; 10: 1107-1114.

14. Garber DA, Salama MA, Salama H. Immediate total tooth replacement. Compend Contin Educ Dent 2001;22:210-6, 218.

15. Davarpanah M, Martinez H, Celletti R, Tecucianu JF. Three stage approach to aesthetic implant restoration: emergence profile concept. Pract Proced Aesthet Dent 2001;13:761-7.

16. Neale D, Chee WW. Development of implant soft tissue emergence profile: a technique. J Prosthet Dent 1994;71:364-8.

17. Spyropoulou PE, Razzoog M, Sierraalta M.Restoring implants in the esthetic zone aftersculpting and capturing the periimplant tissues in rest position: a clinical report. J Prosthet Dent 2009;102:345-7.

18. Al-Harbi SA, Edgin WA. Preservation of soft tissue contours with immediate screw-retained provisional implant crown. J Prosthet Dent 2007;98:329-32.

Guidelines for Author

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