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Determination of Anchor Loss in Patients Undergoing Micro-Osteoperforation and Patients Not Undergoing Micro-Osteoperforation after Enmasse Retraction

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Abstract: ***Introduction: Attempts to accelerate the rate of tooth movement are being made to eliminate risks associated with longer treatment duration. Micro-osteoperforations and piezocision, are said to be least discomforting among all the surgical procedures and can accelerate the tooth movement significantly resulting in shorter orthodontic treatment. Micro implants routinely used in orthodontics these days can be used for osteoperforations procedure. Hence this study was carried out with and without micro-osteoperforations in experimental and control patients respectively, using mini implants and assessing the amount of anchor loss after enmasse retraction of anteriors. Aims and objectives: The aim of the study is to determine the amount of anchor loss between the patients undergoing micro-osteoperforations and patients not undergoing micro-osteoperforations after the enmasse retraction of anteriors. Materials and Methods: 20 patients in the Department of Orthodontics, Al-Ameen Dental College, Vijayapur were included in the study and retraction was started using sliding mechanics. They were randomly divided into two groups, experimental and control. Micro-osteoperforations were done in the experimental group and 150 grams force was applied immediately using active tie-backs on both sides and enmasse retraction was done. Pre-retraction cephalograms and post retraction cephalograms of the patients undergoing micro-osteoperforations and patients not undergoing micro-osteoperforations were obtained and tracings were done. Vertical line was dropped from Ptm. and distance from distal of upper first molar was calculated. Difference in values of pre and post retraction cephalograms was the amount of anchor loss. Pre and post retraction values were compared by paired t test. The difference was not statistically significant. Results: Results showed that there was no statistical significance in the amount of anchor loss in the experimental group when compared with control group. Conclusion: when compared the amount of anchor loss between experimental and control group, there was no statistical significant difference in the amount of anchor loss.***

Keywords: Micro-osteoperforations; Mini Implants; Enmasse Retraction

1. Introduction

Attempts to accelerate the rate of tooth movement are being made to eliminate the risk of gingival inflammation, decalcification, dental caries, and root resorption which are generally associated with longer treatment duration. Various methods that accelerate the tooth movement are documented in the literature which includes surgical methods such as corticotomy, piezosurgery, dentoalveolar distraction etc, mechanical/physical stimulation methods using lasers, direct electrical current, vibrators, pharmacological methods and magnets like samarium – cobalt etc. All these methods reduced treatment duration ranging up to 70%. Yet these approaches cannot be applied clinically as they are not patient compliant.

Of the surgical approaches, that have been tried successfully to accelerate tooth movement, Corticotomy and Piezocision are most commonly employed techniques. They work on the principle of Regional Acceleratory Phenomena (RAP) which was introduced by Frost in 1983[1]. RAP is a local response to noxious stimulus, by which tissue forms faster than the normal regional regeneration process. This phenomenon causes healing to occur 2–10 times faster than normal physiologic healing by enhancing the various healing stages[1]. However the invasiveness, trauma and skill of clinician as well as increased cost makes them little less viable option for the patients. To overcome the shortcomings of corticotomies, non invasive methods have also come into existence.

These include direct electric current, pulsed electromagnetic field, static magnetic field, resonance vibration, and low level laser. Of the various procedures introduced, Corticotomy assisted orthodontic tooth movement (CAOT) had emerged as a promising technique with 70% reduction in treatment duration[9]. In adults especially, it has many advantages because it helps to overcome many of the current limitations including lengthy duration, potential for growth and the limited envelope of tooth movement. Also the surgical techniques demonstrated very favorable and long term effects adding to the stability and retention of the orthodontic therapy.

But morbidity being the major disadvantage of this major invasive procedure, studies are being conducted to reduce the invasiveness. Very recently, Mani Alikhani et al[4], reported that micro-osteoperforations (MOPs) are an effective, comfortable and safe procedure that accelerates tooth movement significantly and could result in shorter orthodontic treatments.

Micro-osteoperforation is the only micro-invasive option able to accelerate orthodontics. MOP creates predictable orthodontic treatment results, improves finishes with braces, and reduces or eliminates with clear aligner therapy. MOP can be completed in chair side in minutes, and does not require any advanced training. Additionally, the treatment yields very little discomfort to the patient. There is zero recovery time, and the patients are able to immediately return to their normal daily routine.

Micro-implants routinely being used in orthodontics these days, can be used for this osteoperforation procedure which is a less extensive approach. With these implants, perforations in each inter proximal area can be enough to generate the regional acceleration of bone remodelling, producing a faster tooth movement.

Since very less literature is available about the effect of micro-osteoperforations on rate of tooth movement, a study was undertaken to determine the amount of anchor loss due to modified micro-osteoperforations and without micro-osteoperforation during enmasse retraction in orthodontic treatment.

2. Materials and methods

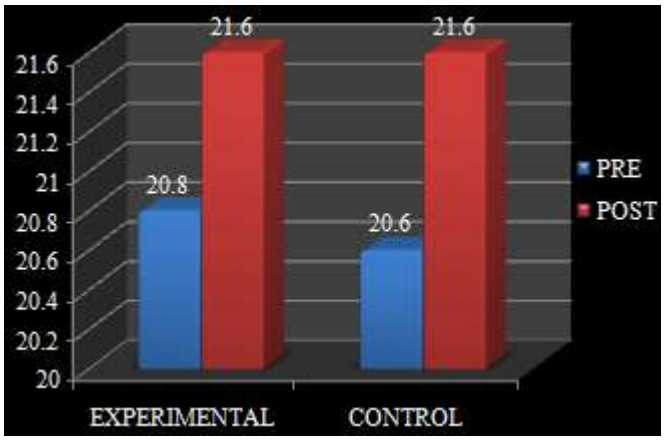
Pre-retraction cephalograms and post retraction cephalograms of the patients undergoing micro-osteoperforations and patients not undergoing micro-osteoperforations were obtained and tracings were done. Vertical line was dropped from Ptm. and distance from distal of upper first molar was calculated. Difference in values of pre and post retraction cephalograms was the amount of anchor loss.

3. Results

Pre and post retraction values were compared by paired t test. The difference was statistically non-significant (p value= 0.4). The mean anchor loss in the experimental group was 0.8mm (p- value of 0.487) , and in control group was 1.0 mm (p-value of 0.432) which was statistically non-significant .

Table 7: Comparison of anchor loss between experimental and control

Anchor loss		Mean	Standard deviation	T	P value
Experimental	Pre	20.80	1.549	-0.997	0.487 (N.S)
	Post	21.60	2.011		
Control	Pre	20.6000	1.50555	-1.259	0.432 (N.S)
	Post	21.6000	2.01108		
Difference between pre and post	Experimental	0.8000	0.78881	-0.514	0.400 (N.S)
	Control	1.0000	0.94281		



Graph 4: Comparison of anchor loss between experimental group and control group

Figure 13: Pre-retraction lateral cehalogram

Figure 14: Post retraction lateral cephalogram

4. Discussion

Various authors have given various methods of determining the anchor loss some renowned are Lotzof L.P. and Fine H.A. palatal plug method[6] and Rickets cephalometric method.

Amir Parviz R. Davoody measured the efficacy of anchorage control between differential moment's mechanics and temporary anchorage devices in a clinical trial. Lateral cephalograms were taken before and after incisor retraction. The ratio of molar protraction to incisor retraction was calculated and intra group and intergroup changes in upper lip, maxillary incisor and molar position were analyzed by paired and independent t-tests. He concluded that both anchorage modalities show statistically significant retraction of the lips during treatment.[7]

Silvia Geron studied the factorial response which is responsible for the anchorage loss. For the measurement of anchorage loss he used two methods one is radiographic method in which he uses lateral cephalograms of pre and post treatment difference of the distal contact point of maxillary first molar to a line perpendicular to occlusal plane through sella. Other one is dental cast analysis in which they mark posterior rugae point and the mesial contact point of first molar and midpalatal raphe was used to construct a median reference line. Then these casts were photocopied at 200% enlargement. He measured the distance between two points. The difference between pre and post treatment length is the anchorage loss. Study suggested that incorporation of second molars in the anchorage strategy, low retraction forces, and frictionless mechanics are superior to the conventional means. They calculated the anchorage loss 0.5mm/year for the females and 0.9mm/year for the males.[8]

Wook Heo did the comparison of the anchorage loss in enmasse retraction and two step retraction of maxillary anterior teeth in adult class I women patient. He also gave the different methods to calculate the anchorage loss by plotting ptm vertical and measuring the distance from 1st

molar. Also measured anchor loss by measuring the distance traveled by the mesial of first molar to palatal plane. This is very simple and efficient method to determine the anchor loss.[9]

Eric JW Liou, and C. Shing Huang retracted canine by distraction of periodontal ligament and observed the average mesial movement of the first molars was less than 0.5 mm in 3 weeks. Seventy three percent of the first molars did not move mesially, and 27% of them moved mesially less than 0.5 mm on the cephalometric superimposition. The average mesial movement was 0.1 mm in the maxillary first molars, and 0.2 mm in the mandibular first molars, respectively.[10]

John V Merson has shown molar distalization with segmental corticotomy around the molars, the anchorage value and resistance of molar to distal movement is effectively reduced with no any extra anterior anchorage device required. Because corticotomy increases remodelling at the localized site only this may be the reason for increase in anchorage because anchorage also depends upon bone density.[11]

In this study, we have taken lateral cephalograms before the retraction and after the completion of retraction in both experimental and control groups. Tracings were made of that cephalograms, and the horizontal distance from the pterygoid vertical (perpendicular to FH plane) to the distal surface of the first molar is measured. Anchor loss is calculated by subtracting pre and post retraction values.

The anchor loss in the present study was minimal i.e., 0.8 mm in experimental and 1.0 mm in control group which was statistically non-significant (p value = 0.4)

5. Conclusion

The mean anchor loss in the experimental group was 0.8mm (p- value of 0.487) , and in control group was 1.0 mm (p-value of 0.432) which was statistically non-significant. There was minimal anchorage loss in both experimental and control group.

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