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Gingival Crevicular Fluid in Periodontitis

Dr. Surendra Man Shrestha

Keywords: Diagnosis; gingival crevicular fluid; periodontitis.

Gingival crevicular fluid (GCF) is an inflammatory exudate that is derived from the periodontal tissue and can be collected at the orifices or from within the gingival crevice.[1] GCF is an exudate released as a result of inflammation in the tissue adjacent to the crevicular epithelium. It has been shown that clinically healthy gingiva always shows histological evidence of inflammation by accumulation of polymorphonuclear leukocytes (PMNLs). This is because some amount of plaque is always present in sulcular region which irritates the sulcular epithelium and the GCF accumulates in the gingival sulcus.

The fluid portion of the exudate is derived from microleakage of the subgingival microvasculature. The constituent of GCF are derived from a number of sources including serum, connective tissue and both host cells and microorganisms in the gingival crevice.

The periodontal diagnostic importance of the GCF was recognized more than 60 years ago, but serious investigation of dynamics of the GCF production began in in the late 1950s by Brill and co-workers.[2] The fact that GCF can be harvested from the gingival sulcus offers great potential as a source of factors associated with disease and destruction. The analysis of GCF for disease marker has numerous advantages, because unlike serum and saliva, it is site-specific, conveniently sampled and non-invasive. Tissue destruction as a consequence of host-bacterial interaction is a well described process in the pathogenesis of periodontal diseases. During the destruction of host cells (mainly PMNLs) release their granular enzymes that are capable of attacking all extracellular matrix components. Thus, extracellular presence of enzymes seems to play an important role in the connective tissue damage.

Analysis of these enzymes in GCF may lead to insight into the pathogenesis of periodontal disease and may provide rational basis for the development of novel diagnostic tests. The enzymes are acid phosphatase, alkaline phosphatase, beta-glucuronidase, lysozyme, hyaluronidase, cathepsin, collagenase, lactic dehydrogenase, etc.

Host responses to periodontal infections include the production of several families of enzymes that are released by microorganism, epithelial or inflammatory cells. Enzymes synthesised and secreted in the tissue are carried by GCF to the crevice where they are augmented by release of enzymes from bacteria and host cells present in pocket.

The diagnostic potential of GCF has been studied for several years.[3] However recently there has been renewed interest in analysing the constituents of GCF using non-invasive methods, by which the host response as well as disease activity in periodontium can be elicited. The constituents of GCF include cellular elements, electrolytes, organic compounds, bacterial products, metabolic products and enzymes. Studies on enzymatic content of GCF is of great diagnostic value since enzymes play an important role in pathogenesis of periodontal disease.

The assessment of periodontal disease and the effectiveness of periodontal therapy have traditionally been made using clinical and radiographic parameters. Determination of variables such as probing depth, sulcular bleeding following the probing and height of alveolar crest are the traditional basis of periodontal evaluation and periodontal treatment plan. Nevertheless, recent advances in understanding of the natural history of periodontal disease have raised question about the significance of these diagnostic criteria.[4] As chronic disorder, patient with periodontitis will experience both active and inactive phases. Enzymes in GCF can serve as a marker for primary granules released from PMNLs. The presence of these enzymes in GCF was able to identify and predict probing attachment loss in periodontitis.[5,6]

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Psychosocial Stress and its Effect on Periodontal Tissues using Malondialdehyde as Oxidative Stress Biomarker

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ABSTRACT

Background: Stress is playing a major role as an aetiologic factor in the initiation of many systemic diseases. Similarly, it is also thought to be an aetiologic factor in the progression of periodontal diseases.

Aim: The production of free radical species is associated with various inflammatory diseases and also during stressful conditions. Hence, an effort in the present study is done to correlate psychosocial stress and periodontitis using serum MDA as an oxidative stress biomarker.

Materials and Methods: A current cross-sectional study included 201 individuals between 20 to 60 years of age. A periodontal examination included Probing Pocket Depth, CAL, Plaque Index, and Gingival Index. According to CAL individuals were divided into four groups i.e. healthy, slight (CAL = 1-2 mm), moderate (CAL = 3-4 mm) and severe (CAL = ≥5 mm) periodontitis. Psychosocial stress of the individuals was evaluated using occupational stress index. Serum MDA level was evaluated using spectrochromatometer.

Results: Patients with stress demonstrated increased levels of MDA along with a higher loss of attachment.

Conclusion: The results revealed statistically significant association between psychosocial stress and periodontitis indicating psychosocial stress as a risk factor for developing periodontitis.

Keywords: Free radicals, malondialdehyde, oxidative biomarker, periodontitis, psychosocial stress.

INTRODUCTION

The American Academy of Periodontology (AAP) defines periodontitis as an inflammation of the supporting tissues of the teeth characterised by a progressively destructive change leading to loss of bone and periodontal ligament (that is, an extension of inflammation from gingiva into the adjacent bone and periodontal ligament).[1] Apart from bacterial aetiology, several environmental and genetic factors also modulate periodontal disease progression one of which could be psychosocial stress.[2]

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Stress, a term continually being redefined, refers to a psychophysiological response of a living organism to a perspective challenge, change or threat and considered as an important factor in the aetiology and maintenance of many inflammatory diseases.[3] According to the American Institute of Stress and World Health Organisation, the most common form of stress in the world is occupational stress. Occupational (job) stress is a psychosocial disorder which is an impact of the interaction between the worker and his work environment on the worker. Growing evidence suggests that the psychosocial factors of stress, depression and level of social support provoke changes in host defence mechanisms that modify disease process.

Stress has gained attention in dentistry and psychiatric medicine and is reported to be associated with various diseases. Hence, an effort has been made to correlate psychosocial stress and periodontitis using serum malondialdehyde (MDA) as an oxidative stress biomarker.

MATERIALS AND METHODS

The present cross-sectional study was conducted to assess the correlation between psychological stress and periodontitis using MDA as oxidative stress biomarker from July 2016 to February 2017. Ethical clearance was obtained from the Institutional Ethical Committee of the Krishna Institute of Medical Sciences Deemed University, Karad, Maharashtra, India (Reg. No.: KIMSDU/IEC/03/2015). The study included teachers from five different schools situated in Karad, Maharashtra, India. All the teachers were explained about the possible relationship between stress and periodontitis. The study design included evaluation of clinical parameters, psychosocial stress evaluation and also estimation of serum MDA level. A written informed consent was obtained from the participants before carrying out clinical and haematological examination which was in accordance with the World Medical Association's Declaration of Helsinki.[4]

A total of 284 individuals were explained about the study. Among them, 201 individuals between 20 and 60 years of age who fulfilled the criteria of the study and were willing to participate in the study were included. The individuals with minimum of twenty teeth in oral cavity and who have not received any periodontal therapy or not taken antibiotics, anti-inflammatory drugs or any other drugs for at least six months prior to commencement of study were included. Individuals with the history of tobacco in any form, having history of any systemic diseases (cardiovascular diseases, rheumatoid arthritis, diabetes mellitus, renal diseases, etc.), pregnant, lactating and post-menopausal women and patients on vitamin and antioxidant supplements were excluded.

The data was collected by a single examiner (MA) using a standardised proforma which consisted of demographic and personal data clinical periodontal examination, occupational stress evaluation and serum MDA level estimation. Before initiating the clinical examination, the examiner underwent a thorough clinical training at the Dpartment of Periodontology, School of Dental Sciences, Karad, India. The calibration and evaluation of intraexaminer reliability was assessed on 15 randomly selected cases which were measured twice on two different days. The results revealed that the examiner was found to maintain more than 90% agreement on repeated measures of clinical examination protocol. A careful periodontal examination was carried out and checked for: Probing Pocket Depth (PPD, distance measured from marginal gingiva to the base of the pocket), Clinical Attachment Loss (CAL, distance measured from cementoenamel junction to the base of the pocket/sulcus), Plaque Index (PI by Silness and Löe, 1963) and Gingival Index (GI, by Löe and Silness, 1963).[5] Each patient was examined using a mouth mirror and University of North Carolina-15 (UNC-15) graduated periodontal probe. After recording the clinical parameters and indices, enrolled individuals were further divided into four groups depending on CAL as described by AAP 1999 classification of periodontal diseases and conditions into healthy, slight (CAL = 1-2 mm), moderate (CAL = 3-4 mm) and severe (CAL = ≥5 mm).

The enrolled individuals were further evaluated for psychosocial stress by using the occupational stress index (OSI, a psychological evaluation tool) put forth by Srivastava and Singh.[6] The index consisted of a questionnaire which was originally designed in English and it was modified to Hindi language (local language) for a better understanding of the questions by the participants.

The questionnaire consisted of 46 questions which had to be answered by each enrolled study individuals. Each question was rated on a five-point scale. Out of the 46 questions, 28 were "True-keyed" and the rest of the 18, were "False-keyed." The questions in the questionnaire were related to almost all relevant components of the job life which could cause stress in some way or other, such as role over-load, role ambiguity, role conflict, group and political pressures, the responsibility for persons, under-participation, powerlessness, poor peer relationship, intrinsic impoverishment, low status, strenuous working conditions and unprofitability. The summation of the individual scores of all the 46 questions gave the occupational stress index score of each participant.

After periodontal examination and psychosocial stress evaluation, the individuals were assessed for serum MDA level estimation. Blood (5 ml) was drawn from Antecubital vein of forearm using 20 gauge needle and plain vacutainer. The blood sample was centrifuged at 2000 rpm to separate the serum. MDA in serum was separated and determined as conjugate with Thiobarbituric acid (TBA) 0.6%. Serum proteins were precipitated by Trichloroacetic acid 17.5% and 70% and then removed by centrifugation. The MDA-TBA complex was measured at 534 nm on spectrochromatometer. The concentration of MDA (nmol/ml) was calculated by using the following formula: Concentration of the test=Absorbent (test)-Absorbent (blank)/1.56 x 1000000.[7]

The data which was obtained from the study groups (healthy, slight, moderate and severe periodontitis) were analysed by using ANOVA test (F-test), Tukey's multiple comparison test and Pearson's Correlation. ANOVA compared the means of variables between the four groups. Tukey's multiple comparison test was used to adjust the level of significance in ANOVA. Pearson's correlation measured the correlation between the variables in the different groups.

RESULTS

The total study population consisted of 201 individuals out of which 111 were female (55%) and 90 were male (45%). The mean age of study individuals were 42.08 ± 6.94 years. All the groups were homogeneous in their ages and that there was no significant age difference between the groups (Table 1).

Table 1: Age wise distribution of the study subjects.

Gender		n (%)	Minimum	Maximum	Mean ± S.D.
Male	Age	90	26	53	42.06 ± 7.017
	(Years)	(45)			
Female	Age	111	23	57	42.11 ± 6.909
	(Years)	(55)			

Table 2: Mean and standard deviation of periodontal parameters, occupational stress index and serum malondialdehyde level of study subjects.

Parameters	Healthy	Slight	Moderate	Severe	F- value	P-value
PPD	1.66 ± 0.82	1.68 ± 0. 66	3.41 ± 1.22	4.95 ± 1.06	125.79	0.00*
CAL	0.00 ± 0.00	1.37 ± 0.49	3.46 ± 0.60	6.33 ± 0.82	175.39	0.00*
PI	0.47 ± 0.29	0.61 ± 0.37	1.45 ± 0.46	2.17 ± 0.47	182.62	0.00*
GI	0.46 ± 0.30	0.53 ± 0.38	1.53 ± 0.50	2.25 ± 0.48	194.88	0.00*
OSI	79. 53 ± 23.62	129.20 ± 28.97	133.20 ± 30.46	160.27 ± 32.39	144. 08	0.00*
MDA	2.05 ± 2.63	3.36 ± 2.49	5.22 ± 2.52	5.96 ± 2.33	1.42	0.01*

ANOVA test was applied to evaluate mean and standard deviation (S.D.) of PPD, CAL, PI, GI, Occupational stress index score and serum MDA levels. The test results revealed that there was a statistically significant difference (P<0.001) in all the parameters among all groups (healthy, slight, moderate and severe group) (Table 2).

Tukey's post-hoc multiple comparison test also indicated that mean plaque and gingival index score increased with increasing PPD and CAL. Similarly, mean occupational index score and mean serum MDA level increased with increasing CAL (Table 2).

The Pearson's correlation was used to study the association between the occupational stress index score and the clinical attachment level in all four groups. A significant positive correlations were observed between occupational stress index and CAL in moderate and severe periodontitis group (P<0.001), but not with healthy and slight periodontitis group. Similarly, CAL when correlated with serum MDA level also showed positive significant values in moderate and severe periodontitis group (P<0.001). Whereas, correlating occupational stress index score and serum MDA level in all the four groups revealed a significant positive association (P<0.001) between them (Table 3).

DISCUSSION

Periodontal disease is a bacterially mediated inflammatory disease of the gingiva and adjacent periodontal attachment apparatus. Epidemiologic studies have demonstrated that periodontitis does not affect all individuals in the population in a similar manner. Numerous studies being reviewed indicate that only a subpopulation of 7% to 15% of the dentate adult population is affected by advanced destructive periodontal disease.[8]

Apart from bacterial culprit of periodontal destruction certain environmental risk factors also tend to mediate the periodontal disease process such as smoking and diabetes mellitus that modify the host response and thus altering disease progression, severity, and outcome. Other factors, such as stress, depression, and anxiety, are not yet confirmed as absolute risk factors, but have been identified in some observational studies as potential factors that may affect periodontal diseases.[9,10] The biologic plausibility for stress mediated periodontal destruction is supported by several studies showing that psychosocial conditions, such as depression and exposure to stressor agents, may affect the host immune response, making the individual more

Table 3: Pearson's correlation between clinical attachment level, occupational stress level and serum malondialdehyde level in the study group.

Group	OSI and CAL	OSI and serum MDA level	CAL and serum MDA Level
Healthy	Nil	0.719**	Nil
Mild	0.209	0.798**	0.129
Moderate	0.489**	0.848**	0.529**
Severe	0.585**	0.883**	0.542**
OSI	79. 53 ± 23.62	129.20 ± 28.97	133.20 ± 30.46
MDA	2.05 ± 2.63	3.36 ± 2.49	5.22 ± 2.52

susceptible to the development of unhealthy conditions and affecting periodontal health.[11]

Stress can be viewed as a process with both psychological and physiological components affecting the periodontium directly or indirectly. The indirect route involves the psychological aspect of a person with health impairing behaviour like poor oral hygiene, smoking, alcohol consumption and poor nutritional intake. The direct route involves the alteration of the resistance of the periodontium to infection.[12] Several studies show that psychosocial stress can down-regulate the cellular immune response which can be explained by three hypothesis, (i) monocyte T-lymphocyte hypothesis of depression, (ii) cytokine hypothesis of depression and (iii) inflammation and oxidative/ nitrosative stress hypothesis of depression. The cascade of events in monocyte T-lymphocyte and cytokine hypothesis are interlinked. This interrelation between immune cells and cytokine begins with the stimulation of Hypothalamus-Pituitary Axis which plays a key role in stress response and can serve as a prototype for coordination of psychosocial information into physiological response and immune modulation.[13]

In oxidative and nitrosative stress hypothesis of depression there is decrease in antioxidant level such as vitamin E, omega-3 fatty acid in stressful conditions. This will progressively lead to increase in reactive oxygen species (ROS) and reactive nitrogen species (RNS) collectively called as free radical species. Excessive free radicals further can effectuate the disease process by causing damage to proteins, carbohydrate, fatty acids, deoxyribonucleic acid (DNA) etc. Damage to the free fatty acid generates xanthine peroxidase which leads to increase in lipid peroxidation. Polyunsaturated fatty acids are more vulnerable to lipid peroxidation which is evident by increase in serum MDA level as advanced lipoxidation end product (ALE).[14] MDA targets the mitochondria causing mitochondrial damage by depressing mitochondrial Glutathione (GSH) and Superoxide dismutase (SOD) concentration, increases mitochondrial ROS and protein carbonyls and inhibits mitochondrial respiratory process thus causing degenerative changes in the tissue. This oxidative stress hypothesis explains the link between degenerative changes associated with destructive periodontal diseases and psychosocial stress.[15]

In the current study association between psychosocial stress and periodontitis was explained by evaluating serum MDA as indicator/biomarker for oxidative stress. The study revealed a significant difference for PPD and CAL in all four groups and all study groups also showed significant differences in mean occupational stress index score which indicate that severity of periodontal disease increases with increase in psychosocial stress. These findings are in agreement with the literature which revealed that depression was associated with a more rigorous course of periodontitis.[10]

Studies have revealed significantly higher self-reported depression and loneliness in chronic periodontitis and generalised aggressive periodontitis than in control group when examined for psychosocial variables.[12] Systematic review analysis has considered psychosocial stress as a potential risk factor for periodontal disease.[16] A study conducted by Moss et al correlated various parameters of periodontal diseases with measures of psychological stress, distress and coping behaviours and reported that the effects of stress on periodontal diseases can be moderated by adequate coping behaviours. They further concluded that psychosocial measures of stress associated with strain and distress are significant risk indicators for severe periodontal disease in adults.[9]

Correlation between psychosocial stress and periodontitis in present study showed moderate positive correlation in moderate (r = 0.489) and severe periodontitis (r = 0. 585) groups (P =<0.01) indicating that psychosocial stress can be considered as one of the relative but not an absolute risk indicator for periodontitis. A cross-sectional study evaluated the prevalence of negative life events and psychological factors and their relation to periodontal disease, and concluded that traumatic life events such as the loss of a spouse may increase the risk for periodontal disease.[17] An individual's coping behaviour may play a role in the progression of periodontal disease. The patients with periodontitis and inadequate stress-coping strategies are at greater risk for severe periodontal diseases when compared to periodontally healthy individuals.[18] Deinzer et al conducted a case-control study to evaluate whether a range of life-events were associated with an objective measure of periodontitis in adults and concluded that psychosocial factors and oral health behaviours cluster together as important determinants of periodontitis.[19] It is obvious that proper oral hygiene is partially dependent on the mental health status of the patient. It has also been reported that psychological disturbances can lead patients to neglect oral hygiene and that the resultant accumulation of plaque is detrimental to the periodontal tissue.

In the present study, the healthy group had a lower mean plaque score and gingival index score as compared to the mild, moderate and severe groups. Further, the mild group had a lower mean plaque score as compared to the moderate and severe periodontitis groups. These findings were in accordance with the study which reported increased dental plaque accumulation and gingival inflammation in medical students who were under academic stress.[20,21] Emotional conditions are thought to modify dietary intake, thus indirectly affecting periodontal status. Psychological factors affect the choice of foods, the physical consistency of the diet, and the quantities of food eaten. This can involve, for instance, the consumption of excessive quantities of refined carbohydrates and softer diets requiring less vigorous mastication and

therefore predisposing to plaque accumulation at the risk site. In contrast to the above statement, relationship between stress and anxiety with chronic periodontitis was evaluated concluding that there is no correlation between mean plaque score and perceived life events and related stress score.[22]

Psychosocial stress is said to be associated with the increased oxidative burst in the body which further lead to tissue destruction. Serum MDA level which is the end product of lipid peroxidation of ROS pathway is found to be significantly increased in major depression.[23] Recent data suggest increased oxidative stresses and MDA play a key role in many chronic diseases such as periodontitis, atherosclerosis, neurodegenerative disorders, etc.[24,25] In the present study, the result revealed that the mean serum MDA level increased with increase in CAL which was different in all four groups (P = <0.01). Furthermore, Pearson's correlation showed significant positive association between mean serum MDA level and mean CAL in moderate and severe periodontitis group and no significant correlation was observed in healthy group and individuals with mild periodontitis. Consistent with the results of current study a significant increase in MDA level in the periodontitis group was demonstrated by Celec et al.[25] Similarly, higher serum MDA level were found in periodontitis and that oxidative stress is thought to be a predisposing factor for MDA production in periodontitis.[26]

A significant elevation of MDA and reductions in antioxidant enzymes was reported in patients with periodontitis and also a direct correlation between MDA levels and an inverse correlation of antioxidant enzymes in periodontitis was observed. Our results are consistent with studies demonstrating an increase in lipid peroxidation levels in serum of individuals with periodontitis.[27]

Thus, present study supports the positive correlation between psychosocial stress and periodontitis. Psychosocial stress along with the other factors such as age, socio-economic condition can be considered as one of the risk indicator to develop periodontal disease.

CONCLUSION

The current study concluded with a positive association between periodontitis and psychosocial stress. But, for a better understanding of this possible relationship, studies involving larger sample size and also taking into consideration the demographic data such as socioeconomic status and age has to be given priority. It is equally important to take into account that more longitudinal study designs are required to prove the association.

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Probing Pocket Depth and Clinical Attachment Level between Non-Surgical and Surgical Periodontal Therapy in Chronic Periodontitis Patients: A Randomised Controlled Clinical Trial

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ABSTRACT

Background: : Chronic periodontitis is one of the most common form of periodontal diseases which either require non-surgical periodontal therapy or open flap debridement-surgical therapy or both. To date, it is unclear as of how much changes occur after NSPT or OFD and which therapy provides the best outcome in chronic periodontitis having probing pocket depth ≥ 5-7 mm.

Aim: The aim of this randomized controlled clinical trial was to evaluate the Probing Pocket Depth and Clinical Attachment Level between NSPT and OFD in chronic periodontitis patients.

Materials and Methods: A total of 52 healthy patients with PPD ≥ 5-7 mm were included in the present study. Half of the patients assigned for the NSPT and half in the OFD group. The PPD and CAL were measured at baseline, three and six months. Independent sample t-test was used to compare the change in mean PPD and CAL between NSPT and OFD group at three and six months, respectively.

Results: The difference in the mean decrease of PPD between NSPT and OFD group at three and six months were 0.15 mm ($P<0.05$) and 0.19 mm ($P<0.05$), respectively. The difference in the mean gain of CAL between NSPT and OFD group at three and six months were 0.03 mm ($p>0.05$) and 0.12 mm ($P<0.05$), respectively.

Conclusion: Substantial improvement in periodontal status occurred with both the therapies, however, significantly higher decrease in PPD and gain in CAL were seen with surgical therapy.

Keywords: Clinical attachment level; non-surgical periodontal therapy; probing pocket depth; surgical periodontal therapy.

INTRODUCTION

Chronic periodontitis has been defined as "an infectious disease resulting in inflammation within the supporting tissues of the teeth, progressive attachment loss, and bone loss."[1] Almost 10-15% of the population worldwide is suffering from a severe form of periodontitis according to a report published in 2005 by the World Health Organization.[2] In Nepal, 29 % of aged 35-44 years are suffering from deep periodontal pockets.[3] Chronic periodontitis demands periodontal therapies that include either non-surgical periodontal therapy (NSPT) or open flap debridement (OFD) surgical therapy or both to arrest the progression of a disease.[4] To date, it is unclear as which therapy is superior for probing pocket depth (PPD) ≥ 5-7 mm and how much decrease of PPD and gain in clinical attachment level (CAL) occur after surgical and non-surgical periodontal therapies (NSPT). To the best of our knowledge, this study is the first of its kind in Nepal which has evaluated decrease in PPD and gain in CAL after periodontal therapies. The objective of this study is to evaluate the PPD and CAL between NSPT and open flap debridement (OFD) in chronic periodontitis.

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Citation

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MATERIALS AND METHODS

A randomised controlled clinical trial was carried out between May 2016 to January 2018, in the Department of Periodontology and Oral Implantology, College of Dental Surgery, B.P. Koirala Institute of Health Sciences, Dharan, Nepal. Ethical approval for the study was obtained from the Institutional Review Committee Dharan. All the patients visiting the out patient department (OPD) and fulfilling inclusion criteria were participants of this study. The inclusion criteria were patients with chronic periodontitis, age range between 30 to 55 years, having at least 20 natural teeth within both jaws, with PPD 5 to 7 mm in at least two or more sites of non-adjacent teeth. The exclusion criteria were patients with a known systemic disease, history of a known infective disease other than periodontitis, use of an antibiotic in the preceding three months, history of receiving treatment with any medications known to affect periodontal health, pregnant females, history of a receiving periodontal treatment within three months, smokers.

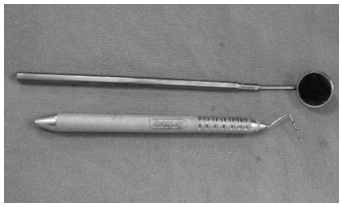

Figure 1a: Mouth mirror and UNC 15 probe.

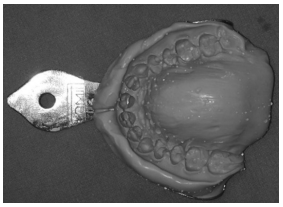

Figure 1b: Alginate impression material.

Patient recruitment: The patients diagnosed with chronic periodontitis meeting the inclusion criteria were selected. Prior to the initiation of this study, a written informed consent was obtained from each patient after explaining the nature of the study. All the selected patients underwent supra-gingival scaling. Two weeks following supra-gingival scaling, 52 patients of chronic periodontitis were enrolled in the study. The patients were divided into two groups; group I for NSPT and group II for OFD. The NSPT and OFD periodontal therapies were coded and sealed in the opaque envelope which were revealed only at the time of the procedure. All periodontal parameters were collected by the principal investigator.

Randomisation of patients was done by lottery method and this method was used for assigning the patient to two different treatment procedures (NSPT or OFD). One box which consisted of 52 sequentially numbered written paper slips in an opaque envelope. Twenty-six labeled paper slips for OFD and next 26 for NSPT. The patient was asked to pick one opaque envelope for his/her therapy on the day of treatment and other investigator performed both the NSPT and OFD who was not involved in data collection.

Periodontal Parameter measured: PPD was measured from gingival margin to the base periodontal pocket. Clinical attachment level (CAL) was measured from the cementoenamel junction to the base periodontal pocket. PPD and CAL were measured at baseline and at the interval of three and six months after periodontal therapy. For the fabrication of splint, an alginate impression was made (Figure 1b). The PPD and CAL were recorded manually using a University of North Carolina-15 (UNC-15) probe, mouth mirror and custom-made acrylic occlusal stent. The customised acrylic stent was fabricated with cold cure acrylic on a cast. A fixed groove was made with bur for reference. Custom-made acrylic occlusal stent with groove was used for precise alignment of the probe for measuring PPD and CAL in all the patient.

Periodontal therapy:

I. Non-surgical periodontal therapy

NSPT included supra and subgingival ultrasonic scaling and root planing with NSK (Varios 570 iPiezo engine) ultrasonic scaler and oral hygiene instructions. 0.2% chlorhexidine digluconate oral rinses for plaque suppression twice a day for two weeks was given after scaling and root planing (SRP). Patients were kept on two-weekly Follow-up till one month for supra-gingival scaling, initial clinical response evaluation, and oral hygiene reinforcement, then they were kept on monthly Follow-up for supra-gingival scaling and oral hygiene reinforcement over the entire duration of the study.

Surgical therapy (OFD):

One month prior to surgery all patients received phase I therapy (hygienic phase) which included supra and sub-gingival scaling and plaque control instructions. Patients exhibiting an O'Leary plaque index < 25%, persistence of bleeding on probing, ≥ 5-7 mm PPD at the time of surgery were only included for OFD.[5-6] It was done after proper extra-oral asepsis with 5% povidone-iodine and 0.2% preprocedural rinse with chlorhexidine. Open flap debridement (Modified flap operation-Kirkland 1931) was done.[7] After adequate local anaesthesia; sulcular incision was made on both the labial and the lingual aspects of the interdental area. The incisions were extended in a mesial and a distal direction, and mucoperiosteal flap was reflected. The defects were carefully debrided. Angular bony defects were curetted but no bone was removed. Extensive removal of non-inflamed tissues and intentional apical displacement of the gingival margin were avoided. Following the elimination of the pocket epithelium and granulation tissue from the inner surface of the flaps, these were replaced at their original position and complete wound closure was achieved with interrupted ligation with 4-0 silk suture (Figure 2). Tablet Ibuprofen 400 mg three times a day (8 hourly) for three days as analgesic and chlorhexidine digluconate 0.2% rinse for plaque inhibition twice a day for two weeks were prescribed. Surgical therapy was done once and then patients were on Follow-up weekly for the next four weeks for professional

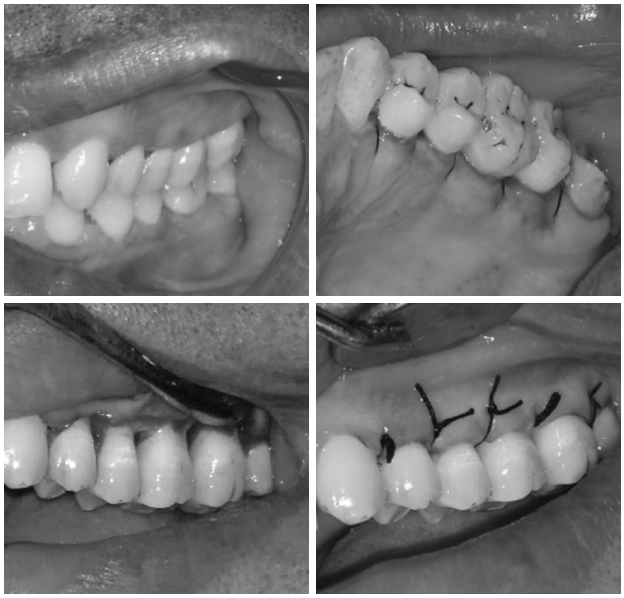

Figure 2: Open flap debridement-Surgical therapy.

plaque control and then kept on monthly Follow-up over the entire duration of the study.

The data was entered in MS-Excel 2007 and was analysed by SPSS, version 11.5. Descriptive statistics (mean, standard deviation) were calculated of before and after periodontal therapy. Two independent sample t-test was used to compare change in mean PPD and change in mean CAL between OFD and NSPT groups. The probability of significance was set at 5% level.

RESULTS

This single centered randomised clinical trial was carried out to evaluate the change in probing pocket depth after NSPT and OFD in chronic periodontitis patients. A total of 52 patients (16 males and 36 females) with mean age 42.31 years were enrolled (Table 1). All the enrolled patients (N = 52) completed the trial and analysis of all patients were done as shown in the CONSORT diagram.

In the NSPT group (Table 2), the mean PPD at baseline, 3 and 6 months were 6.23 mm, 5.29 mm and 4.36 mm, respectively and mean change from baseline to 3 months and baseline to 6 months were 0.94 mm and 1.87 mm, respectively. Similarly, in the OFD group, the mean PPD at baseline, 3 and 6 months were 6.22 mm, 5.14 mm and 4.17 mm, respectively and mean change from baseline to 3 months and baseline to 6 months were 1.07 mm and 2.04 mm, respectively. The decrease of PPD at 6 months was greater than 3 months in both the groups. The difference in the mean decrease of PPD between NSPT and OFD group at 3 and 6 months were 0.15 mm (P<0.05) and 0.19 mm (P<0.05) and from baseline to 3 months and baseline to 6 months were 0.13 mm (P<0.05) and 0.17 mm (P<0.05), respectively.

Likewise, in the NSPT group (Table 3), the mean CAL at baseline, 3 and 6 months were 5.32 mm, 5.23 mm and 4.31 mm, respectively and mean change from baseline to 3 months and baseline to 6 months were 0.09 mm and 1.00 mm, respectively. However, in the OFD group, the mean CAL at baseline, 3 and 6 months were 5.25 mm, 5.19 mm and 4.19 mm, respectively and mean gain from baseline to 3 months and baseline to 6 months were 0.06 mm and 1.06 mm, respectively. The gain of CAL at 6 months was greater than 3 months in both the groups. The difference in the mean gain of CAL between NSPT and OFD group at 3 and 6 months were 0.03 mm (P.>0.05) and 0.12 mm (P<0.05) and from baseline to 3 months, and baseline to 6 months were 0.02 mm (p>0.05), and 0.06 mm (P<0.05), respectively.

Table 1: Age of the participants in years.

Age	Mean	Standard deviation
Number of Patients (N) = 52	42.31	6.49

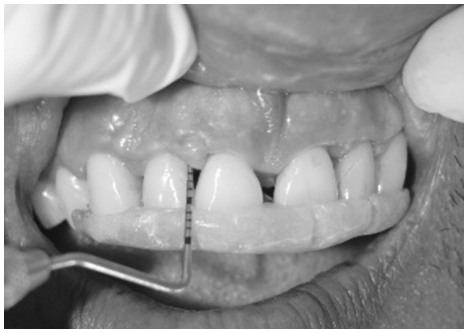

Figure 3: PPD and CAL recording with the stent and UNC-15 probe.

Table 2: PPD at baseline, 3 and 6 months after NSPT and OFD.

PPD	T0	T3	T6	T0-T3	T0-T6
NSPT (n = 26)	6.23 ± 0.14	5.29 ± 0.18	4.36 ± 0.21	0.94 ± 0.16	1.87 ± 0.17
Mean difference b/w NSPT and OFD	0.01	0.15	0.19	0.13	0.17
OFD (n = 26)	6.22 ± 0.15	5.14 ± 0.12	4.17 ± 0.13	1.07 ± 0.12	2.04 ± 0.13
P value	0.705	0.001*	<0.001*	0.001 *	< 0.001 *

N = 26 (number of patients in each NSPT and OFD group),
T0 = baseline, T3 = 3 months, T6 = 6 months,
T0-T3 = difference between(b/w) baseline and 3 months, T0-T6 = difference b/w baseline and 6 months
Confidence interval = 95% Independent sample t-test was used
The mean difference is significant at the 0.05 level.. (P<0.05 as significant)*

Table 3: CAL at baseline, 3 and 6 months after NSPT and OFD.

CAL	T0	T3	T6	T0-T3	T0-T6
NSPT (N = 26)	5.32 ± 0.15	5.23 ± 0.14	4.31 ± 0.16	0.09 ± 0.10	1.00 ± 0.10
Mean difference b/w NSPT and OFD	0.06	0.03	012	0.02	0.06
OFD (N = 26)	5.25 ± 0.14	5.19 ± 0.12	4.19 ± 0.13	0.06 ± 0.83	1.06 ± 0.11
P value	0.114	0.310	0.003*	0.295	0.005 *

N = 26 (number of patients in each NSPT and OFD group)
T0 = baseline, T3 = 3 months, T6 = 6 months,
T0-T3 = difference between(b/w) baseline with 3 months, T0-T6 = difference b/w baseline and 6 months
Confidence interval = 95% Independent sample t-test was used
The mean difference is significant at the 0.05 level.. (P<0.05 as significant)*

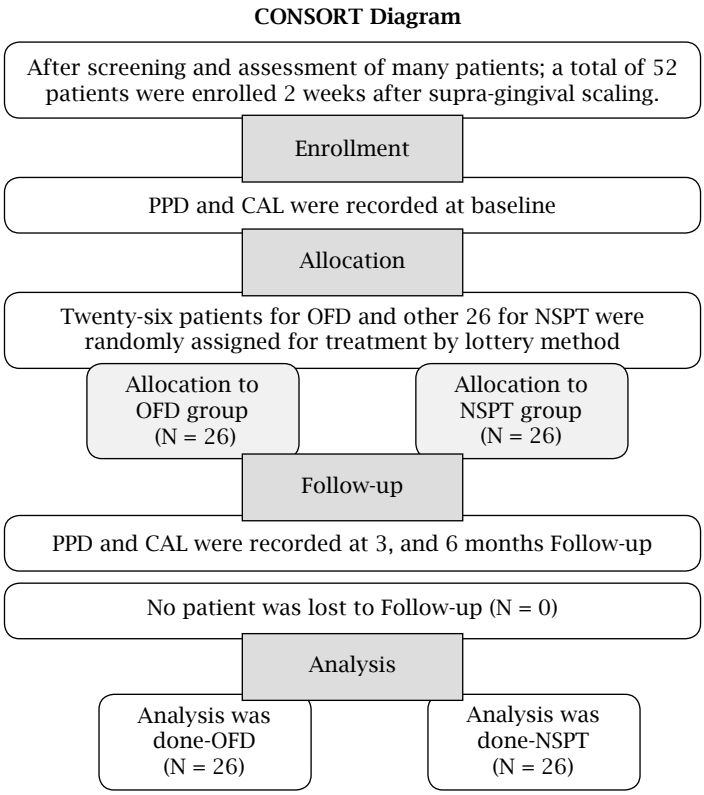

Figure 4: Participant enrollment, Allocation, Follow-up and Analysis.

DISCUSSION

The aim of periodontal therapy is to arrest the progression of periodontal disease and to get stable periodontium. In this study, baseline data were recorded two weeks following supra-gingival scaling in all patients to standardised the baseline measurement by reducing distortion in assessment and gingival inflammation. The customised stent with fixed groove was used for angulation control of the probe for measurement of probing pocket depth and clinical attachment level (Figure 3).

There was substantial improvement of periodontal status in terms of decrease in PPD and the gain of CAL from baseline to six months after NSPT and OFD. The PPD and CAL were recorded at three and six months in both NSPT and OFD group in the present study which is in accordance with studies done by Kim et al, Haffajee et al, and Badersten et al.[8-10] Egelberg (1999) cited that three months post-therapy is a suitable interval for the primary evaluation of initial non-surgical therapy, even in areas with preliminary deep lesions.[11] Rylander and Lindhe (2003) cited that healing after non-surgical therapy seemed to be complete after three to six months in those who use proper oral hygiene measures.[12] According to Hall (2003), surgical therapy reevaluation should be performed approximately three months after the completion of surgical therapy and this evaluation is similar to non-surgical evaluation and assesses the success of surgical therapy.[13] Histological evidence indicates that gain of clinical attachment after root planing does not represent new connective tissue attachment, but corresponds to a reduction of inflammation in the gingival connective tissue and the formation of a long junctional epithelium.[14]

Need for surgical therapy can be only assessed by completion of one month hygienic phase in which clinical severity of periodontitis reduced significantly.[15] Surgical therapy was done following one month hygienic phase of periodontal therapy which agrees with Morrison et al.[15] The consensus report from the American Academy of Periodontology World Workshop agreed that a four to six weeks interval was usually adequate to assess the initial response to therapy.[16] In case of surgical therapy, Follow-up was done weekly for suture removal, polishing of teeth, supra-gingival scaling, initial response evaluation and plaque control reinforcement in accordance to Kaldahl et al[6] and monthly for maintenance therapy over the entire duration of study. In NSPT group, supra and subgingival scaling and root planing was done at baseline followed by supra-gingival scaling and plaque control reinforcement two-weekly for one-month, and then monthly recall for supra-gingival scaling and plaque control reinforcement over entire duration of study. This is consistent with the study done by Badersten et al in 1984 who reported reduction of approximately 2 mm mean PPD with single supra and subgingival instrumentation followed by supra-gingival professional plaque control and no further improvement was achieved with repeated subgingival instrumentation.[10] In our study, decrease in PPD was more at six months than three months which is in accordance with Badersten et al[17] in which gradual decrease in PPD following root planing over a period of four to five months in 4-7 mm pocket depth or even more over nine months in deeper sites was seen. Following phase II and maintenance therapy, larger change may be due to increase in probing attachment and continued connective tissue reorganization or creeping attachment coronally.[6]

When comparing with NSPT group, the decrease in PPD (0.17 mm) and the gain in CAL (0.06 mm) were significantly higher after OFD from baseline to 6 months in our study. The findings are in accordance with the meta-analysis by Heitz-Mayfield et al (2002), in which at 12 months, open flap debridement resulted in slightly greater (0.6 mm) probing depth reduction and clinical attachment gain (0.2 mm) in deep pockets (> 6 mm) in non-furcation areas than SRP.[18]

In the NSPT group, the decrease of PPD from baseline to 6 months was 1.87 mm and the gain of CAL from baseline to six months was 1.00 mm. Similarly, in the OFD group, the decrease of PPD from baseline to six months was 2.04 mm and the gain of CAL from baseline to six months was 1.06 mm are in agreement with Lindhe et al. (1982), also showed in SRP group (PPD >6 mm), the reduction in mean probing pocket depth was 2.6 mm in non-molar areas and 2.0 mm in molar areas and in the OFD group, the PPD reduction was 3.4 mm in non-molar areas and 2 mm in molar areas. In case of PPD > 6 mm, the mean gain in CAL in SRP group were 0.9 mm in non-molar areas and 0.9 mm in molar areas and the mean gain in CAL in the OFD group was 1.5 mm in non-molar areas and 0.7 mm in molar areas.[19] Considering various confounding factors like variation in sample size, inclusion and exclusion criteria, variation in methods and study designs, it is difficult to predict which factors have greater role in the decrease in probing pocket depth after periodontal therapies. Therefore, furthermore multicenter randomized controlled trials with greater sample size and longer duration will be needed to clarify the factors affecting the results of periodontal therapies.

CONCLUSION

The following conclusions were obtained from the present study:

- There was the significant improvement of periodontal status in terms of reduction in PPD, and gain in CAL from baseline to three and six months following non-surgical and surgical periodontal therapy.
- The decrease in PPD was significantly more following surgical periodontal therapy than non-surgical periodontal therapy from baseline to three, and six months.
- The decrease in PPD was significantly higher at six months than three months in both the NSPT and OFD group.
- When comparing with the NSPT group, the gain in CAL was significantly higher in the OFD group at six months.

Thus, from the current study, authors would like recommend:

I. For decreasing of PPD, surgical therapy is preferred.
II. To obtain substantial and significant healing after periodontal therapy; post-treatment duration should be at least six months or even more with good plaque control.

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Locally Delivered Tetracycline Fibres in the Treatment of Chronic Periodontitis

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ABSTRACT

Background: Chronic periodontitis is a highly prevalent and recurrent form of periodontal disease and locally delivered tetracycline fibres are considered to exert tremendous benefits for its treatment.

Aim: The aim of the study was to observe the clinical results of locally delivered tetracycline fibres in the treatment of chronic periodontitis.

Materials and Methods: Patients aged 35-54 years diagnosed with chronic periodontitis of both gender fulfilling the inclusion criteria were selected. A sample size of 30 was calculated and total number of 60 posterior sites were selected. These sites were divided into two sets in a split mouth design as control sites treated with SRP alone and test sites treated with SRP plus tetracycline fibres.

Results: A combination of scaling, root planing and local drug delivery in the form of tetracycline fibres resulted in added benefits in the control of chronic periodontitis on the basis of the clinical findings from this study.

Conclusion: This study further adds to the evidence that tetracycline fibres as locally delivered agent are safe and effective adjunct to scaling and root planing, and can produce significant clinical benefits when compared to scaling and root planing alone in the treatment of chronic periodontitis.

Keywords: Chronic periodontitis; local drug delivery; tetracycline.

INTRODUCTION

Chronic periodontitis is an infectious disease resulting from inflammation within the supporting tissues of the teeth characterised by progressive attachment and bone loss.[1] It is the most common form of periodontitis which is associated with an accumulation of plaque and calculus with slow to moderate rates of disease progression.[2] There is growing interest in localised antimicrobial therapy because of the site-specific nature of periodontal infections, greater subgingival concentrations of antimicrobial agent, and reduced side-effects compared to systemic antibiotics.[3]

The periodic use of local drug delivery helps to minimise bleeding and stabilise attachment levels, thereby reducing probing pocket depth. Thus, it appears to hold sound promise in periodontal therapy allowing better control and management of periodontal diseases. Various locally delivered chemotherapeutic agents available are: tetracycline fibres (Actisite), metronidazole gel (Elyzol), minocycline gel and minocycline microspheres (Arestin), chlorhexidine chip (Perio Chip) and doxycycline hyclate (Atridox) to name a few.[4]

Tetracycline group is among the most widely used drugs to treat periodontal diseases. Factors that may play a role in the efficacy of tetracyclines in the subgingival area include substantivity, whereby tetracycline strongly adsorbs to and then is released from tooth surfaces while retaining its antimicrobial activity.[5] This study was performed with an aim to evaluate the efficacy of locally delivered tetracycline fibres in the treatment of chronic periodontitis.

MATERIALS AND METHODS

A non-randomised clinical trial with split mouth study design was used for the study. A total number of 30 subjects aged 35-54 years diagnosed with chronic periodontitis of both gender and able to follow verbal or written oral hygiene instructions were selected by convenience sampling technique from the Periodontology and Oral Implantology Unit, Dental Department, National Academy of Medical Sciences (NAMS), Bir Hospital.

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Citation

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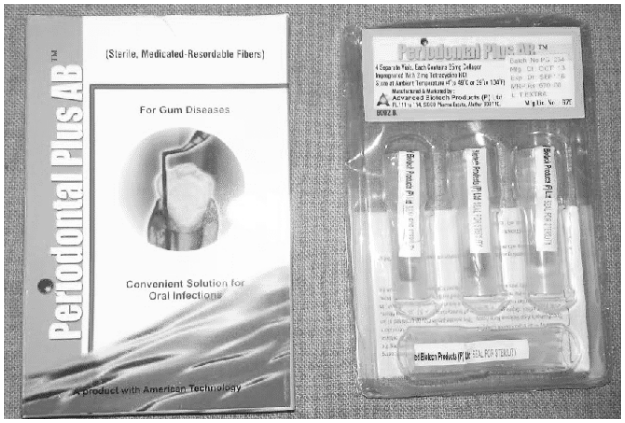

Figure 1 : Tetracycline fibres (PerioPlus AB™).

Among them, patients with similar probing pocket depth ranging from 5 to 8 mm in two contralateral sides and those fulfilling all the inclusion criteria were enrolled for the study. The participants were assigned into two sites i.e; control site [with scaling and root planing (SRP) alone] and test sites (SRP along with locally delivered tetracycline fibres). All subjects underwent periodontal examination by a single examiner. Probing pocket depth was recorded using an acrylic stent for the standardisation of readings. Periodontal parameters: plaque index (PI), gingival index (GI), and clinical attachment level (CAL) were also assessed and compared between control and test sites at baseline, two months and three months follow-up visits.

Before embarking upon the study, ethical clearance was obtained from the Institutional Review Board, NAMS, Bir Hospital. Patient attending the dental department of Bir Hospital who consented to be part of the study were selected. Written informed consent was obtained from each participant of the study who voluntarily agreed. All the expenses were borne by the principal investigator. Armamentarium used were: mouth mirror, tweezers, University of North Carolina (UNC) #15 periodontal probe, ultrasonic scaler set, and Gracey curettes (Hu-Friedy).

Tetracycline fibres available as 2 mg of tetracycline impregnated in 25 mg of collagen fibres (PerioPlus AB™, Advanced Biotech Products, Chennai, India) was used.

RESULTS

Results of the study are summarised in Table 1 to 4 which show the mean scores of various periodontal parameters between control and test sites.

Table 1 compares the mean plaque scores at different time intervals i.e. at baseline, at two months and three months follow-up visits. The comparison of mean difference shows that there was no statistically significant difference in plaque scores at test and control sites at the baseline as well as during follow-up visits.

The mean gingival scores reduced from baseline at subsequent follow-up visits at both control and test sites. However, comparison between two sites did not reveal any statistically significant difference highlighting that local delivery of tetracycline fibres along with SRP does not produce significant reduction in gingival index scores compared to SRP alone (Table 2).

As depicted in Table 3, pocket depth was same in both the study sites at baseline. Following treatment with SRP alone and SRP with tetracycline fibres, there was reduction in

Table 1: Mean plaque scores at control and test sites (n = 60).

Time line	Control sites (mean ± SD)	Test sites (mean ± SD)	Mean Diff.	95% CI		P- value
				Lower	Upper	
At baseline	1.831 ± 0.32	1.757 ± 0.30	0.073	- 0.091	0.238	0.378
At 2 months	1.402 ± 0.53	1.281 ± 0.52	0.121	0.137	-0.153	0.381
At 3 months	1.196 ± 0.33	1.101 ± 0.39	0.095	0.094	-0.093	0.317

Table 2: Mean gingival scores at control and test sites (n = 60).

	Control sites (mean ± SD)	Test sites (mean ± SD)	Mean Diff.	95% CI		P- value
				Lower	Upper	
At baseline	1.885 ± 0.440	1.841 ± 0.45	0.044	-0.186	0.274	0.704
At 2 months	1.457 ± 0.410	1.410 ± 0.40	0.047	- 0.164	0.258	0.658
At 3 months	1.150 ± 0.45	1.089 ± 0.47	0.060	- 0.179	0.300	0.617

Table 3: Probing pocket depth (in mm) at control and test sites (n = 60).

	Control sites (mean ± SD)	Test sites (mean ± SD)	Mean Diff.	95% CI		P- value
				Lower	Upper	
At baseline	6.33 ± 0.711	6.33 ± 0.71	0	-0.368	0.368	1.00
At 2 months	5.23 ± 0.77	4.43 ± 0.85	0.800	0.378	1.222	<0.001
At 3 months	4.83 ± 0.69	4.07 ± 0.64	0.767	0.420	1.113	<0.001

Table 4: Clinical attachment level at control and test sites (n = 60).

	Control sites (mean ± SD)	Test sites (mean ± SD)	Mean Diff.	95% CI		P- value
				Lower	Upper	
At baseline	6.30 ± 0.83	6.67 ± 0.60	- 0.367	-0.744	0.011	0.06
At 2 months	5.90 ± 0.66	5.07 ± 0.90	0.833	0.423	1.244	<0.001
At 3 months	5.57 ± 0.67	4.63 ± 0.66	0.933	0.585	1.282	<0.001

pocket depth. However, this reduction was significantly higher (p value <0.001) at test sites compared to control sites.

The CAL scores at control and test sites were not significantly different at the baseline level (p value = 0.06). However, in the follow-up visits at 2 and 3 months, the reduction in CAL was significantly higher at test sites (P<0.001). This indicates that efficacy of locally delivered tetracycline fibres and SRP is more compared to SRP alone in reduction of clinical attachment loss in patients suffering from chronic periodontitis.

DISCUSSION

The localised therapeutic intervention provides long-term retention of highly concentrated drug within target tissue after local delivery. It produces constant and prolonged concentration of the agent in local area. Potential therapeutic advantages of local drug delivery approach have been claimed to be several fold.

Tetracycline fibre first introduced into clinical practice in 1970s are bacteriostatic in action and hence are effective against rapidly multiplying bacteria. The proven efficacy of this group of drugs in the management of periodontal disease may be related not only to their antibacterial action but to a number of additional benefits that have been recently identified. These include collagenase inhibition, anti-inflammatory actions, inhibition of bone resorption and their ability to promote the attachment of fibroblasts to root surfaces. Consequently, tetracyclines have also been used as an adjunct to bone grafting in periodontal defects, and as agents for conditioning root surfaces to enhance the regeneration of periodontal tissues.[6]

In the present study, there was higher percentage reduction in plaque scores at test sites compared to control sites during the subsequent follow-up visits. These results are in accordance with the results of the studies conducted by Lindhe et al[7] and Friesen et al[8] who also found lower level of PI scores in their study compared to baseline. This could also be due to a greater attention to oral hygiene practice by all selected participants throughout the study.

Similarly, GI also showed significant reduction in scores from baseline to three months for both treatment groups as observed by Goodson et al[9] and Minabe et al.[10] Radvar et al[11] found 80% reduction in sites that bled on probing during the course of their study. Adjunctive fibre therapy was significantly better in reducing GI than SRP alone at one, three, and six months as observed by Newman et al.[12] Flemmig et al[13] also found significantly lower scores for GI at six months.

In the present study, intra-group observation showed highly significant (P<0.001) reduction in probing pocket depth from baseline to three months in both groups in consistent with the study conducted by Vandekerckhove et al,[14] Kinane et al,[15] and Gonçalves et al.[16] Current study was in accordance with Vandekerckhove et al[14] where an analysed data from all sites indicated significant decrease in probing pocket depth.

A significant gain in clinical attachment level was also obtained from baseline to three months in both the treated sites (P<0.001), differences observed were similar to that of Goodson et al,[9] Minabe et al,[10] Newman et al,[12] and Radvar et al.[11] Minabe et al[10] found gain of clinical attachment level of around 2 mm and suggested that the local application of antibiotic using local drug delivery in combination with root debridement may contribute to gain in clinical attachment level.

Gain in clinical attachment level were more in test than in control group as reported by Sinha et al,[17] similar to present study. Gain in clinical attachment level could be attributed to anti-collagenolytic property of tetracyclines and an enhancement of collagen synthesis and their ability to promote an attachment of fibroblasts to root surfaces.[18-22]

Tonetti et al[23] reviewed the development over the last 20 years of the evidence supporting clinical application of controlled delivery device for the treatment of human periodontitis. The study concluded that combination of tetracycline fibres with mechanical debridement represents a documented treatment alternative, the application of which may offer clinical benefits to many patients which was in accordance to the findings of present study.

CONCLUSION

Within the limits of this study, this study further adds to the evidence that tetracycline fibres as locally delivered agent are safe and effective adjunct to scaling and root planing,

and can produce significant clinical benefits compared to scaling and root planing alone for the treatment of chronic periodontitis.

Though the local drug delivery system used in the study is safe and effective treatment modality, further longitudinal studies utilising larger sample size and even encompassing the analysis of microbiological and radiographic parameters are recommended for supporting the findings of this study.

ACKNOWLEDGEMENT

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Platelet Rich Fibrin and Bone Graft in the Treatment of Intrabony Defect in Periodontitis Patients

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ABSTRACT

Background: Porous hydroxyapatite and β-tricalcium phosphate (β-TCP + HA) bone grafting material has resulted in clinically acceptable responses when used to fill the periodontal intrabony defects. PRF is an autologous leukocyte and platelet preparation that concentrates various polypeptide growth factors which therefore holds potential to be used as regenerative treatment for periodontal defects.

Aim: The purpose of this study was to evaluate clinical and radiographic outcomes in periodontal intrabony defects treated with platelet rich fibrin compared to alloplastic bone graft material.

Materials and Methods: Twenty subjects (10 subject per group, one site/subject) were treated either with platelet rich fibrin or alloplastic bone graft (30% β-TCP+ 70% HA). Primary clinical parameters: PD, CAL were taken at baseline, three months, six months and nine months post-operatively. Standardised radiographic data were collected at baseline, six months and nine months postoperatively.

Results: Preoperative parameters were similar for both groups. Postsurgical measurements revealed a greater reduction in pocket depth in bone graft group (2.5 mm), greater CAL gain (2.2 mm) and greater defect fill (1.30 mm) as compared to platelet rich fibrin group (1.50 mm, 1.6 mm and 0.80 mm respectively) at nine months.

Conclusion: Treatment of intrabony defects with alloplast (30% β TCP+ 70% HA) or platelet rich fibrin both resulted in a significant probing depth reduction, CAL gain and bone depth reduction, with significantly better improvement in bone graft group.

Keywords: Bone graft; clinical attachment loss; periodontitis; platelet rich fibrin; pocket depth; regeneration.

INTRODUCTION

Periodontal disease is characterised by the loss of connective tissue attachment with destruction of periodontal tissues.[1] Periodontal regeneration is considered a multifactorial process[2,3] that occurs when the systemic and local conditions are favorable and when therapy is properly applied.[4]

Among variety of treatment modalities available,[5] alloplastic bone substitutes like synthetic calcium phosphates: β-tricalcium phosphate (β-TCP) and hydroxyapatite (HA) have their ability to bond bone minerals directly and to promote new bone formation by osteoconduction.[6,7]

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Platelet-rich fibrin (PRF) described by Choukroun et al[8] is a second-generation platelet concentrate that contains platelets and growth factors prepared from the patient's own blood free of any anticoagulant.[1] PRF release polypeptide growth factors, such as transforming growth factor-β1, platelet- derived growth factor, vascular endothelial growth factor and matrix glycoproteins (such as thrombospondin- 1) and provides a three-dimensional fibrin matrix that may be utilized as a scaffold for a variety of procedures including the function as a barrier membrane.[9,10]

The purpose of this study was to report clinical and radiographic outcomes from treatment of periodontal intrabony defects with autologous PRF with open flap debridement compared to alloplastic bone graft material with open flap debridement.

MATERIALS AND METHODS

The study was conducted in the Department of Periodontology and Oral Implantology, People's Dental College and Hospital. The study design was approved by the Institutional Review Board of Institute of Medicine, Tribhuvan University, Kathmandu, Nepal. It was a randomised controlled clinical

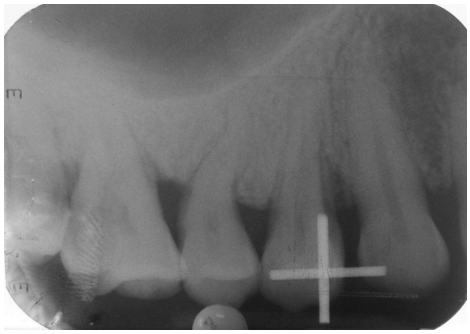

Figure 1a: Long cone parallel intraoral periapical view with radiographic stents.

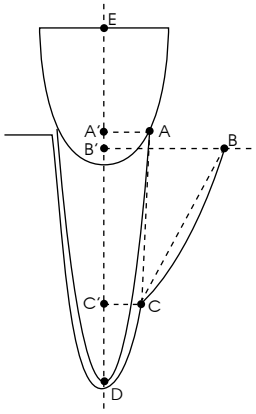

Figure 1b: Representation of reference points for radiographic analysis: A1–B1, horizontal (suprabony) component; B1–C1, vertical (intrabony) component of the defect.

trial. Twenty systemically healthy patients (12 women and 8 men, mean age 34.8 years) with interproximal, intrabony defects were enrolled in this study. Written informed consent was obtained from each patient and the patients were informed about the procedures to be performed and its benefits and risks were explained.

The inclusion criteria included patients with age 25-50 years with the presence of interproximal intrabony defects in maxillary and mandibular premolars and molars with probing depths 6-8 mm, after the completion of phase I therapy. Osseous defects needed to have two or three walls. One-wall defects and interdental craters were excluded from the study. The plaque index achieved following initial therapy had to be <1.[11] Radiographic evidence of intrabony defects of 3-4 mm had to exist as revealed by periapical films taken with the long-cone parallel technique.[12]

The exclusion criteria were: the patients with systemic disease and under medications known to interfere with periodontal healing and regeneration, and contraindication for periodontal surgery, patients who were pregnant or lactating and patients undergoing orthodontic treatment, patients with smoking habit or tobacco chewing habit and surgical periodontal therapy in the preceding six months. Tooth with mobility of Grade II, III, endo-perio lesion and third molars were also excluded.

Initial therapy consisted of scaling and root planing using Gracey curettes and an ultrasonic device. Patient education, motivation and detailed oral hygiene instructions were given. Patients were recalled after one week for review. Patients under the inclusion criteria were recalled. The defects were randomly assigned into two groups where group 1 were patients to be treated with autologous platelet rich fibrin and group 2 were patients to be treated with bone graft. Patients were not blinded for allocation to a particular group and treatment.

The patients were allocated according to the inclusion criteria. Pre-surgical clinical parameters measurements were done by University of North Carolina 15 (UNC-15) Hu-Friedy, Chicago, IL, USA periodontal probe. An individual occlusal stent was fabricated of cold cured acrylic resin on a cast model. Prior surgery, clinical parameters Plaque Index (PI),[11] Oral Hygiene Index (OHI), Gingival Index (GI), Probing depth (PD), Clinical attachment loss (CAL) were measured.

Long cone paralleling technique with radiographic stent was used to obtain standardised radiographs. For the measurement of bone defect, criteria described by Schei et al 1959,[13] and Bjorn et al 1969,[14] were followed. (Figure 1a, 1b)

The PRF was produced according to the protocol developed by Choukroun et al 2001.[8] Immediately before the surgical procedure, 10 ml of blood was drawn from the subjects by venipuncture of the antecubital vein. The blood sample was collected in sterile glass test tubes (10 ml) and were immediately centrifuged (ISO9001, ISO 13485, GMP,FDA, CE MARKING, Gemmy Industrial Corp. Taipei, Taiwan) at 3000

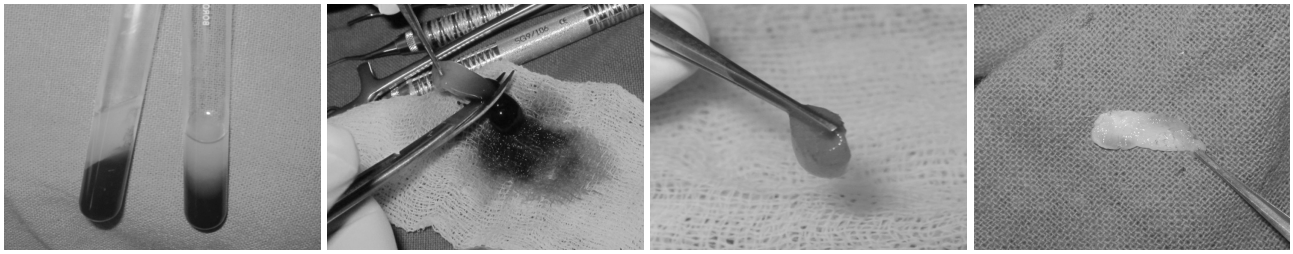

Figure 2: Platelet rich fibrin gel and membrane preparation.

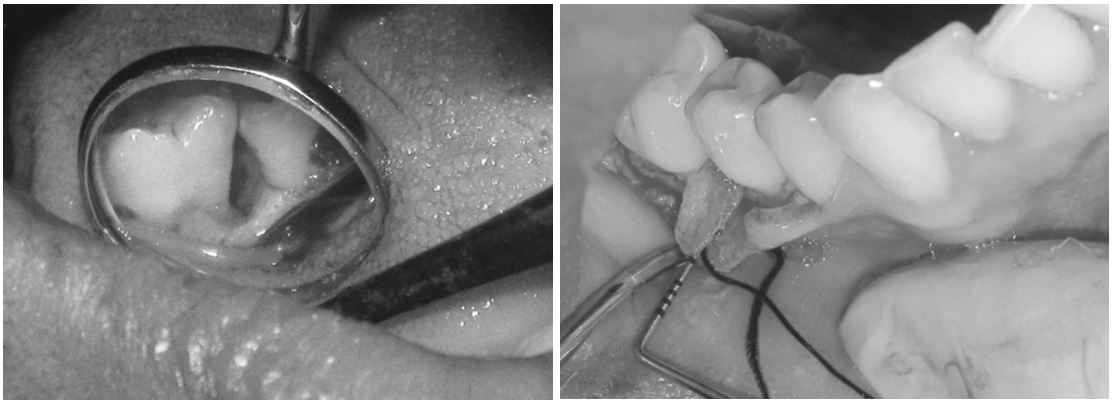

Figure 3: Platelet rich fibrin gel and membrane placed in the infrabony defect in lower right first molar after debridement.

rpm for 10 minutes. The centrifuged blood mass presented with a structured fibrin clot in the middle fraction of the tube, between the red blood cells (RBC) corpuscle layer on the lower fraction and the straw-colored acellular plasma on upper fraction. The fibrin clot could easily be removed from the tube and shaped freely, and was used immediately after its collection (Figure 2).

The upper portion of the test tube containing the acellular plasma was removed. The middle portion containing the fibrin clot was then removed and scraped off from the lower part containing the red blood cells base, preserving a small red blood cell layer, using sterile tweezers and scissors just after removal of platelet poor plasma (PPP). PRF was used immediately after its preparation.

A stable fibrin membrane was obtained by squeezing serum out of the PRF clot between two wet gauge pieces in order to take the form of a consistent autologous fibrin membrane, which will be applied over the treatment defects (Figure 2).

In Group 2, bone graft (GENOSS OSTEON II) of particle size 0.2-0.5 mm, volume 0.25 cc was mixed with as per the manufacturer's instructions.

One surgeon performed all surgeries. Each patient contributed only one intrabony defect. Patients were made to rinse with 0.2% chlorhexidine digluconate and povidine iodine solution was used to carry out extraoral antisepsis. The surgical area was anaesthetised with 2% lidocaine. Buccal and lingual intracrevicular incisions were made extending to the 1-1 adjacent tooth mesially and distally. Full thickness mucoperiosteal flaps were reflected. Extreme care was exercised to preserve as much marginal and interproximal soft tissue as possible to achieve better closure of the grafted sites.

Meticulous defect debridement and root planing was carried out carefully. To avoid the displacement of PRF, a 4-0 non-absorbable black silk surgical suture was passed through buccal and lingual flap before placement of the mixture. Prepared PRF was taken. Size reduction was done by cutting the PRF clot into appropriately sized pieces to fit the bony defect to the coronal margin of the alveolar crest. A membrane of compressed PRF was trimmed and adapted over the grafted defect (Figure 3). Membrane was extended over the periphery of the defect in the buccal and lingual directions. The mucoperiosteal flaps were repositioned and secured in place using the suture. The interrupted suture was placed. Periodontal dressing was not utilised.

Surgical procedures for Group 2 were performed with the same surgical protocol. Bone graft of particle size 0.2-0.5 mm,

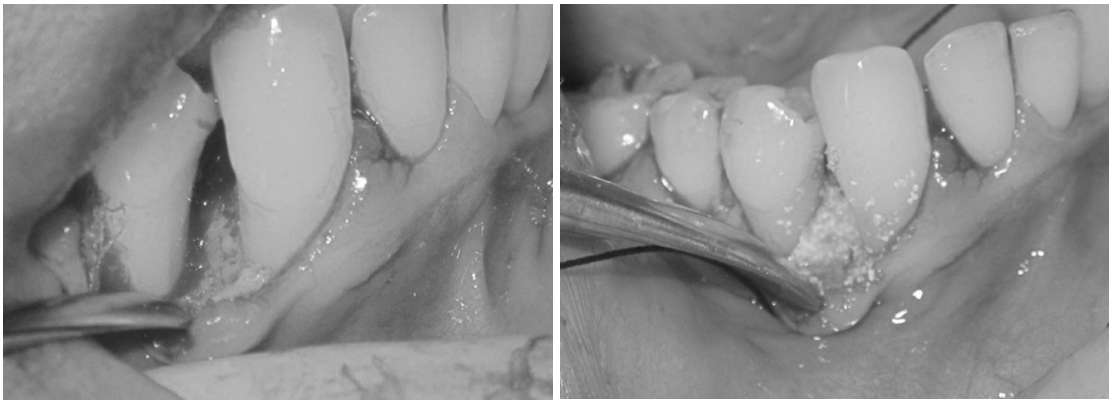

Figure 4: Placement of bone graft in infrabony defect in lower right first premolar after debridement.

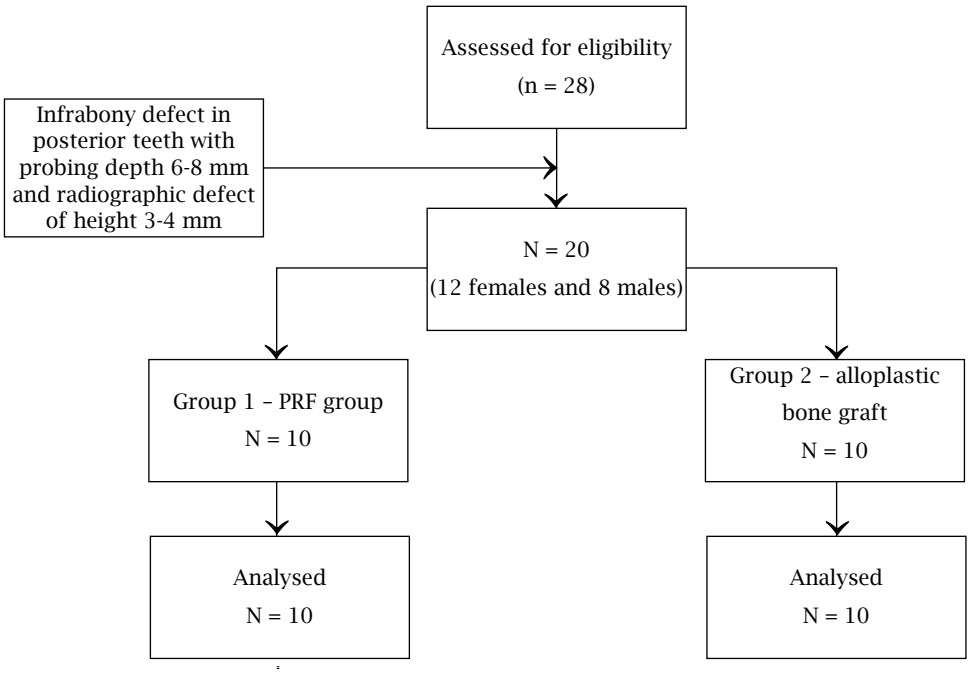

Figure 5: Study flow chart.

volume 0.25 cc was mixed with sterile saline as per the manufacturer's instructions (Figure 4). Suitable antibiotics and analgesics were prescribed.

Sutures were removed two weeks postoperatively. All clinical measurements were repeated at one, three, six and nine months after the initial surgery. Clinical parameters (probing depth and clinical attachment level) measurements were repeated with previously used acrylic stents. For hard tissue re-evaluation, intraoral periapical radiograph of the same study site was carried out and bone defect measurement was reassessed at six and nine months.

Power analysis determined that a sample size of 10 defects per protocol group was sufficient to detect a clinically significant mean difference at the 0.05 level with power of 80%, taking, 10% amplification for non-response and 20% for loss to Follow-up. Clinical measurements for each group were averaged (means ± standard deviation). The comparison of clinical outcome and radiological outcome between the groups at different time intervals were done with the help of Independent t-test and Paired t-test after checking for normal distribution of the data.

RESULTS

All 20 patients completed the study and healing was uneventful in both the groups. There were no significant differences in pocket depth between the two groups at baseline. Both PRF and bone graft groups showed significant pocket depth reduction and clinical attachment level gain at nine month compared with baseline. Mean pocket depth in PRF group at baseline was 7.20 ± 0.78 which was reduced to 5.70 ± 1.16 at nine months. Similarly mean pocket depth in bone graft group was 6.60 ± 0.69 at baseline that was reduced to 4.10 ± 0.99 at nine months which was statistically significant. Changes in pocket depth are reported in Table 1.

Changes in clinical attachment level are reported in Table 2. PRF group had mean clinical attachment loss of 7.30 ± 0.82 at baseline which was reduced to 5.70 ± 1.41 in nine months. Bone graft group had mean clinical attachment loss of 6.70

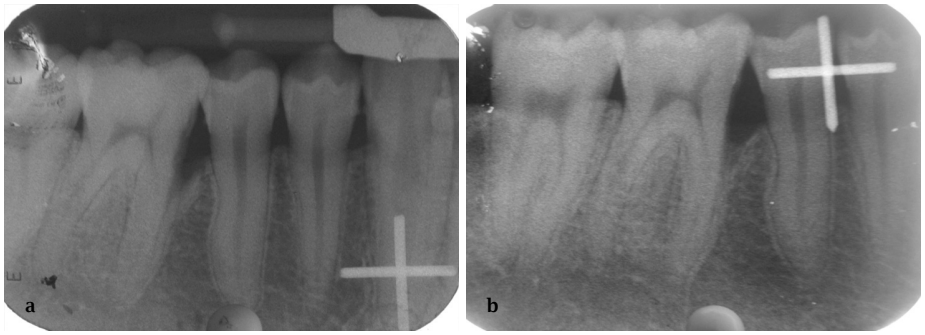

Figure 6a and 6b: Long cone parallel IOPA of a patient treated with PRF at baseline and nine months in lower right first molar.

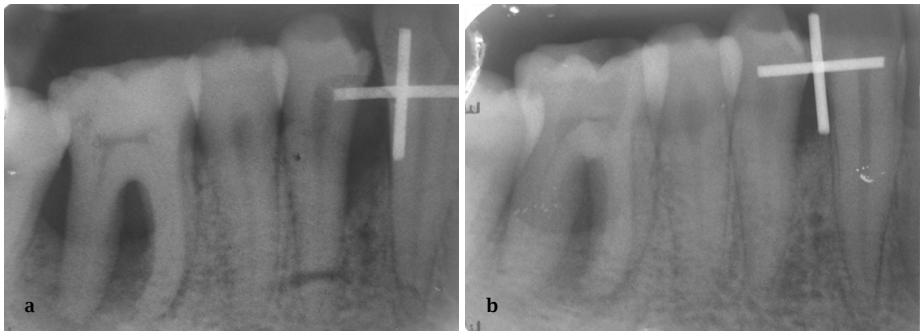

Figure 7a and 7b: Long cone parallel IOPA of a patient treated with bone graft at baseline and nine months in lower right first premolar.

Table 1: Comparison of pocket depth reduction in two study groups.

Pocket depth (mm, mean ± SD)	Baseline	3 months	6 months	9 months	P value
PRF	7.20 ± 0.78	6.40 ±1.43	6.10 ± 1.44	5.70 ± 1.16	0.002*
Bone graft	6.60 ± 0.69	4.90 ±1.19	4.20 ± 1.39	4.10 ± 0.99	<0.001*
P value	0.089	0.020*	0.008*	0.004*	

**statistically significant.*

Table 2: Comparison of clinical attachment level in two study groups.

Clincal Attachment Loss (mm, mean ± SD)	Baseline	3 months	6 months	9 months	P value
PRF	7.30 ± 0.82	6.40 ± 1.43	6.10 ± 1.44	5.70 ± 1.41	0.007*
Bone graft	6.70 ± 0.82	5.00 ± 1.15	4.20 ± 1.39	4.50 ± 1.43	0.001*
P value	0.121	0.027*	0.008*	0.076	

**statistically significant.*

Table 3: Comparison of radiographic defect depth in two study groups.

Bone Defect (mm, mean ± SD)	Baseline	6 months	9 months	P value
PRF	3.50 ± 0.52	2.8 ± 0.48	2.7 ± 0.42	<0.006*
Bone graft	3.40 ± 0.45	2.30 ± 0.34	2.10 ± 0.45	<0.001*
P value	0.656	0.016*	0.007*	

**statistically significant.*

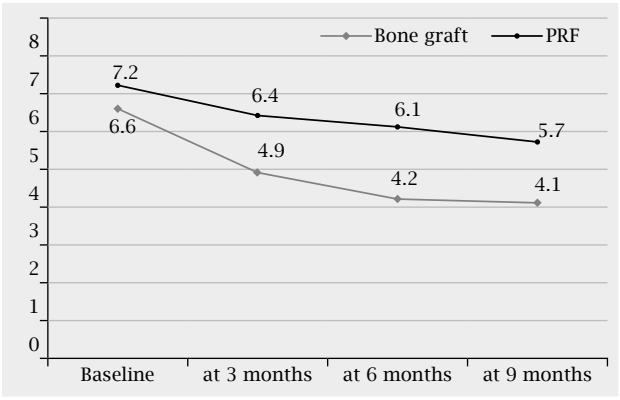

Figure 8: Time trend of change in mean values of probing depth among the two study groups (mm).

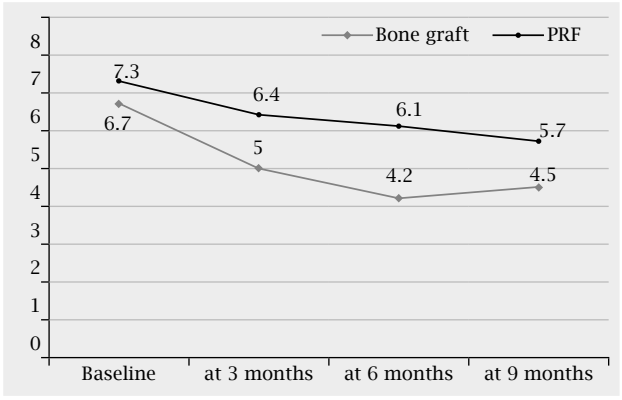

Figure 9: Time trend of mean values of CAL among two study groups (mm).

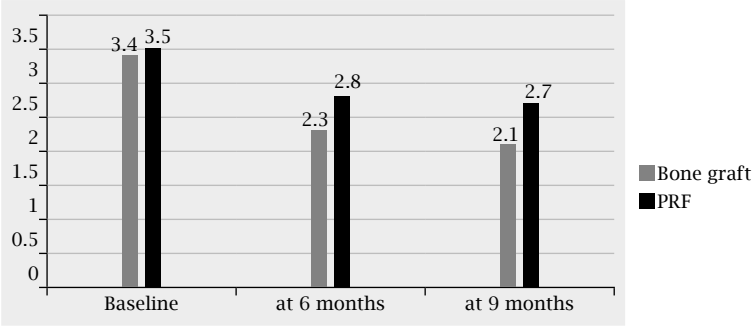

Figure 10: Bone defect levels among the two study groups (mm).

± 0.82 at baseline which was reduced to 4.50 ± 1.43 in nine months. While, the clinical attachment gain were different in favour of bone graft group than platelet rich fibrin group (Table 1, 2). Figure 8 and Figure 9 shows the diagrammatic difference of the comparison between two groups.

Table 3 reports the changes in defect fill between the two groups where bone graft group shows significant reduction in radiographic defect depth (3.40 ± 0.45 at baseline: 2.10 ± 0.45 in nine months; P value <0,001) as compared to PRF group (3.50 ± 0.52 at baseline: 2.7 ± 0.42 in nine months; P value <0.006). Diagrammatic illustration is shown in Figure 10.

DISCUSSION

This randomised clinical trial was designed to compare the treatment of periodontal vertical defects with platelet-rich fibrin and conventional open flap debridement with an active treatment of alloplastic bone graft material (30% β Tricalcium Phosphate + 70% Hydroxyapatite) and open flap debridement. In total, 20 subjects (10 subjects per group, one site per subject) were treated. The treatment protocol emphasised the principles of careful soft tissue handling, wound stability and infection control. No uneventful healing and postoperative complication was observed in any of the studied groups. The uneventful healing in patients was in agreement with various previous studies[15-17] thus supporting the excellent biocompatibility and enhanced wound healing properties of PRF and alloplast bone graft.

In the present study, defects treated in both groups showed significant improvements in all clinical parameters compared between baseline and nine months. However, there was more PD reduction (2.5 mm) and CAL gain (2.2 mm) in the alloplast (βTCP+HA) treated group compared with the subjects treated with platelet rich fibrin (PD reduction 1.6 mm; CAL gain 1.6 mm). The present study also reflects the intrabony defect fill in the bone graft group (1.3 mm) is higher than the subjects that were treated with PRF (0.8 mm).

To our knowledge, there are very less studies reporting the comparison of autologous PRF and alloplastic bone graft in the treatment of vertical intrabony defects. Therefore, a direct comparison with other studies is not possible.

The result of our study supports the study conducted by Chadwick et al in 2016[18] who reported changes in clinical attachment level and bone fill of periodontal intrabony defects treated with demineralized freeze dried bone allograft (DFDBA) compared to platelet-rich fibrin (PRF) in humans. He concluded that both treatment groups had significant gains in CAL as well as bone fill, with no significant differences in outcomes between groups but there was slight better outcomes in DFDBA group than the PRF group.

Thorat et al[16] investigated the clinical and radiological effectiveness of autologous PRF in the treatment of intrabony defects of chronic periodontitis patients. He reported a greater reduction in pocket depth, more gain in clinical attachment level and greater intrabony defect fill at sites treated with PRF than those treated with open flap debridement alone and the difference was found to be statistically significant.

Despite the fact that PRF is a denser and firmer agent than other biological preparations, it is still considered non-rigid to a degree that its space-maintaining ability in periodontal defects is not ideal and it may be like regenerative adjuncts.[18] Subjectively, the opinion of the clinicians in various studies was that PRF was more difficult to handle than bone grafts. The slippery consistency of PRF made it difficult to keep the material within the defect after placement. The lack of rigidity and space making capacity of the PRF material may make it more difficult to contain in the defect.[16]

Lekovic in 2012[5] examined the suitability of autologous PRF as regenerative treatment for periodontal intrabony defects in humans and to examine the ability of bovine porous bone mineral (BPBM) to augment the regenerative effects exerted by PRF. Postsurgical measurements revealed a significantly greater reduction in pocket depth, greater attachment gain and greater defect fill in the PRF–BPBM group than in the PRF group. He concluded that PRF can improve clinical parameters associated with human intrabony periodontal defects, and BPBM has the ability to augment the effects of PRF in reducing pocket depth, improving clinical attachment levels and promoting defect fill.

In our study, PRF group showed statistically significant pocket depth reduction and clinical attachment level gain only at nine months while the defect fill was statistically significant at both six and nine months. Different subjects may have distinct healing responses and/or the employed surgical technique may jeopardize the regenerative potential.[19] This gain might have been the result of true periodontal regeneration via new attachment or, alternatively, healing by repair, which implies the presence of a long junctional epithelium between the newly regenerated tissues and the root surface.

Defect morphology plays a major role in healing following periodontal-regenerative treatment of intrabony defects.[19-22] In the present study, the defect depth was measured, but the width and angle of the vertical defect weren't measured. Wider defects have been associated with reduced amounts of clinical attachment level and bone gain at one year.[19,21,23]

Radiographic evaluation is a noninvasive examination for bony defects repair. However, bone fill data derived from surgical re-entry are important to substantiate routine postoperative measurement data. In addition, histology of the treated periodontal intrabony defects is the only reliable method to determine the nature of the periodontal soft and hard tissue interface.[24]

Although results of the present study demonstrates that the use of autologous PRF and alloplast were effective in the treatment of two or three wall intrabony defect with an uneventful healing of the sites, our results are based on single-centered study with a small sample size. Future research is needed, including histologic evaluation of defects treated with PRF and alloplast to determine if periodontal regeneration is obtained. Studies with larger sample sizes, multi-centered and longer follow-ups would also be valuable to help guide treatment decisions.

CONCLUSION

The result of this study indicates that both treatment resulted in reduction in pocket depth, gain in clinical attachment level and defect fill compared with baseline, but there was greater reduction in pocket depth, more clinical attachment level gain and greater vertical defect fill at sites treated with alloplastic bone graft with open flap debridement than the sites treated with PRF with open flap debridement.

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Pain Perception after Periodontal Therapies

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ABSTRACT

Background: Pain perception is a complex sensory experience which is perceived by different individuals in different manners. The pain perceived by the patient after periodontal surgery may vary based on different parameters.

Aim: This observational study was conducted to evaluate the perception of pain after periodontal therapies.

Materials and Methods: A total of 63 surgeries were carried out in 50 patients and the surgeries were divided into three categories: open flap debridement, resective and regenerative surgeries, and periodontal plastic surgeries. The pain experienced by the patient was recorded on the visual analog scale that ranged from 0 to 10.

Results: The mean VAS score for different periodontal surgeries was 2.49. The study showed highest mean VAS in open flap debridement (2.74) followed by periodontal plastic surgery (2.5) and the lowest in resective and regenerative procedures (2.13). Among various variables such as age, sex, periodontal dressing, arch, amount of local anaesthesia and time duration, the data showed statistical difference between VAS score and sex ($p = 0.04$) and between VAS score and amount of local anaesthesia ($p = 0.012$).

Conclusion: The study showed there is low pain perception after different periodontal surgeries as measured by VAS. Proper understanding of the variables that affect pain is important as they may produce emotional responses that could influence compliance and the therapy result. Inadvertent use of large dose of anaesthetics beforehand assuming high anticipation of pain should be discouraged as the increase in volume relates to increased pain. .

Keywords: Anxiety; pain perception; periodontal therapy; visual analog scale.

INTRODUCTION

The International Association for the Study of Pain (IASP) has defined pain as an unpleasant sensory or emotional experience associated with actual or potential tissue damage or described in terms of such damage.[1]

Periodontal diseases are mostly chronic inflammatory conditions that cause destruction of periodontium. Treatment usually ranges from simple scaling and root planing (SRP/ non-surgical treatment) to more advanced surgical procedures.[2] Numerous questions arise when patients are about to undergo dental treatment, main concern is the fear of pain. As pain influence informed consent and patient management, dental practitioner performing treatment is also concerned.[3]

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The proper understanding of intensity of pain and variables that affect pain is important as pain may produce emotional responses that could influence hormones, stress level and compliance.[4] The clinicians can help their patients to build an expectation level and to cope with pain, by providing adequate information about level of pain after dental procedures which will enhance rapport between dentist and patient.[5]

Various types of periodontal surgeries, such as soft tissue grafts and osseous surgeries have been reported to produce more discomfort than routine non-surgical therapy.[6] Many studies have reported low rates of post-operative infection and complications after periodontal and implant surgeries.[7] To our knowledge, there is paucity of data in the Nepalese population on pain perception after different types of periodontal surgeries so it is evaluated in this study.

MATERIALS AND METHODS

The minimum sample size was computed using the formula

$$n = z^2 \frac{PQ}{d^2} = 63$$

where:

n = sample size; z = standard normal deviate of 1.96 for

a confidence level set at 95%; P = the prevalence is set at 79.5%5; Q = 100-P = 100-79.5 = 20.5 and d = 10.

A total of 63 systemically healthy subjects: 21 males and 29 females (mean age: 38.84 years ranging from 16-64 years) were recruited from the Periodontology and Oral Implantology Unit, Department of Dental Surgery, National Academy of Medical Sciences, Bir Hospital, Kathmandu. The study was conducted from January 2018 to May 2018 in accordance with Declaration of Helsinki. Demographic information for the patients such as sex and age were taken from patients' records.

All subjects were verbally informed and written informed consent was collected for participation in the study. Subjects with potentially contributory dental conditions (such as active orthodontic treatment, pulpal pathology), pregnancy, immunocompromised subjects, systemically unhealthy patients, patient under analgesic therapy for other diseases and patients taking any additional remedies other than prescribed medication for pain control were excluded from the study.

Phase I therapy (oral hygiene instructions, full-mouth supragingival and subgingival scaling and root planing under local anaesthesia, and occlusal adjustment) was initiated to all the subjects prior to the surgical periodontal therapy. Subjects were scheduled for various periodontal surgeries six to eight weeks following phase I therapy.

All of the surgical procedures were performed following standard protocols under local anaesthesia in strict aseptic condition. Local anaesthetic (LA) used administered was lignocaine HCl 2% with epinephrine 1:2,00,000. Bone graft used was Bio-oss Geistlich Biomaterials, USA) and membrane used was Bio-gide (Geistlich Biomaterials, USA). Periodontal dressing used was Coe-pak (G.C. America Inc., USA) and Barricaid (Dentsply, USA).

Standard post-surgical instructions were given. Subjects who received a free gingival graft were delivered a palatal stent to protect the donor site post-surgery. Antibiotics and analgesics were prescribed, along with chlorhexidine digluconate rinses (0.2%) 24 hours after surgery twice daily for two weeks. Periodontal dressing and sutures were removed 10 days post-operatively in regenerative surgical cases and seven days post-operatively in other cases. Each subject was reinforced for proper oral hygiene measures.

The data was entered in the questionnaire. The surgeon filled in the data collection form on the type of surgery performed, the duration of surgery, the quantity of anaesthesia used, the number of teeth treated, the arch treated and whether or not periodontal dressings were used. The subjects were instructed to chart their perceptions of pain using a Visual Analog Scale (VAS) with a range of equal units from 0 to 10, with 0 designated as no pain and 10 for severe excruciating pain. Statistical analysis was done by SPSS 23 software. The mean prevalence of pain between two groups was done by unpaired t test. For all tests, $P<0.05$ was considered significant. The obtained results were described and plotted.

RESULTS

A total of 63 surgeries in 50 subjects were included in this study (Table 1). The average age at assessment was 37.84 years, ranging from 16 to 64 years. Males made up 44% of the sample. Twenty eight subjects were under the age of 40 years.

The surgeries were classified into three types. Their frequency and distribution are listed in Table 2. As listed in Figure 1, the highest mean VAS score was found in open flap debridement (OFD, 2.74), followed by periodontal plastic surgery (2.5) and the lowest mean VAS score was found in resective and regenerative surgery (2.13).

The frequency distribution of various scores is presented in Figure 2. The highest VAS score was 5, whereas the lowest 0. Maximum number of subjects experienced pain of VAS score 2 (38.1%).

Among different parameters based on age, sex, periodontal dressing, operator, number of teeth, arch, amount of local anaesthesia and time, statistically different values were found only in sex and the amount of LA used (Table 3). The mean VAS score in subjects less than 40 years of age was

Table 1: Frequency and distribution of different parameters.

Parameter (Average)	n (%)
Age (37.84 years)	
≤40 years	28 (56.0%)
>40 years	22 (44.0%)
Gender	
Male	22 (44.0%)
Female	28 (56.0%)
Time (hours)	
≤1.5	16 (25.4%)
>1.5	47 (74.6%)
Periodontal dressing	
Yes	26 (41.3%)
No	37 (58.7%)
Arch	
Maxillary	30 (47.6%)
Mandibular	33 (52.4%)
LA (4.8 ml)	
≤3	38 (60.3%)
>3	25 (39.7%)

Table 2: VAS score in different types of surgeries.

SN	Type of surgery	n (%)	Mean VAS score
1.	Open flap debridement	31 (49.2%)	2.74
2.	Resective and regenerative surgery	22 (34.9)	2.13
3.	Periodontal plastic surgery	10 (15.9%)	2.5

Table 3: Mean VAS Score of the observed data with p value.

Parameter	Type of surgery	Mean VAS Score	P value
Age	≤40	2.41	0.58
	>40	2.59	
Sex	Male	2.14	0.04
	Female	2.77	
Periodontal dressing	Given	2.34	0.43
	Not given	2.59	
Arch	Maxillary	2.34	0.52
	Mandibular	2.60	
Amount of LA(ml)	≤3	2.18	0.012
	>3	2.96	
Time(hours)	≤2	2.44	0.22
	>2	3.11	
	>2	3.11	

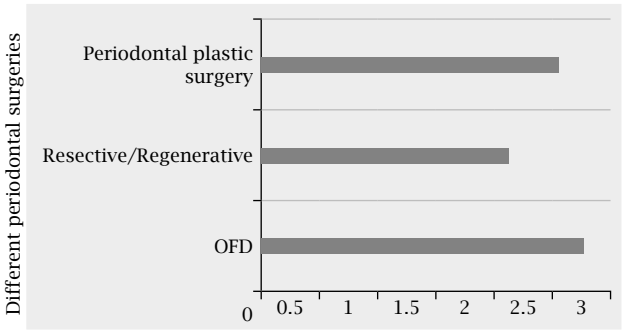

Figure 1: Bar diagram showing VAS score of different surgeries.

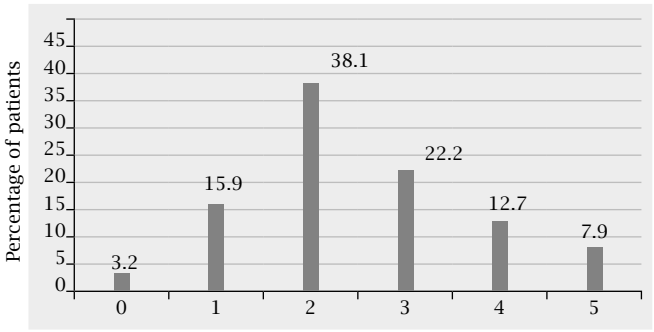

Figure 2: Bar diagram showing percentage of subjects showing different VAS Scores.

less than those who were above 40. Males showed a mean VAS score of 2.14 and females showed a mean score of 2.77. This showed a statistically significant difference with P value of 0.04. Mean VAS score was higher when periodontal dressing was placed, when the procedure was carried out in the mandibular arch and when the duration of the surgery was more than two hours. However, the difference failed to show any statistical significance. When larger amount of anaesthesia was used (>3 ml), the mean VAS score obtained was 2.96, which was statistically significant.

DISCUSSION

The mean value of VAS for different periodontal surgeries was 2.49. This is in agreement with pain studies on "straight forward" implant installation by Hashem et al (2006),[7] Al-Khabbaz et al (2007),[8] on periodontal flap surgical procedures by Fardal and McCulloch (2012)[9] and on both by Tan et al (2014).[10] The study done by Al Hamdan (2009)[11] also indicated that most of the patients reported mild levels of pain and discomfort following surgical and non-surgical therapy. Mei et al (2016)[5] demonstrated that 70% of the subjects had no or mild pain following periodontal surgeries.

Pain and different surgeries: The study showed highest mean VAS in OFD (2.74), periodontal plastic surgery (2.5) and the lowest in Resective and Regenerative procedures (2.13). A study done by Fardal and McCulloh (2012)[9] showed that there was no significant differences of VAS scores for perception of discomfort for periodontal surgery (9.9 ± 17.0) compared to implant surgery (16.7 ± 24.2; P >0.2). Tan et al (2014)[10] categorised three surgery types: crown lengthening (CL), OFD and implant and found the difference to be significant after adjustment with other important confounders. They suggested that implant represents a surgical procedure with minor morbidity compared to the periodontal surgical procedures (CL and OFD). In contrast, the study done

by Al Hamdan (2009)[11] found that surgical procedures (including open flap curettage, frenectomy, bone and soft tissue augmentation, crown lengthening, gingivectomy and corticotomy) had the highest pain score, followed by implant surgeries. In another analysis by Canacki and Canacki (2007),[13] there was no statistically significant differences between the subjects' discomfort levels associated with the four therapy types during periodontal treatment (OFD; Gingivectomy: GV; Modified Widman Flap: MWF and SRP). However, postoperative pain was significantly higher for OFD ($P< 0.01$) and GV ($P< 0.05$) procedures than for SRP and MWF procedures. Contradictory to the results found in this study, the study done by Curtis et al (1985)[3] showed that mucogingival surgery was associated with approximately 3.5 times as much pain as osseous surgery and six times as much pain as soft tissue surgery. Soft tissue surgery was not significantly associated with pain, but osseous and mucogingival surgery were both associated with increased pain.

Pain and Age: The study as shown in Table 3 showed more pain perception in individuals above 40. However, the difference was not statistically significant. Beaudette et al (2018)[14] demonstrated statistically significant difference in pain perception in older individuals experiencing decreased pain perception. Similar to current findings, Al Hamdan (2009)[11] study showed subjects between 36-45 years old had more pain than those who were between 18-25 years. Studies by Canakci and Canakci (2007)[13] and Fardal and Johannessen (2002)[15] reported that VAS scores decreased with increasing age. Urban and Wenzel (2010)[12] reported that subjects more than 50 years experienced less pain. Age is one of the biological factors that has been discussed as important for pain experience.[15] Elderly people are usually more tolerant to pain. The reason for higher pain threshold in elderly subjects may be the consequence of biological phenomenon of tissue changes such as reduced vascularity, fatty degeneration of bone tissue, and secondary dentine formation.[15]

Pain and Sex: The study showed statistically significant differences between male and female, with females showing greater VAS Score. Curtis et al (1984)[3] stated that males had significantly less pain than females. In contrast, Canacki and Canacki (2007)[13] showed no differences in terms of subjects' discomfort during periodontal treatments. Similar findings were seen in studies done by Mei et al (2016),[5] Lopez et al (2011)[16] and Dal Pra and Strahan (1972).[17] Eli et al (2003)[4] hypothesised that differences in sex and experience of pain is possible due to the reported sex differences in dental fear. However, contrasting findings are possible. Interpretation of VAS score varies with individual. The same score could mean different levels of pain in males and females.[14]

Pain and Periodontal dressing: The present study could not demonstrate any difference in pain with or without the placement of periodontal dressing. Jones and Cassingham (1979)[18] investigated the effect of periodontal dressings on healing following periodontal surgery. They reported no difference in the parameters of healing between surgically treated quadrants where periodontal dressings were or were not used, but their subjects rather reported an increased discomfort in terms of frequency and severity when a periodontal dressing was placed.

Pain and Location: The study showed statistically insignificant difference in pain in maxilla and mandible. Del Pra and Strahan (1972)[17] also found no difference in postoperative pain related to the location of surgery.

Pain and LA: This study showed statisitically significant difference in pain perception based on the quantity of anaesthesia used with increased LA volume caused more pain. The result is consistent with the studies done by Sanchez-Siles et al (2014)[19] and Mei et al (2016)[5] where the pain and swelling scores in subjects receiving large volume of LA was significantly higher than those receiving small volume of LA. Sanchez-Siles et al (2014)[19] postulated that the administration of high-volume (>7.2 mL) of anaesthetic agent is associated with increased local tissue distension, including epithelium connective tissue, ligaments and muscles. Injected drug volume is reabsorbed with local vasodilatation acting as a compensatory counterpart. This results in inflammation and the release of proinflammatory mediators, which further entails the stimulation of the nociceptive amielinic nerve endings, causing pain. The benefits of limiting anaesthetic volume include the absence of intraoperative pain, less postoperative pain and swelling, improved subject satisfaction, a lesser use of anti-inflammatory medication and less events of side effects due to overdose of local anesthetics.

Pain and Duration: The study showed surgical procedures with longer duration of time resulted in more pain. However, statistically there was no difference. In a study done by Griffin et al (2006),[20] the duration of surgical procedures (gingival augmentation) was highly related with pain or swelling post-surgically ($P = 0.001$). Mei et al (2016)[5] demonstrated statistically significant difference with moderate to severe pain being experienced on longer duration. Similarly, Tan et al (2014)[10] also showed results with longer duration of surgery (60 minutes or more) resulting in statistically higher VAS scores for swelling and bruising on the day of surgery itself, when compared to those who had undergone procedures done within 60 minutes.

The results of this study, although observational in nature, provide an insight in evaluating the level of pain perception and also help in determining the factors that influence pain perception. Considering the low mean VAS score, strong analgesics especially those types containing codeine need not be preferred to prescribe after periodontal surgeries. Periodontal treatment is experienced as painful by substantial number of subjects. The fear of pain resulting from surgery can demotivate the subject to undergo treatment and likely cause the subjects to deny the treatment. Therefore, the dentist should enquire the pain responses during and after treatment and relate the degree of pain according to sex, age and therapy type. Proper understanding of the variables that affect pain is important as they may produce emotional responses that could influence compliance and result of the therapy. Inadvertent use of large dose of anaesthetics assuming high anticipation of pain should be discouraged as the increase in volume relates to increased pain.

The limitations of the study includes small sample size, disproportionate distribution of sample among various groups and lack of assessment of other parameters such as subjects' pre-surgical anxiety scores, smoking, type of incisions, pain subsequent to surgery and consideration of other complication such as bleeding and swelling.

CONCLUSION

Within the limitations of this study, we can conclude from our investigation that there is low pain perception after different periodontal surgery as measured by VAS. No statistically significant difference in pain was found on the basis of age, sex, duration, location, number of teeth, periodontal dressing and operator. However, there is an obvious relationship between pain and sex and the amount of local anaesthetics used in the procedure.

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Azithromycin in Periodontal Therapy: Beyond the Antibiotics

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ABSTRACT

Periodontitis is a multifactorial disease, in which microorganisms in plaque biofilm play a major role. Scaling and root planing is the primary mode of non-surgical treatment for periodontal disease. Adjunctive use of an antimicrobial is advocated in certain periodontal disease conditions. Azithromycin might be considered a promising adjunctive drug in the treatment for periodontal disease because of its distinguished characteristic of immunomodulation, anti-inflammatory and antibiotic property along with the accumulation in higher concentration into the acute reactant cells and sustained release at the site of infection. This antibiotic is popular for its very simple dosage regime and limited side effects. The objective of this literature review to highlight the mechanism and potential favourable role in the management of various form of the periodontal disease.

Keywords: Antibiotics; azithromycin; gingival overgrowth; macrolide; periodontal therapy.

INTRODUCTION

The complete elimination of tissue invasive microorganism is not possible with mere mechanical debridement in certain disease conditions. The systemic antimicrobials as an adjunctive mechanical therapy have been shown to enhance clinical benefits in these patients.[1]

Azithromycin (AZM) first synthesised in 1980, is a subclass of macrolides called azalides.[2] AZM is an antibiotic used extensively for the treatment of a wide range of infections such as upper respiratory tract infections, middle ear infections, sexually transmitted infections and trachoma. It is also effective against the most common periodontopathogens: Aggregatibacter actinomycetemcomitans (A. actinomycetemcomitans), and Porphyromonas gingivalis (P. gingivalis). These invasive periodontal pathogens are difficult to eliminate by mechanical debridement alone, but the adjunctive use of systemic antibiotics can enhance the therapeutic response to non-surgical periodontal therapy (NSPT).[1] AZM well plays a triple role in the treatment of moderate to advanced periodontitis. Its effectiveness against gram-negative bacteria, the ability to penetrate biofilm, and a long antibacterial half-life and short course make it an attractive antibiotic option as an adjunct to the management of advanced inflammatory periodontitis.[3]

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Literature Search Methodology

An electronic search was conducted, for citations included till January 2017, to identify papers on azithromycin in periodontal therapy. Related studies and case reports written in the English language and published in major dental journals were included. Key words used for the search were the combination of "Azithromycin" and "Periodontal therapy" in surgical or non-surgical therapy.

Mechanism of Action

The mechanism of action of AZM is similar to other macrolide antibiotics.[4] AZM thought to bind to donor site, prevents translocation of aminoacyl transfer RNA and inhibit the growing peptide chain from the acceptor site to the donor site, by competing for this site. This may cause premature termination of the peptide chain.

AZM absorbs rapidly from gastrointestinal tract with bioavailability of about 40% and the peak plasma concentration is achieved 2-3 hours after the oral administration. The terminal half-life of AZM is 68 hours and average half-life is about 1-4 days.[5]

Dosage and Adverse Effects

The most common dosage regime for AZM (500 mg) orally once a day for three days, one hour before the food.[6,7] However, the approved dosage of ZM in the United States

(500 mg on the first day, followed by 250 mg daily for next five days) and in Europe (500 mg daily for three days) are different.[8] Shorter regimens are required because of long half-life, and this makes good patient compliance compared to other antibiotics.[9]

The single course of AZM rarely demonstrates any adverse reactions. Nausea, abdominal pain and diarrhoea are the most frequent adverse reactions (in approximately 5%). Rare, serious, allergic reactions, including angioedema and anaphylaxis (rarely fatal), have been reported in patients on AZM therapy. AZM is only contraindicated in combination with antacid, warfarin and cyclosporin. AZM interacts with the antacids and may potentiate the effect of warfarin. AZM should be avoided to prescribe in patients with known hypersensitivity to erythromycin.[10,11]

Antibiotic Spectrum

AZM is a broad spectrum antibiotic acting against both gram-positive and gram-negative bacteria and has bacteriostatic effects,[3] and effective against systemic, intraoral, and facial infections.[12] AZM demonstrates strong antibacterial activity against gram-negative anaerobic bacteria including Porphyromonas spp., Prevotella spp., and A. actinomycetumcomitans in comparison with earlier macrolides.

Immunomodulation

Immune-modulator properties of AZM is favourable over other macrolides, characterised by its significantly higher uptake by fibroblasts and acute reactant cells, like neutrophils, macrophages, monocytes, and lymphocytes,[13] with a high degree of retention.[14] AZM is carried efficiently into inflamed tissues by neutrophils through chemotaxis[15] while maintaining its activity. AZM exerted acute effects by prolonged degranulation of circulating neutrophils and the release of neutrophil granular enzymes, through oxidative burst and oxidative protective mechanisms; which could represent a potential anti-inflammatory effect in the treatment of subacute, noninfective inflammatory responses.[16]

AZM was demonstrated to decrease the expression of proinflammatory cytokines [interleukin (IL)-1β, IL-6, IL-8 and tumour necrosis factor (TNF)-α], growth factors such as granulocyte–macrophage colony-stimulating factor and also increases the number of actively phagocytosing alveolar macrophages.[17] Downregulation of the proinflammatory cytokines results into its anti-inflammatory property.[3]

Bacterial Resistance

AZM has significantly less bacterial resistance to subgingival microflora of adult periodontitis compared to other commonly prescribed oral antibiotics.[18] It was noticed that after 12 months the percentage of resistant species were reduced to levels approaching those detected before periodontal therapy.[19]

FAVOURABLE ROLE OF AZITHROMYCIN IN PERIODONTAL THERAPY

Bacteraemia Incidences

The prevalence of scaling and root planing (SRP)-triggered bacteraemia in patients with periodontitis was reported 80.9% and it occurred more frequently immediately after treatment. AZM prophylaxis is beneficial in both reducing the bacteraemia incidence and the improvement of the effect of periodontal therapy.[20]

Effect on Biofilm

In vivo, bacteria within the biofilm are thought to be protected from antibiotics.[19] AZM demonstrated to reduce the formation of biofilm by interfering with the signals of quorum sensing.[3,21,22] AZM permitting more effective antimicrobial activity against microbes within the biofilm by efficiently infiltrating this barrier.[23] AZM is likely to be useful for the treatment of diseases caused by P. gingivalis biofilms.[24]

Accumulation in Gingival Crevicular Fluid (GCF)

Drugs that enter the interstitial fluid seep through gingival connective tissue and eventually cross the junctional epithelium into the gingival crevice. However,

Table 1: Effect of azithromycin in periodontal treatment.

Bacteraemia	Decreased incidences
Biofilm	Infiltrate barrier, Decrease in thickness
GCF	Higher concentration than serum
Smokers	Rapid wound healing
Non-surgical therapy	Improvement in the gingival inflammation Pocket reduction and improve clinical attachment level in aggressive and chronic periodontitis
Surgical therapy	Decrease in pocket depth and enhance clinical attachment gain Bone regeneration recently reported on periapical radiographs.
Gingival overgrowth	Inhibition on Cyclosporin-A induced gingival overgrowth

Table 2: Clinical studies used azithromycin as an adjunct to periodontal therapy.

Author	Study design	Periodontal Status	Sample size	Study duration	Treatment/AZM regimen	Outcomes
Smith et al (2002)[33]	RCT	Chronic Periodontitis	44	22 weeks	SRP+AZM-500 mg x 3 days / control-SRP+ Placebo	Significantly more reduction in pocket depth in AZM group, even with poor plaque control.
Mascarenhas et al (2005)[39]	RCT	Chronic Periodontitis in smoker	31	6 month	SRP+ AZM 250 mg 1st day and one 250 mg for next 4 days. Control-SRP	Improved the efficacy of non-surgical periodontal therapy in smokers with moderate to advanced attachment loss.
Gomi et al (2007)[34]	Case -control	Severe chronic periodontitis	34	25 weeks	SRP+ AZM 500 mg x 3 days. Control-SRP	Shortened the duration of periodontal treatment.
Dastoor et al (2007)[47]	RCT	Chronic periodontitis, Heavy smoker	30	6 months	Surgical AZM-500 mg x 3 days. Control-Placebo	Sustained reduction in periodontal pathogens and rapid wound healing. No difference in clinical outcome.
Haas et al (2008)[41]	RCT	Aggressive periodontitis	24	12 months	SRP+AZM 500 mg x 3 days, Control-SRP+Placebo	Significantly more reduction in mean PPD. Potential to improve periodontal health
Pradeep et al (2008)[28]	RCT	Chronic periodontitis	80	3 months	SRP+0.5% AZM (controlled drug delivery system). Control-SRP	Enhanced the clinical result, and improved microbiological parameter.
Yashima et al (2009)[7]	Case -control	Chronic periodontitis	30	12 months	AZM 500 mg x 3 days before SRP. FM-SRP (single visit), PM-SRP (3 visit over 7 days), Control: SRP (6 visit over 6 weeks)	Improvement in clinical parameters, with no significant differences between the two test groups. Different treatments for test and control groups make results difficult to compare.
Oteo et al (2010)[38]	RCT	P. gingivalis associated Chronic periodontitis	29	6 month	SRP+ AZM 500 mg x3 days. Control-SRP	Significant improvement in clinical parameter and reduction in frequency of pathogenic microbes.
Sampaio et al (2011)[40]	RCT	Chronic periodontitis	40	12 months	SRP+AZM 500 mg x 5 days. Control- SRP	No adjunctive benefit.
Han et al (2012)[8]	RCT	Chronic periodontitis	36	6 months	SRP+ AZM 500 mg x 3 days. Control-SRP	No additional benefit on the periodontal pathogen investigated except decrease in F. nucleatum and reduction in GCF MMP-8 level.
Haas et al (2012)[45]	RCT	Aggressive periodontitis	24	12 months	SRP+ AZM 500 mg x 3 days Control- SRP	Ineffective in lowering the subgingival level of important putative periodontal pathogens.
Haas et al (2012)[45]	RCT	Aggressive periodontitis	17	12 months	SRP+ AZM 500 mg x 3 days Control-SRP+Placebo	No significant radiographic bone label change compared to placebo.
Pradeep et al 2013[29]	RCT	Chronic periodontitis in smokers	54	9 months.	SRP+0.5% AZM Control-SRP+placebo gel	Significant improvement in clinical outcome in the treatment of chronic periodontitis among smokers.
Ercan et al 2015[42]	RCT	Aggressive periodontitis	45	3 months	SRP+AZM, SRP+ Metronidazole +Amoxcilline, Control-SRP,	A non-significant improvement in periodontal parameter in the AZM and Metronidazole+Amoxicilline groups. Good Healing tendency in the AZM group despite the baseline plaque scores. AZM might be active against the bacteria in dental biofilms.
Saleh et al 2016[35]	RCT	Chronic periodontitis, Non-smoker	37	3 months	SRP+AZM, SRP+Metronidazole +Amoxicillin, Control-SRP	Amoxicillin+Metronidazole showed a higher reduction in PPD compared to AZM in the all sites analysis.
Latif et al 2016[36]	RCT	Chronic periodontitis	40	90 days	Group 1: SRP only, Group 2: SRP + AZM patch, Group 3: SRP + AZM tablet, Group 4: AZM buccal patch monotherapy, Group 5: AZM tablet 500 mg x 3 days monotherapy.	SRP + AZM tablets showed greater reduction in clinical parameters, however no significant gain in the clinical attachment was observed.
Martande et al 2016[43]	RCT	A. actinomycetemcomitans associated moderate to severe periodontitis	70	12 months	SRP+AZM (500 mg x 3 days), Control-SRP+Placebo	Significantly improved the clinical and microbiological parameters.

a substantial amount of macrolide antibiotics may be taken up from interstitial fluid and concentrated inside macrolide reservoirs (fibroblasts, epithelial, inflammatory, and immune cells).[13,25] They are thought to enhance macrolide distribution to gingiva and account for the large concentration difference between blood serum and gingival crevicular fluid[26] (Table 1).

A study found AZM level in GCF, above the minimal inhibitory concentrations for the several periodontal pathogens after two weeks suggested, that AZM could produce beneficial antimicrobial and anti-inflammatory activity, even in patients who fail to complete the standard 1.5 gm regimen.[27]

Application in Local Drug Delivery

Topical administration of AZM (0.5%) in systemically healthy chronic periodontitis patients demonstrated improvement in the clinical parameter as well as in subgingival microflora in both non-smokers[28] and smokers.[29] The authors hypothesised that the local application of AZM at the site of inflammation facilitated the penetration of the drug into the periodontal tissues, resulting in a high drug concentration and enhancing the bactericidal effect. The dual effect of the drug on the local microflora as well as on the invading pathogens may result in clinical improvement without systemic side effects or the development of bacterial resistance.

Susceptibility to Periodontal Pathogens

Various microorganisms including the A. actinomycetemcomitans, P. gingivalis, P. intermedia, and Pseudomonas aeruginosa are susceptible to AZM.[3] This suggested that adjunctive AZM can potentially enhance the elimination of A. actinomycetemcomitans from patients with periodontitis[30] especially under conditions in which neutrophils are greatly outnumbered by bacteria in gingival epithelial cells. A. actinomycetemcomitans has shown susceptibility to a low dose of AZM,[31] which are resistant to high dosage of erythromycin, clarithromycin and roxithromycin. AZM is highly effective against P. gingivalis.[32]

Non-surgical Periodontal Therapy

AZM has a wide spectrum of antibiotic action against periodontopathic bacteria as well as availability for a long duration, in periodontal lesions or in regions of surgical stress such as SRP may be an advantage for NSPT.[5] The shift of bacterial flora from the elimination of the anaerobic environment to healthy state induce a tendency to heal, which is responsible for the improvement of inflammation and decrease in the periodontal pocket depth (PPD). The high concentration of AZM was maintained in inflamed tissues after uptake by phagocytic cells, which seems to make AZM ideal for the treatment of periodontitis.[33]

Multiple randomised controlled trial (RCTs), conducted ranges from three to 12 months duration in chronic periodontitis patients including non-smokers[7,28,33–37] and smokers[29,38,39] investigated the effect of systemic AZM (500 mg x 3 days) in adjunct to SRP demonstrated the improvement in the efficacy of NSPT in reducing PPD and/or improving attachment levels in chronic periodontitis (Table 1, 2).

However, contrary to these reports, few clinical studies found no additional benefit in the improvement of clinical parameters as well as a reduction in periodontal pathogens, with adjunctive use of AZM with SRP in chronic periodontitis patients in non-smoker[7] and smoker.[8,40]

Systemic antimicrobials have been advocated as a possible alternative to achieve better outcomes in the treatment of Aggressive periodontitis (AgP) in adjunct to SRP. The results from the clinical trials, demonstrate the improvements in periodontal clinical parameters at three months,[41] and at 12 months[42,43] as well as reduction in A. actinomycetemcomitans positive subjects.[43] However one study found that AZM was ineffective in lowering the subgingival levels of putative periodontal pathogens in young AgP subjects, although periodontal health was achieved,[44] another RCT[45] also failed to show any change in radiographic bone level compared to placebo (Table 1, 2).

Surgical Periodontal Treatment

The only available RCT[46] using the AZM adjunct to surgical periodontal therapy in heavy smokers showed rapid wound healing, short-term gingival inflammation and less plaque formation in AZM group, but failed to demonstrate any difference in PPD or clinical attachment with placebo. (Table 1, 2)

Bone Regeneration

In addition to the resolution of inflammation, remodelling and significant periodontal healing of the gingival tissues over time, regeneration of bone has been reported in few case reports[47,48] in patients with severe localised and generalised periodontitis, following a single course of AZM. Bone formation was noted on periapical radiographs after the patients took two additional courses of AZM in the treatment of periodontal abscesses in conjunction with SRP.[49] The results from these case reports raise the possibilities of bone formation with the use of AZM (Table 1).

Drug Induced Gingival Overgrowth

Clinically, AZM has been reported to be highly effective in treating Cyclosporin-A (CsA) induced gingival

overgrowth.[50,51] These results imply that AZM has an inhibitory effect on CsA induced gingival overgrowth[50,52] (Table1). Three possible mechanisms[53] could be inferred, i) the inherent drug effect of AZM on gingival overgrowth might be related to its antibiotic activity, killing of oral bacteria, reducing local inflammation, and suppressing protein synthesis in fibroblasts;[51] ii) AZM inhibits the inherent effects of CsA, The interaction between AZM and CsA is controversial, but no studies has been found to support this second mechanism; iii) AZM is associated with the inhibition of phagocytosis induced by CsA. Phagocytosis was thought to be the principal pathway of collagen degradation in CsA induced gingival overgrowth. Moreover, treatment with AZM appears to restore part of the phagocytosis mechanism.

SUMMARY

AZM represents a promising option for the adjunctive treatment of chronic inflammatory periodontal diseases, due to its various properties such as prolonged retention, good bioavailability, immunomodulation, accumulation in GCF, infiltrating the biofilm and marked penetration into both normal and pathological periodontal tissues. Evidence from the various studies supported the improvement in periodontal health with the adjunctive use of 500 mg AZM, in the NSPT. However, if future well-designed studies confirm these breakthrough findings, AZM could prove a valuable unique drug, not only as antibiotic but also as host modulating agent in the treatment of moderate to severe form of periodontitis and gingival overgrowth.

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Improvement of Severe Gummy Smile by Botulinum Toxin Application and Gingivoplasty

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ABSTRACT

Currently, the search for aesthetic excellence has become the main objective in the dental treatment. The gummy smile is one of the complaints from the patients, since this situation may influence their self-esteem and social relationship. The development of new techniques, such as the application of botulinum toxin, may be a therapeutic option more conservative, in the treatment of gummy smile. The purpose of this article is to present a case of a patient with dentogingival discrepancy and severe gummy smile, who was treated with gingivoplasty and application of botulinum toxin in order to optimise the harmony of the smile.

Keywords: Botulinum toxins type A; gingival overgrowth; gingivectomy; gingivoplasty; gummy smile; surgical crown lengthening.

INTRODUCTION

Currently, the search for aesthetic procedures has grown exponentially. Dental procedures, as well as medical, besides craving the principle of promoting health, look for smile aesthetics.[1-3]

The facial aesthetic harmony is formed by the union of three components: teeth, gingiva and lips.[1-4] The smile becomes aesthetically pleasing when these elements are arranged in suitable proportion, and gingival exposure is limited to 3 mm. When gingival exposure is larger than 3 mm, it characterises a non-aesthetic condition called gummy smile, which affects some patients psychologically.[1,5-7]

Several therapeutic modalities were proposed for the correction of gummy smile, among them are gingivoplasty,[1-7] myectomy,[6] and orthognathic surgery.[6-8] The last two procedures are more invasive and present high morbidity.[1] On the other hand, the use of botulinum toxin can be considered as a therapeutic option to the surgical procedure, as it is a method more conservative, effective, faster and safer, when compared to surgical procedures.[1,5,9]

Botulinum toxin is synthesised by the anaerobic Gram-positive *Clostridium botulinum* bacterium, and inhibits the release of acetylcholine at the neuromuscular junction, impeding the muscle contraction.[1,6-8] There are seven distinct serotypes of the toxin and the type A is the most frequently used clinically and it is a stronger subtype.[1,6]

The botulinum toxin has shown efficiency in the treatment of gummy smile, as well as other disorders such as temporomandibular dysfunction (bruxism, clenching and masseteric hypertrophy) and orofacial pains.[1,4-10] The purpose of this article was to report a case of a patient who presented severe gummy smile and was treated by associating gingivoplasty and botulinum toxin.

CASE REPORT

A female patient, 34-year-old, attended the particular clinic complaining of gummy smile (Figure 1). Clinically, the patient presented anatomic discrepancy between the length of the maxillary teeth, and severe gummy smile, with more than 4 mm (Figure 2). Systemic alterations were not reported. Gingivoplasty was suggested. However, the application of botulinum toxin was proposed to complement the result of gingivoplasty. Additionally, the patient was counseled about the recurrence of the gummy smile after six months of the application. The patient agreed with the proposed treatment and signed the term of consent for the application of botulinum toxin.

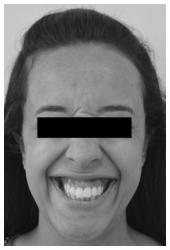

Figure 1: Severe gingival exposure, characterising gummy smile.

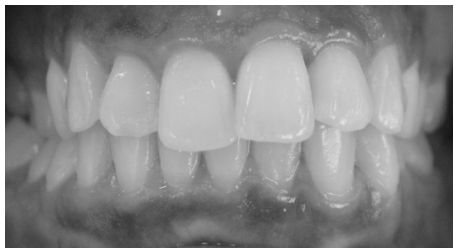

Figure 2: Intraoral clinical aspect presenting anatomic discrepancy between the maxillary teeth.

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Citation

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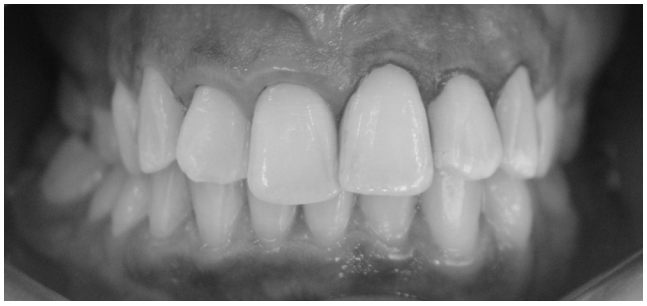

Figure 3: Immediate post-operative view of the teeth 21, 22 and 23.

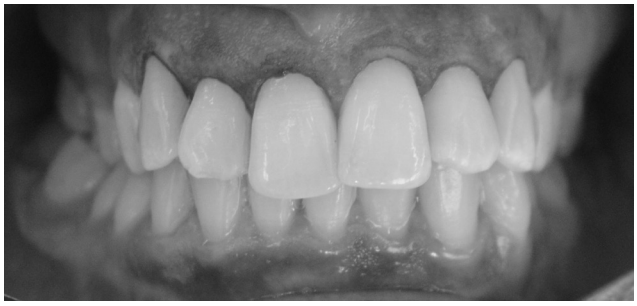

Figure 4: Immediate post-operative view after gingivoplasty.

Under local infiltrative anaesthesia, gingivoplasty was performed, by the determination of the bleeding points with the aid of a millimeter probe and the union of these points was made with the electric scalpel.[2] The length of the teeth was increased, characterising the dental zenith. Posteriorly, the scraping was performed, resembling the technique of external bevel, with the purpose of increasing the tissue reparation (Figure 3, 4). There was no need for the surgical cement, given that the wound repair process occurs by second intention. The patient was oriented and analgesics were administered postoperatively.

After 30 days, satisfactory tissue reparation was observed (Figure 5) and the patient reported no changes or complaints. However, the persistence of the gummy smile was observed (Figure 6). In the same treatment session, botulinum toxin was applied. Prior to application, the surface of the skin was disinfected with ethanol, to avoid local infection and remove the skin oiliness. Posteriorly, local anesthetic (Emla™ Astra, São Paulo, Brazil) was applied, with the purpose to promote comfort during the procedure. The botulinum toxin type A (Botox™ 200 units, Allergan Pharmaceuticals, Westport, Ireland) was diluted in 2 ml of saline solution, according to the manufacturer's instructions, and two units were injected at the recommended site, laterally to each nostril, at the level of the nose wing, at the insertion of the *levator labii superioris alaeque nasi* muscle. After application, the patient was advised to not lower her head and not engage in physical activity during the first four hours after the procedure.

After 15 days, the patient was evaluated. She presented uniform dehiscence of the upper lip (Figure 7). Side effects or complaints were not reported. The clinical effect of botulinum toxin application remained for six months.

DISCUSSION

Several aetiologies were suggested to the gummy smile, like the vertical excess of maxilla,[1,4-8] delayed passive eruption,[1,4,6,8] hyperfunction of the muscles involved in the smile[1,6,8] and reduced length of the teeth clinical crown,[1-3] which may occur singly or in combination, and determine the type of treatment to be applied. In gummy smile caused by muscular hyperfunction, botulinum toxin was indicated. It is the treatment of first choice for the facility and security of applications, besides being a more conservative approach when compared to surgical procedures (myectomy or Le Fort I osteotomy).[1,4,10]

The smile activity is determined by several facial muscles, such as the *levator labii superioris*, the *levator labii superioris alaeque nasi*, and the *zygomaticus major* and *minor*.[1,4-9] The fibers of these muscles converge to the same area, forming a triangle, suggesting that the appropriate election point comprehends the three muscles in a single injection. The proposed site of the injection lateral to the wing of the nose (ala).[1,4,7-9] The toxin, when injected, can be spread in an area of 20 mm, allowing the effective extension.[1,4,5] The toxin decreases the contraction of muscles responsible for the elevation of the upper lip, reducing gingival exposure.[4-9]

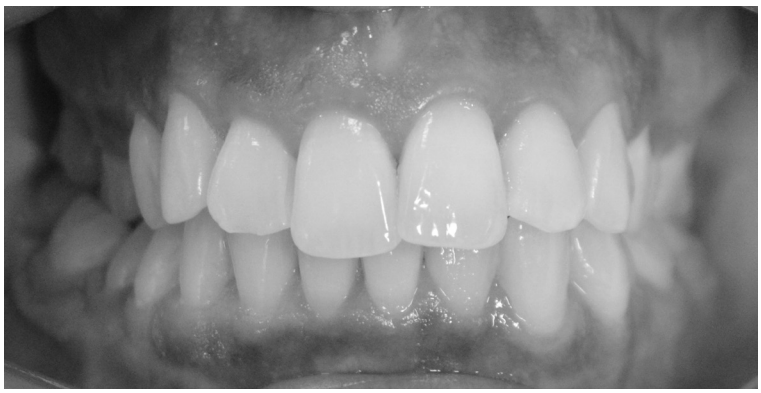

Figure 5: Post-operative (30 days) after gingivoplasty.

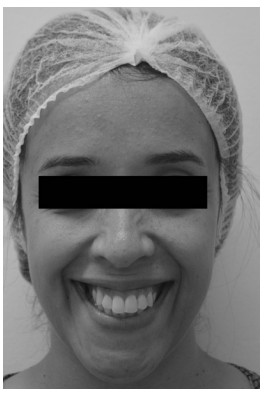

Figure 6: Persistence of the gummy smile after gingivoplasty.

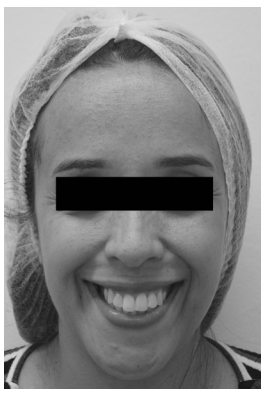

Figure 7: Result presented after 15 days of botulinum toxin application.

The botulinum toxin is a hydrophilic powder, stored under vacuum, sterile and stable conditions..[1,6,7] The reconstitution occurs from the smooth injection of the diluent (sodium chloride 0.9%) into the bottle, and it have to be stored at 2 to 8°C, and used within four to eight hours, in order to guarantee its effectiveness.[1,8]

Clinical effects present into 2-10 days after the injection, and the maximum visible effect occurs after 14 days of injection.[1,4,6] This effect last approximately 3-6 months.[1,5,6,8]

Contraindications to the use of botulinum toxin include: pregnant and lactating women, patients with neurodegenerative and autoimmune diseases, and concurrent use of aminoglycoside antibiotic that enhances the action of the toxin.[1,8]

In this report, the result was satisfactory to the harmony of the smile by association of treatments - gingivoplasty and application of botulinum toxin. The institution of isolated treatments could not culminate in the excellence of the earned results. Initially, the creation of the new dental zenith after gingivoplasty promoted the new dental architecture, favouring harmony of gingival-dental-facial architecture for the patient. Subsequently, the application of botulinum toxin reduced the gummy smile, by the uniform dehiscence itself of the upper lip, still promoting smoothness to facial lines of the smile, as can be seen in the nasolabial folds, adjacent to the nostrils, comparing Figures 1 and 7.

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Immediate Implant Placement in Anterior Maxilla

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ABSTRACT

This case report describes extraction of a fractured right maxillary lateral incisor tooth which was previously treated endodontically, followed by immediate placement of a dental implant in the prepared socket and temporisation by a removable partial denture. The tooth was extracted with minimal hard and soft tissue trauma. The socket was prepared to the required depth and implant was inserted. An impression was made after four months, and a definitive restoration was placed. The atraumatic operating technique and the immediate insertion of the implant resulted in the preservation of the hard and soft tissues at the extraction site. The patient exhibited no clinical or radiologic complications after loading.

Keywords: Crown; immediate healing abutment; immediate implant; implant; single stage implant.

INTRODUCTION

Missing teeth and supporting oral tissues have traditionally been replaced with dentures or bridges allowing functional restoration of mastication, speech, and aesthetics.[1] Dental implants offer a better alternative. The implants are inserted into the jawbones to support a dental prosthesis and are retained because of osseointegration.[2] Osseointegration was first described by Branemark (1977),[2,3] as the direct structural and functional connection between living bone and implant surface. It has definitely been one of the most significant scientific breakthroughs in dentistry. Teeth may have been lost through dental diseases or trauma or they may be congenitally absent. However in many clinical situations compromised teeth or roots may still be present in the patient's mouth. Before the invention of dental implants, compromised teeth were removed and the extraction sockets were left to heal for several months. Conventionally, implants are placed three to six months after the extraction of teeth. However, the majority of patients are interested in shortening the treatment duration between tooth extraction and implant placement or even better in having the implants inserted at the same day (immediate implants)[4,5] which is well documented.[5]

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Citation

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CASE REPORT 1

A 32 year-old female reported of root stump in upper right front region and gave history of fractured maxillary right lateral incisor due to road traffic accident a week ago in which root canal therapy was done two years ago. She was referred to Department of Periodontics for needful treatment after endodontic evaluation. Patient's general and medical history were taken and was not significant. Patient was examined clinically and cone beam computed tomography was taken. After thorough analysis clinically (Figure 1) and radiographically (Figure 2) it was evaluated that there was no underlying pathology and tooth root was unrestorable. It was there and then decided to do immediate implant placement and so was desired by the patient. Tooth root was extracted atraumatically under local anaesthesia after

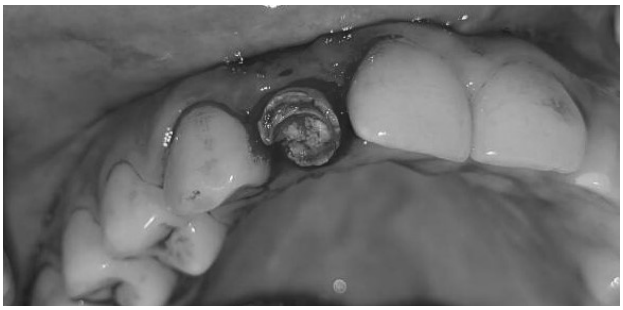


Figure 1: Pre-operative clinical view.

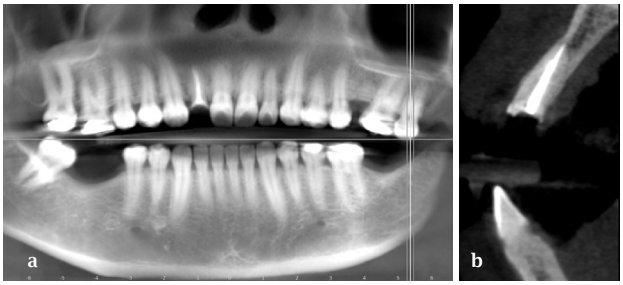


Figure 2: (a) Pre-operative radiographic view (b) Lateral View.

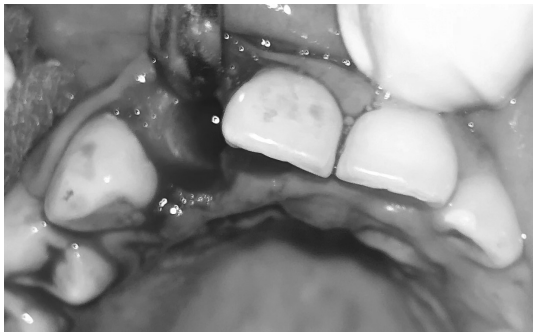


Figure 3: Extraction socket

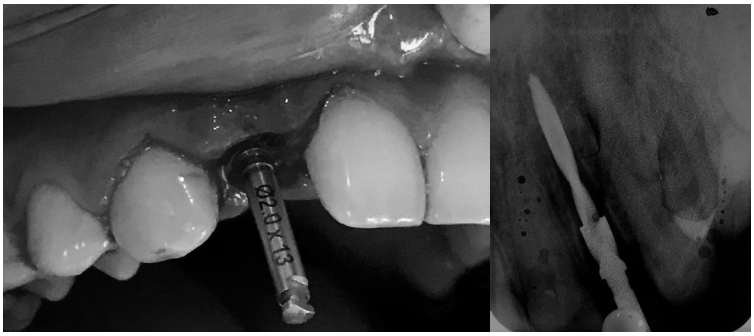


Figure 4: Checking proper alignment

carefully raising the flap (Figure 3). The pilot drill was used for creating a osteotomy site of the appropriate depth that is 13 mm for implant placement. When appropriate depth was reached with the pilot drill, the implant depth probe was used for tactile perception of intact bony plates and or any perforations and the confirmation of desired osteotomy depth. Once desired depth was confirmed, 2.0 mm diameter drill was used and same was used to check the proper alignment of the implant with adjacent teeth and opposing occlusion (Figure 4). After confirmation of depth and angulation, the osteotomy site was prepared for 3 mm diameter implant. The Implant site was generously irrigated with normal saline to remove any residual bone chips/other residue following preparation. The depth of the osteotomy was ascertained with Implant depth probe. Contamination by touching the implant with instruments made of a dissimilar metal or by contact with soft tissue, cloth or even surgical gloves may affect the degree of osseointegration. The implant (3x13 mm, Dio Implants, South Korea) was removed from the sterile vial using the insertion tool and inserted into the osteotomy site (Figure 5, 6). The torque was around 25 Ncm so it was planned to put the healing abutment preventing second stage surgery. The flap margins were then repositioned and sutured tension free using 3-0 silk in interrupted fashion (Figure 7). A radiograph was taken post operatively to evaluate the implant angulation and position (Figure 8). Antimicrobials (Capsule Amoxicillin + Clavulanic acid 625 mg TDS for 7 days), Analgesics (Ibuprofen 400 mg + Paracetamol 500 mg TDS for 5 days), and Chlorhexidine mouthwash 0.2% twice daily for two weeks were prescribed. The patient was on regular recall and under strict oral hygiene measures. The patient was recalled after 16 weeks, radiograph was taken and prosthetic phase was carried out. After soft tissue healing, impressions were made with the impression post attached to the implant using the closed tray impression technique. Shade selection was also done during this appointment. Casts with impression post-implant analogue complex, abutment, lab drivers and selected shade were sent to laboratory for preparation of cement retained Zirconium crown. After one week, the healing abutment was removed and replaced with final abutment (Figure 9). The Zirconium crown was cemented with dual cure composite resin (Figure 10). Oral hygiene instructions were reinforced and recalled for regular follow-ups (Figure 11, 12).

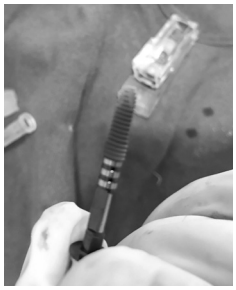


Figure 5: Implant 3 mm x 13 mm.

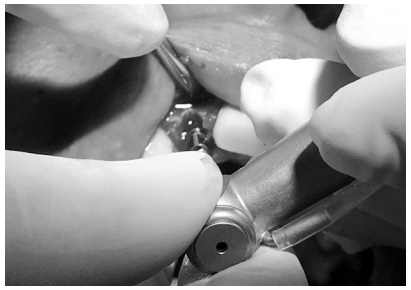


Figure 6: Implant placement.

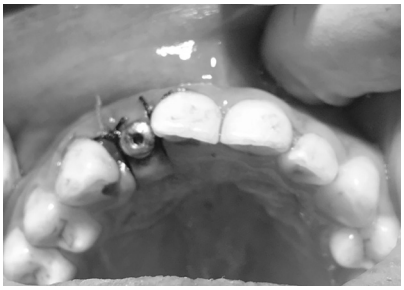


Figure 7: Implant with healing abutment clinical view.

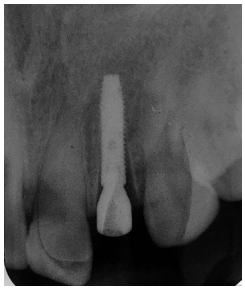


Figure 8: Implant placement radiographic view.

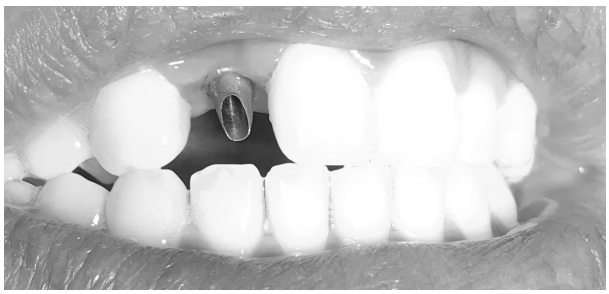


Figure 9: Final abutment placement.

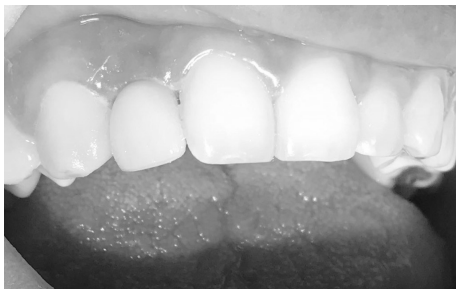
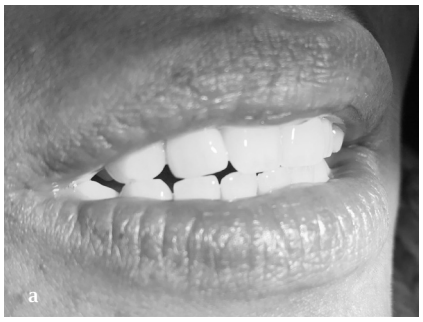


Figure 10: Final crown placement.



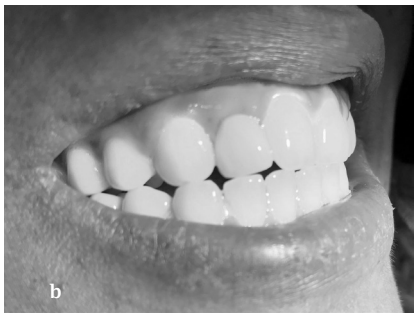


Figure 11: (a,b) One month follow-up.

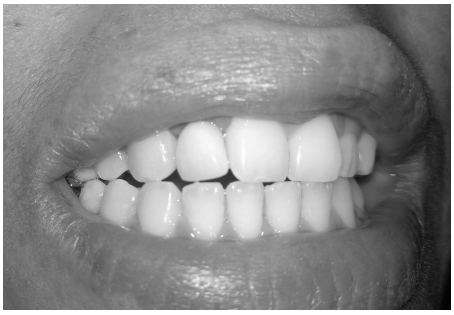


Figure 12: Two months follow-up.

DISCUSSION

Many clinical reports and experimental studies in the animal model demonstrated the favourable outcomes of dental implants immediately inserted in freshly extraction socket, without the use of any regenerative materials.[2,3,5-8] These data agree with those from other authors who evaluated the clinical success rate of immediate implantation without use of any membrane or graft material in both humans and animals.[9] It must be kept in mind that the present study is related to immediate implant not subjected to functional loading and therefore not fully comparable with the results from loaded implants. However, it has been demonstrated that functional loading does not impair, but rather enhance, bone maturation.[5,10]

This case report describes a technique to preserve and augment anterior aesthetics by combining atraumatic teeth extraction, hard and soft tissue augmentation, immediate provisionalisation and using the platform switching concept to preserve the buccal plate. The gingivaI tissue surrounding the implants has remained stable with no recession. The implant therapy must fulfill both functional and aesthetic requirements to be considered a primary treatment modality.

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Root Submergence Technique: Forgotten Terrain Revisited

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ABSTRACT

The resorption of the alveolar ridge is an inevitable phenomenon after tooth extraction and continues throughout the lifespan of an individual. Socket preservation, hard and soft tissue augmentation procedures are indicated to compensate alveolar bone resorption. Compensation can also be done by masking with acrylic flanges, pink porcelain and gingival veneers. However, procedures to preserve the bone anticipatory to the loss after extraction should be prioritised. This paper reports a case of fractured non-vital tooth where root submergence technique was done. A follow-up at 6 months presents intact bone aiding in the aesthetics and function of the prosthesis.

Keywords: Alveolar ridge; endodontically treated tooth; root submergence.

INTRODUCTION

Partial extraction therapies (PET) are a subgroup of therapies that use the tooth itself to compensate the loss of alveolar tissue and prevent the collapse of the ridge.[1] They include root submergence, socket shield, pontic shield and proximal socket shield techniques.

The root submergence technique or the root banking[2] was introduced in the 1950s in prosthodontics to maintain the alveolar ridge under complete dentures. The technique involves complete removal of the coronal portion of the tooth leaving behind an intact root.

The advantage of this technique is that it preserves bone width, bone height, the connective tissue and the blood supply of the indicated tooth which ultimately helps to maintain papilla height and width and eliminates the need for extensive bone and connective tissue grafting surgery.[3] Moreover, the clinician will still have an option of socket shield technique before implant placement for future purpose.

The indications[4] are unrestorable tooth crown with absence of apical pathology. The tooth should have healthy amputated pulp or endodontic therapy must have been completed. However, there are certain contraindications to the procedure which includes apical pathologies, root caries, root resorption, ankylosis, periapical pathology, endo-perio lesion and soft tissue perforation.[3]

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Citation

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CASE REPORT

A 62-year-old male patient reported to the Periodontology and Oral Implantology Unit with the chief complaint of broken upper front teeth since two weeks. His medical history revealed diabetes mellitus, hypertension and hypothyroidism. Intraoral examination revealed fractured tooth in relation to 23 and 33, generalised attrition, generalised abrasion, missing 17, 16, 15, 12, 22, 25, 26, 27, 37, 47, crown in relation to 11 with defective margin and bridge in relation to 34, 35, 36.

Various treatment options were consulted with the patient. The patient agreed to comprehensive restoration with root submergence technique followed by removable partial denture. The treatment plan included oral prophylaxis, restorations and replacement of faulty prosthesis. The tooth had been endodontically treated previously and showed no periapical pathology on the periapical radiograph.

Procedure: Scaling and root planing was done followed by oral hygiene instructions. Following phase I therapy, the root submergence technique was performed. Patient preparation was done (Figure 1 a) with proper extraoral asepsis with 2% povidone-iodine, followed by intraoral preprocedural 0.2% chlorhexidine rinses. Local anaesthesia was administered.

Crevicular incision was given with Bard Parker blade no. 12. Vertical incisions was given with Bard Parker blade no. 15.

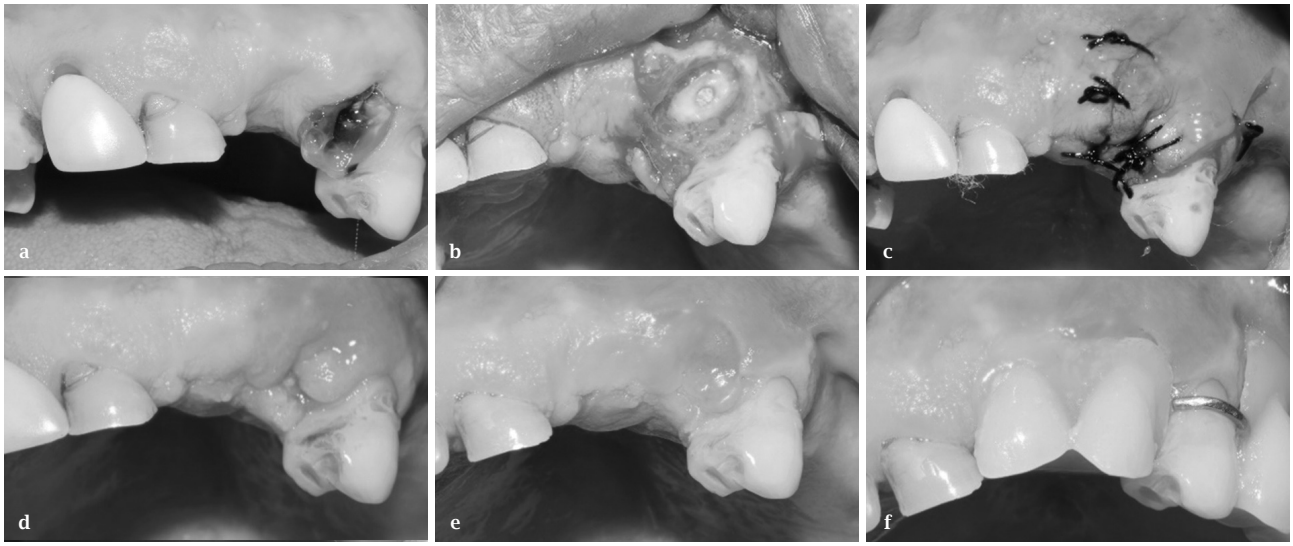

Figure 1: (a) On clinical Examination (b) Decoronation (c) Suture placed (d) Suture removal (e) Healed site (f) Prosthesis.

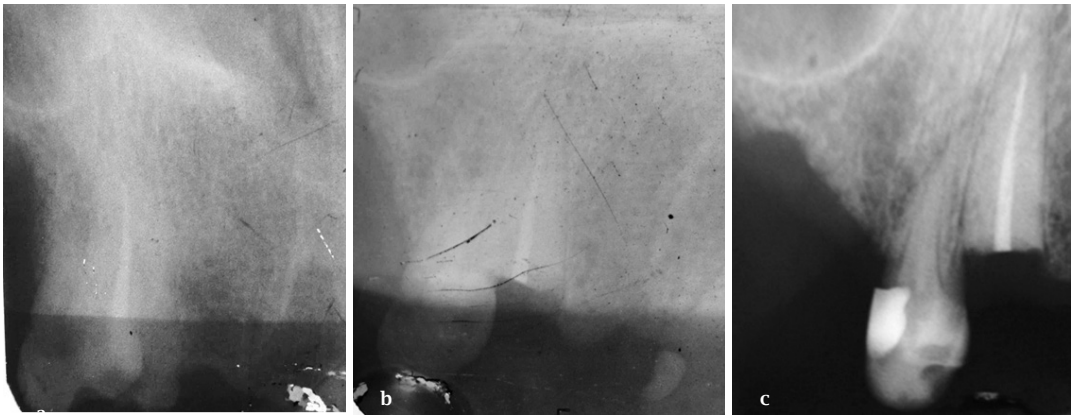

Figure 2: Intraoral Periapical Radiograph (a) Initial (b) Immediately after surgery (c) After six months.

Labial and lingual mucoperiosteal flaps were raised for the advancement and mobility of the flap. The root was reduced to 2 mm below the level of the alveolar crest using high speed handpiece with straight bur (Figure 1 b). Interrupted suturing technique with 3-0 silk was performed (Figure 1 c). The patient was prescribed analgesics (Ibuprofen 400 mg every 8 hours) or when needed and instructed to rinse with 0.2% every 12 hours for 14 days. Postoperative written instructions were given. Sutures were removed after seven days (Figure 1 d). There was uneventful healing (Figure 1 e). Removable partial denture made up of acrylic and acrylic teeth with clasp was delivered after three months (Figure 1 f).

Intra oral periapical radiograph at six months revealed intact alveolar bone with no pathologies (Figure 2 a-c). The patient was satisfied with the treatment and the same procedure was done to rehabilitate the left lower canine.

DISCUSSION

Hard and soft tissue augmentations before, during, or after implant placement have shown successful results. But, they require surgical expertise, longer duration time, sound health and financial condition of the patient. Immediate implant placement is another option to minimise bone loss at the extraction site, but its success is limited by the tissue biotype and buccal bone thickness. Socket preservation minimises the amount of resorption but does not preserve the alveolar ridge dimensions and the height of the papilla completely.[5]

Partial extraction therapy can be opted as a potential treatment modality for the preservation of the bone when other modalities are restricted due to systemic diseases and financial constraints.

The first reported clinical study of submerged endodontically treated roots in humans was done by Howell in 1977.[2] He recommended that the procedure could be utilised for the maintenance of ridge height under prosthetic appliances.

The root submergence technique is possible in both vital and non-vital roots. In non-vital root submergence, the tooth is endodontically treated before decoronation.

In vital root submergence, the vital tooth is decoronated, keeping the pulp intact and ensuring that the root is covered

with a flap. The pulp tissue in the roots remains vital because of the blood supply through the apices and collateral occlusal circulation from the soft tissue.[6] Whitaker and Shankle in 1974 showed that vitally submerged teeth have a greater repair potential compared with endodontically treated teeth.[7] The criteria[8] for vital root submergence include one mm horizontal mobility, reducible infrabony defects, one third root length/ bone ratio, asymptomatic vital teeth and healthy mucogingival tissue.

The complications of the root submergence technique are failure of the submerged roots that could result in their extraction, subsequent grafting of the site, and rehabilitation with a new prosthesis.[4,9] The complication in this case would be soft tissue perforation. Von Wowern and Winther[9] reported a four-year Follow-up study of 20 non-vital submerged roots among 15 participants. The study revealed 53% failures due to exposure of the root surface. In order to prevent this complication, the root should be completely submerged, and all sharp edges should be removed.

In a study done by O'Neal,[10] histologic and radiographic findings showed positive results and they concluded that root submergence technique should be considered as an alternative to extraction of key teeth in an effort to preserve alveolar bone.

Although current reports support the success of the technique, the procedure has not been indicated as a routine procedure due to lack of long term evidence. Thus, clinical cases should be studied in detail and proper case selection is the key to the success of this therapy.

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Five-Year Follow-up of an Immediate Implant Placement in the Aesthetic Zone

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ABSTRACT

Immediate implants are placed in the site of surgical extraction of the tooth to be replaced. The percentage success of such procedures varies among authors from 94-100%. Immediate implant placement is most commonly indicated when tooth extraction is done with pathologies not amenable to treatment. The advantages include reduced post-extraction alveolar bone resorption, shortened treatment time, and the avoidance of a second surgical intervention with regard to delayed implantation. This report describes a case of immediate implant placed in a maxillary central incisor followed by evaluation of soft and hard tissue changes occurring during post-operative period with a follow-up at five years.

Keywords: Atraumatic extraction; crown; immediate implant placement; osseointegration.

INTRODUCTION

Immediate implants are defined as the placement of implants in the course of surgical extraction of the teeth to be replaced.[1] Conventionally, after tooth extraction, the alveolar socket is allowed to heal completely prior to the placement of a dental implant which leads to the prolonged treatment time and bone resorption during the first three months of healing.[2] In order to avoid the problem of post-extraction and implant-related bone resorption, the concept of immediate implants was introduced in the late 1970s. Clinical evidence demonstrated the role of immediate implants in limiting physiological bone remodelling following tooth extraction.[3] In contrast to these initial results, numerous other studies published during the last five years report excellent survival rate, degree of osseointegration and maintenance of interdental bone levels with the use of immediate implant protocol.[4]

CASE REPORT

A 22-year-old male patient with no significant medical history was referred to a private clinic (Om Dental Clinic and Implant Center, New Baneshwor, Kathmandu) regarding dental implant or needful. Patient presented with a root stump in upper right front region and gave the history of trauma to maxillary right central incisor many years back. The patient had undergone root canal treatment along with a post and crown for the same tooth. Patient complained about the unpleasant look due to the wearing away of the crown (Figure 1, 2, 3).

The treatment modalities were explained to the patient after thoroughly analysing the clinical and radiographical data. An immediate implant-supported prosthesis sounded promising to the patient. Prior to implant surgery, maxillary and mandibular impressions were made to fabricate a maxillary transitional denture which would enhance the healing of extraction sockets as well as the aesthetic appeal of the patient after extraction. Immediate implant surgery was carried out in the following appointment. A full thickness flap was reflected with a No. 15 blade after anaesthetising the area, with an utmost care to preserve the interdental papilla (Figure 3). Atraumatic extraction of the maxillary central incisor was performed using a periotome (Figure 4, 5). An implant depth gauge was used to ensure the intact buccal bone plates and thorough curettage was performed to ensure total debridement of infra bony pocket. The osteotomy site preparation started with a 2 mm pilot drill into the socket till 13 mm length. The pilot drill was extended 2-3 mm in the socket beyond the apex of the extracted teeth. Subsequent drilling along with the copious amount of saline irrigation was carried out to place 4.2 x 13 mm (Alpha Bio, Israel)

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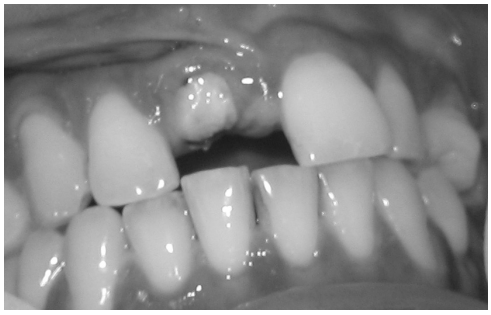

Figure 1: Root stump - central incisor.

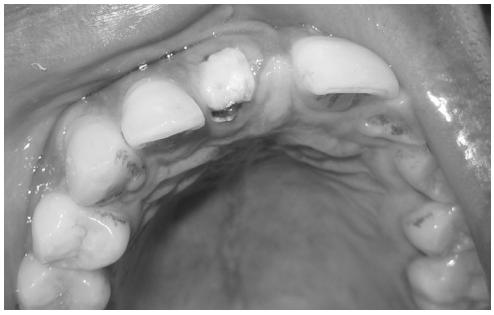

Figure 2: Occlusal view.

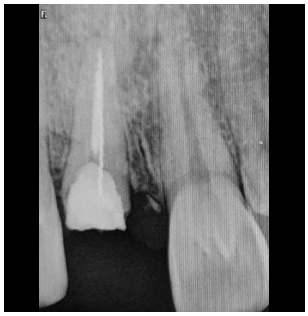

Figure 3: IOPAR showing root stump.

within the extracted site (Figure 7). However, an adequate torque could not be achieved to carry out immediate loading, so the sutures were placed with 4-0 silk suture along with a healing abutment (Figure 6).

The patient was then given post surgical instructions along with antibiotics and analgesics were given to the patient. Chlorhexidine mouthwash was prescribed for two weeks. Sutures were removed after 10 days and an uneventful healing was assessed. A closed tray implant level impression was made after four months. A try-in was carried out for the laboratory fabricated crown in patient's mouth. The occlusion was adjusted and a glazed, porcelain fused to metal (PFM) crown (Figure 8) was cemented with temporary cement. After one month, the crown was permanently cemented using polycarboxylate cement (Prime-Dent Mfg. Inc. Chicago, IL, USA). Proper oral hygiene instructions were given to the patient and reviewed after a month. Oral hygiene instructions were reinforced at the visit. However, patient could not come in-between for Follow-up visits as he was pursuing his studies abroad. At the 5-year follow-up examination, the implant was fully osseointegrated, presenting satisfactory functional and aesthetic conditions without clinical or radiographic signs of alterations or pathologies (Figure 9, 10).

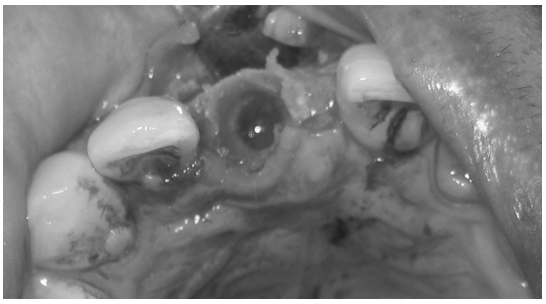

Figure 4: Extraction socket immediately after extraction.

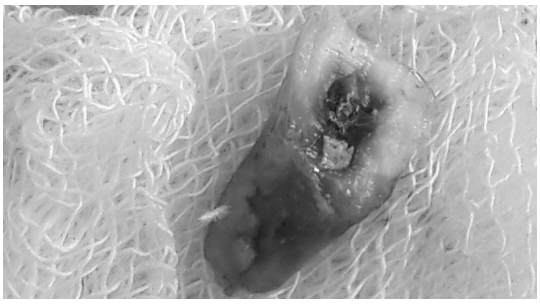

Figure 5: Extracted root.

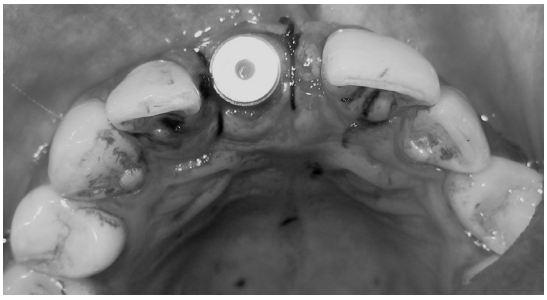

Figure 6: Implant placement with healing abutment.

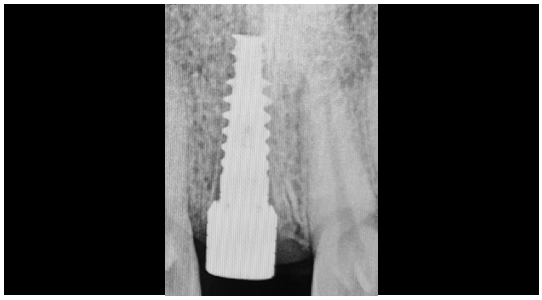

Figure 7: IOPAR showing implant with healing abutment.

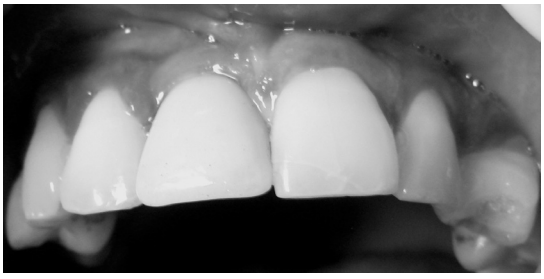

Figure 8a: Final prosthesis with PFM crown.

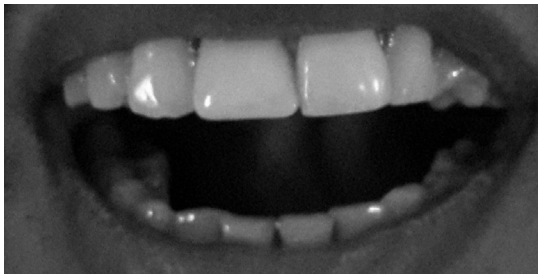

Fig 8b: Final prosthesis with PFM crown.

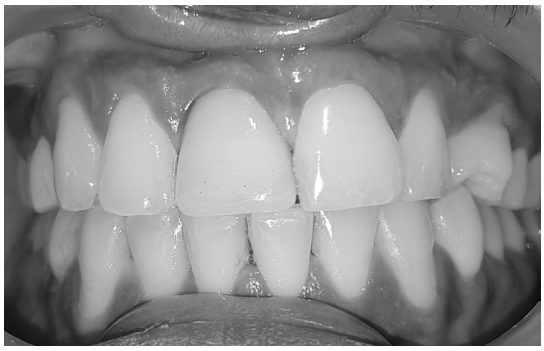

Figure 9: PFM crown with five years Follow-up.

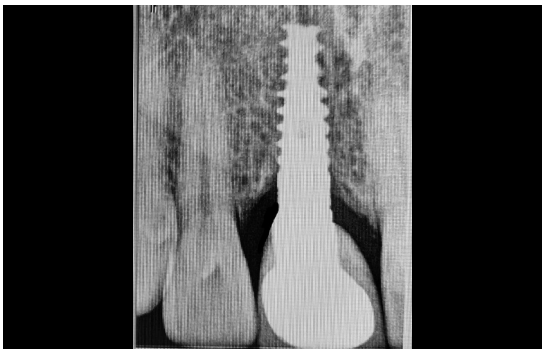

Figure 10: IOPAR showing dental implant with prosthesis after five years.

DISCUSSION

Immediate implant placement is most commonly indicated when tooth extraction is done due to trauma, endodontic causes, root fracture/resorption/perforation, unfavourable crown to root ratio (not due to periodontal loss) and bony walls of alveolus that are still intact. Contraindications include presence of active infection, insufficient bone (<3 mm) beyond the tooth socket apex for initial implant stability and wide and/or long gingival recession.

Clinical Guidelines for Aesthetic Outcomes When Using Immediate Implant Protocol includes: 1) Thick and intact buccal bone wall, 2) Thick gingival biotype, 3) Minimal trauma in tooth extraction, 4) Presence of at least three socket walls—ideally four walls, 5) Implant shoulder should be placed 2–3 mm apical to anticipated gingival margin, 6) Primary implant stability with engagement of 3–4 mm bone apical to root apex. 7) Slight palatal/lingual positioning of implant, and 8) Fill the gap between implant and inner bone surface using a low resorbing bone graft material with or without membrane.[5]

Dental implant therapy is the first choice of treatment modality for the replacement of missing teeth. Patients are more satisfied with implant supported prosthesis in terms of comfort, stability and aesthetics compared to conventional prosthesis.[6] In the present case, implant was successfully osseointegrated with no signs of pain or discomfort and no periapical radiolucency at the end of the five years.

Many clinical reports and experimental studies have demonstrated favourable outcome of dental implants immediately placed in fresh extraction socket, without the use of any regenerative materials.[7-9] Clinical and radiographical records of this case show a favourable survival rate of immediate implantation at five years which is comparable to the cases where implants were placed in the healed site. These data agree with those from other authors who evaluated the clinical success rate of immediate implantation without use of any membrane or graft material in both humans and animals.[10]

Single-tooth implants have shown high success rates in both the anterior and the posterior regions of the maxilla and the mandible.[11] Immediate implant placement has been done since the early years of the clinical application of implants with very good clinical outcomes.[12]

This case report describes an atraumatic tooth extraction, followed by dental implant placement with healing abutment without bone grafts to preserve the buccal plate. The gingival tissue surrounding the implant showed stability with no recession at five years of final crown placement. For considering a primary treatment modality, the implant therapy must fulfill both functional and aesthetic requirements. Immediate placement of endosseous implants into extraction sockets achieved high success rate of between 94-100%, compared to the delayed placement with reduced process of alveolar bone resorption and treatment time.[13]

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Scope

Journal of Nepalese Society of Periodontology and Oral Implantology (JNSPOI) is the official, peer-reviewed journal of the NSPOI. It is published twice a year and the types of articles published in the journal are original research articles, review articles, case reports, personal communications, letters to the editor, book reviews and editorials both in-house and commissioned.

Interested authors don't have to pay for the submission, processing and publishing of the articles till date.

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Research article should be divided into these sections:

Word limit

3000 (excluding abstract, references and figures)

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Title should be short not more than 100 characters or 15 words. It should contain all the pertinent author contact information (name in full form, mailing address, telephone and fax numbers and e-mail address of the author responsible for correspondence about the manuscript. The corresponding author should indicate clearly whether his/her e-mail address can be published. Each author's highest academic degree for record, institutional affiliation(s) and name of the department(s) and institution(s) to which the work is attributed should be mentioned. The title page should contain disclaimers, if any. It should also contain information on source(s) of support in the form of grants, equipment, drugs, or all of these. The number of figures and tables should be noted on the title page.

Conflict of Interest Notification Page

This should be included on a separate page(s) immediately following the title page.

Abstract

Abstract should be the next page during submission. It should not exceed 250 words and is a structured summary. All research articles should be submitted with the following subheadings: Background, Aim, Materials and Methods, Results and Conclusion(s)

Below the abstract should be three to six keywords arranged alphabetically separated by semicolons. The first letter of first word should be upper case, rest all lower case.

Introduction

Introduction should clearly state the problem being investigated, the background that explains the problem and reasons for conducting the research. It should summarize relevant research to provide context and also state how the work differs from published work. It identifies the questions that has to be answered and also explain what other findings if any are challenging or extending. It describes the experiment, hypothesis (es), research question(s), general experimental design or method. This section should have a maximum of 200 words.

Materials and Methods

This provides the reader enough details so they can understand and replicate your research. It explains how you studied the problem, the procedures you followed and establishes eligibility and exclusion criteria. It explains new methodology in detail; otherwise name the method and cite the previously published work. It includes the frequency of observations, what types of data were recorded etc. It must be precise in describing measurements and include errors of measurement or research design limits.

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Objectively present your findings, and explain what was found. It shows how the work is contributing to the body of scientific knowledge and follows a logical sequence based on the tables and figures present in the findings and answers the questions or hypotheses.

Discussion

Discussion describes what the results mean in context of what is already known about the subject and indicates how the results relate to expectations and to the literature previously cited. It explains how the research has moved the body of scientific knowledge forward. It also outlines the next steps for further study. It links the conclusion with the goals of the study but avoids unqualified statements and conclusions not adequately supported by the data.

Conclusion

A concise conclusion which briefly explains the importance and usefulness of the paper.

Acknowledgements

All contributors who do not meet the criteria for authorship can be listed in here.

References

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Article in a Journal

Journal references shall include the specified information listed in the following order: authors, article title and subtitle, journal abbreviation, year, volume, number in Arabic numerals and inclusive pages.

Joshi AR. Variation in serum glucose, urea, creatinine and serum sodium and potassium as a consequence of delayed transport/ processing of samples and delay in the assays. J Nepal Med Assoc. 2006;45:186-9.

Joshi AR, Sinha S, Dil-Afroz, Sulaman IM, Banerji AK, Hasnain SE. Alterations in brain tumour DNA detected by a fingerprinting probe. Indian J Biochem Biophys. 1996;33:455- 7.

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When referencing a book chapter, the order changes as follows: author of the chapter, title of the chapter, In: editors/ authors of the book, title of the book, edition (if there are more than one), volume(if there are more than one), city, publisher, year and inclusive pages of the chapter.

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They should be self-explanatory and should not duplicate textual materials. Tables with more than 10 columns and 25 rows are not acceptable. Number tables in Hindu-Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each. Type or print each table with double spacing on a separate sheet of paper. Number tables consecutively in the order of their first citation in the text and supply a brief title for each. Give each column a short or an abbreviated heading. Authors should place explanatory matter in footnotes in the heading. Explain all nonstandard abbreviations in footnotes, and use the following symbols in sequence:

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Be sure that each table is cited in the text.

If you use data from another published or unpublished source, obtain permission and acknowledge that source fully. Submit such tables for consideration with the paper so that they will be available to the peer reviewers.

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Graphs, charts, diagrams or pen drawings must be drawn by professional hands in India ink (black) on white drawing paper. In case of X-ray(s), miniature photo prints should be supplied. Photographs should be supplied in high quality glossy paper not larger than 203 mm x 254 mm (8x10 inches). In case of microphotographs, stains used and magnification should be mentioned. Each illustration should bear on its back the figure number and an arrow indicating the top. All illustrations should be in black and white and

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For X-ray films, scans and other diagnostic images as well as pictures of pathology specimens or photomicrographs, send sharp, glossy, black and white or color photographic prints usually 127 x 173 mm (5x7 inches). Letters, numbers and symbols on figures should therefore be clear and consistent throughout and large enough to remain legible when the figure is reduced for publication.

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Legend for Figures (Illustrations)

Type or print out legends or illustrations using double spacing, starting on a separate page, with Hindu-Arabic numerals corresponding to the illustration. When symbols, arrows, numbers or letters are used to identify parts of the illustration, identify and explain each one clearly in the legend. Explain the internal scale and identify the method of staining in photomicrographs.

Units of Measurement

Measurement of length, height, weight and volume should be reported in metric units (meter, kilogram or liter) or their decimal multiples. Temperature should be in degrees Celsius. Blood pressure should be in mm of Hg, unless other units are specifically required by the journal.

Abbreviations and Symbols

Use only standard abbreviations; use of nonstandard abbreviations can be confusing to readers. Avoid abbreviations in the title of manuscript. The spelled-out abbreviation followed by the abbreviation in parenthesis should be used on first mention unless the abbreviation is a standard unit of measurement.

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The journal welcomes solicited and unsolicited reviews. They should cover areas of interest and should be well researched. They should be to a maximum of 4000 words and should include an abstract of 200 words, six keywords, an introduction section in no more than 200 words and a minimum of 50 and maximum of 100 relevant references. There should be no conclusion section, if needed keep summary section.

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Article based on some experience, education or variety of topic which has clinical or scientific value.

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New/interesting rare cases with clinical significance or implications can be reported. They should be restricted to 1500 words (2500 for case report with review of literature) excluding references which in turn are restricted to 10. The abstract should not have more than 200 words. The introduction section should not exceed 200 words. In the case report materials and methods will be supplanted by case report. JNSPOI does not keep conclusion in case report section.

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These articles are personal views and allow the author to express their own point of view on issues relevant to health. Controversial topics are recommended to be probed into. Up to 800 words and 8 references are allowed.

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They should be of books published by our peers recently and should be from 250 to 500 words.

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