ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 4, July - 2021, Page No. : 14 - 23

A Comparative Evaluation of En-Masse Retraction With And Without Micro-Osteoperforation In Pre Adjusted Edgewise Mechanotherapy- A Split Mouth Study.

[1]Dr Amric Mukundan, PG Student, COORG Institute of Dental Sciences, Virajpet, Karnataka

[2]Dr Sanju Somaiah, M.D.S, Professor, COORG Institute of Dental Sciences, Virajpet, Karnataka

[3]Dr Goutham B, M.D.S, Professor, COORG Institute of Dental Sciences, Virajpet, Karnataka

[4]Dr Sunil Muddaiah, M.D.S, Professor & Hod, COORG Institute of Dental Sciences, Virajpet, Karnataka

[5]Dr B K Shetty, Professor, COORG Institute of Dental Sciences, Virajpet, Karnataka

Corresponding Author: Dr Amric Mukundan, PG Student, COORG Institute of Dental Sciences, Virajpet, Karnataka

Citation of this Article: Dr Amric Mukundan, Dr Sanju Somaiah, Dr Goutham B, Dr Sunil Muddaiah, Dr B K Shetty," A Comparative Evaluation of En-Masse Retraction With And Without Micro-Osteoperforation In Pre Adjusted Edgewise Mechanotherapy- A Split Mouth Study", IJDSIR- July - 2021, Vol. – 4, Issue - 4, P. No. 14 – 23.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: The duration of treatment has become a prime concern for the orthodontists and the patients. The longer orthodontic treatment duration has become a major anxiety to patients especially adults, who refuses treatment or take alternative options such as implants or veneers with less than optimal results. Therefore this study is conducted to compare the rate of enmasse retraction with and without microosteoperforations in experimental side and control side.

Aim: To compare the rate of enmasse retraction with and without microosteoperforations in experimental side and control side.

Material and method: Patients who had required premolar extractions as part of fixed orthodontic treatment were considered and it was a split mouth study in which retraction was carried out with active tie backs aided by microosteoperforations on experimental side and without microosteoperforation controlled side using active tie backs with a constant force of 200grams measured with dontrix gauge.

Result: The measurement of acceleration during the enmasse retraction was found to be higher for the experimental side than the controlled side.

Conclusion: Difference of enmasse retraction, and the rate of enmasse retraction was found to be higher for the experimental side than the control side.

Keywords: Microosteoperforation, Enmasse retraction, Accelerated orthodontics.

Introduction

One of the main problems associated with orthodontic treatment is the longer duration of treatment, which usually leads the adult patients, to refuse treatment or finding alternative options like veneers, crowns or

implants which has comparatively lesser time as well as lesser esthetic results. There were many alternative methods to decrease the duration of orthodontic treatment without affecting the outcome of main objective. The major factor involved in the rate of the tooth movement is the biologic response to the orthodontic forces. Biological response leads to the formation of osteoclasts which will control the tooth movement.The above reason which is an advantage for the orthodontists to fasten the tooth movement by using alternative and adjunctive procedures which led to the introduction of Wilckodontics by Wilcko brothers. [2]

Wilckodontics involved the surgical intervention, where vertical cuts are given in inter radicular area, after raising full thickness mucoperiosteal flap by utilizing the rapid acceleratory phenomenon (RAP) which was initially termed as periodontally accelerated osteogenic orthodontic (PAOO) technique (K. et al., 2004). This PAOO technique induced a localized inflammatory response, which encourages local recruitment, stimulation of osteoclasts and increased bone remodelling. But it was an invasive procedure. These traumatic protocols pressurized the orthodontists to search for less invasive technique that would produce same amount of rapid acceleratory phenomenon (Haruyama et al., 2002)

Recently a more conservative approach has been introduced where a standardized needle gun (Propel) is used to induce micro-osteoperforations in the cortical alveolar bone without raising periodontal flap. The animal and human studies suggest that this approach helped in increasing the rate of orthodontic tooth movement (OTM) 2–3 fold. This is safe, less traumatic method which can be used along with any orthodontic treatment, not just to increase the rate of tooth movement, but in many other clinical situations, namely to change the type of tooth movement or create differential anchorage.(Kundi et al., 2020).Therefore, the main aim of the present study is to compare the rate of enmasse retraction with and without microosteoperforations in experimental side and control side.

Methodology

The sample size consisted of 10 patients reporting to The Department Of Orthodontics And Dentofacial Orthopaedics, Coorg Institute Of Dental Science for fixed orthodontic treatment. All patients was briefed about the pattern of study and a informed consent was taken from the subjects/parents before undergoing the study. A detailed history was taken before selecting the subjects. The study was a split mouth design. Retraction was carried out with active tie backs aided by microosteoperforations on experimental side and on the other side retraction without microosteoperforation using active tie backs using constant force of 200grams measured with dontrix gauge by same operator. The maxillary arch included bilateral 1st molar banding with a transpalatal bar as the anchorage system. After finishing retraction another alginate impression was taken and impression was poured. These casts were used as study models to measure the difference in the tooth movement. A digital vernier caliper was used to measure the distance between the contact points of the maxillary canine and premolar. Before beginning of the study, patients were instructed to maintain good oral hygiene methods and also systematically checked for periodontal problems if any and were given an oral prophylaxis 1 week prior to study. Measurements of acceleration was taken at 2 intervals (T_0- Beginning of enmasse retraction and T_1- After completion of enmasse retraction).Cast measurements are taken at T_0 and T_1 using digital vernier caliper.

Outcomes Assessment

The inferential statistics done using SPSS (IBM SPSS Statistics for Windows, Version22.0, Armonk, NY: IBM Corp. Released 2013) included Independent t test, paired t test and Pearson's Correlation for the comparisons. Pearson's Correlation test was used to measure the strength of association between two continuous variables. Independent t test was used to compare the mean of two unrelated independent groups. Paired t test was used to compare the difference between two sets of values of a parameter from the same subjects.

Interventions

All the subjects were bonded with 0.022×0.028 inch slot using Pre-adjusted Edgewise Appliance MBT brackets. Following the extraction of first premolars, initial leveling and alignment was done. Then 0.019×0.025 SS arch wire was used to obtain standardization (in-situ for two weeks). This period helps in full arch wire passivity before the microosteoperforation and enmasse retraction. Maxillary and Mandibular arch impressions were made using alginate at the end of leveling and aligning before enmasse retraction. Impressions were then poured. Before entering to 2nd phase microosteoperforations was done followed by conventional MBT retraction using active tie backs. Active tie backs was attached from the maxillary first molar hook to the hook between canine and lateral incisor. Then a Dontrix gauge was used to measure the distalizing force (200 grams). The maxillary arch include bilateral 2nd molar banding with a transpalatal bar as the anchorage system. After finishing retraction another alginate impression was taken and impression was poured. These casts were used as study models to measure the difference in the tooth movement.

Results

Micro osteo perforations (MOPs) were safely done, with minimal trauma, wherein small pinhole perforations are placed in the cortical bones around the retraction area to increase the rate of retraction. All the 10 patients completed Enmasse retraction at a faster rate. The mean of the measurement of acceleration during the enmasse retraction was found to be higher for the experimental group than the controlled group. On the contrary, the difference of enmasse retraction, and the rate of enmasse retraction was found to be higher for the experimental group than the control group.

Comparison of the Enmasse retraction with and without micro osteo perforations in experimental side and control side

The mean of the measurement of acceleration during the beginning and completion of enmasse retraction, difference of enmasse retraction, and the rate of Enmasse retraction, for the experimental group was 5.767, 0.00, 5.767, and 0.9857 respectively and for the control group was 5.799, 2.26, 3.539, and 0.6117 respectively.

Discussion

Accelerated orthodontics is one of the most widely studied and marketed areas in orthodontics. Several techniques have claimed to improve treatment efficiency, thereby reducing treatment time. Microosteoperforations(MOPs) is a safe, minimally invasive, and cost-effective treatment technique wherein small pinhole perforations are placed in the cortical bones around the teeth for accelerated teeth movement. The rate of tooth movement in microosteoperforations(MOPs) is controlled by the rate of bone resorption, which in turn is controlled by osteoclastic activity. In response to orthodontic force an increase in the activity of Inflammatory markers such as chemokines and cytokines was observed. Microosteoperforations(MOPs) on alveolar bone during orthodontic tooth movement can stimulate the expression of the Inflammatory markers,

leading to increase in osteoclastic activity and rate of tooth movement.

The sample had consisted of 10 patients reporting to The Department Of Orthodontics And Dentofacial Orthopaedics, Coorg Institute Of Dental Science for fixed orthodontic treatment. All patients were briefed about the pattern of study and an informed consent was taken from the subjects/parents before undergoing the study. A detailed history was taken before selecting the subjects. A split mouth study was done wherein one side retraction was carried out with active tie backs aided by microosteoperforations and on the other side retraction without microosteoperforations using active tie backs.Measurements of acceleration were taken at 2 intervals (T0- At the beginning of the enmasse retraction and T1- At the completion of enmasse retraction). Cast measurements were taken at T_0 and T_1 using digital Vernier caliper.

For the Orthodontic Appliance, all the subjects were bonded with 0.022×0.028 inch slot using Pre-adjusted Edgewise Appliance MBT brackets. Following the extraction of first premolars, initial leveling and alignment was done. Then 0.019×0.025 SS arch wire was used for standardization (for two weeks). This period enabled full arch wire passivity before the microosteoperforations and enmasse retraction. Maxillary and Mandibular arch impressions were made using alginate at the end of leveling and aligning before enmasse retraction. Impressions were then poured. Before stepping onto 2^{nd} phase microosteoperforations was performed followed by conventional MBT retraction using active tie backs. After finishing retraction another alginate impression was taken and impression was poured. These casts were used as study models to measure the difference in the tooth movement.

Three Microosteoperforations were performed on the desired side distal to the canines and before retraction using a device specially designed for Microosteoperforations. Microosteoperforations were performed using topical anesthesia. No flap was raised, and no pain and antibiotic medication were prescribed. The perforation passed the cortical layer and reached the medullary bone to get full effect of regional acceleratory phenomenon (RAP).After 4 weeks of canine retraction, impressions were taken again. After the Microosteoperforations patient were recalled and reviewed every two week by the orthodontist to activate wire and the active tie backs. This activation procedure takes advantage of the temporary demineralization phase created by microosteoperforations which in turn fasten tooth movement and helped in early completion of retraction and alignment.

The results were threefold: first, the mean of the measurement of acceleration was found to be better after completion of the enmasse retraction for both the experimental group and control group. Second, the difference of the mean of the measurement of acceleration during the beginning and completion of enmasse retraction was found to be higher for the experimental group than the control group. Third, the difference of enmasse retraction, and the rate of enmasse retraction was found to be higher for the experimental group than the control group.

However, it should be noted that although the results from 10 patients provided sufficient power statistically, the present investigation needs to be considered a pilot study. The results of this study can be used to fulfill the following clinically relevant objectives: Helped the clinician to assess and evaluate rate of enmasse retraction with and without microosteoperforations in experimental side and control side.

Conclusion

The present study was done to compare the rate of enmasse retraction with and without microosteoperforations in experimental side and control side. The study also assessed the rate of enmasse retraction with and without microosteoperforations in experimental side and control side.

The following footprints were laid out within the bounds of this study

1. The mean of the measurement of enmasse retraction was found to be better after the completion of the enmasse retraction for both the experimental group and control group.
2. The difference of the mean of the measurement of acceleration during the course of enmasse retraction was found to be higher for the experimental group than the control group.
3. The difference of enmasse retraction, and the rate of enmasse retraction was found to be higher for the experimental group than the control group.

References

1. Alikhani M, Raptis M, Zoldan B, Sangsuwon C, Lee YB, Alyami B, et al. Effect of micro-osteoperforations on the rate of tooth movement. Am J Orthod Dentofac Orthop [Internet]. 2013;144(5):639–48.
2. Cheung T, Park J, Lee D, Kim C, Olson J, Javadi S, et al. Ability of mini-implant–facilitated micro-osteoperforations to accelerate tooth movement in rats. Am J Orthod Dentofac Orthop [Internet]. 2016;150(6):958–67.
3. Teixeira CC, Khoo E, Tran J, Chartres I, Liu Y, Thant LM, et al. Cytokine expression and accelerated tooth movement. J Dent Res. 2010;89(10):1135–41.
4. Feizbakhsh M, Zandian D, Heidarpour M, Farhad SZ, Fallahi HR. The use of micro-osteoperforation concept for accelerating differential tooth movement. J World Fed Orthod [Internet]. 2018;7(2):56–60.
5. Wilcko MT, Wilcko WM, Pulver JJ, Bissada NF, Bouquot JE. Accelerated Osteogenic Orthodontics Technique: A 1-Stage Surgically Facilitated Rapid Orthodontic Technique With Alveolar Augmentation. J Oral Maxillofac Surg [Internet]. 2009;67(10):2149–59.
6. Kim YS, Kim SJ, Yoon HJ, Lee PJ, Moon W, Park YG. Effect of piezopuncture on tooth movement and bone remodeling in dogs. Am J Orthod Dentofac Orthop [Internet]. 2013;144(1):23–31.
7. Long H, Pyakurel U, Wang Y, Liao L, Zhou Y, Lai W. Interventions for accelerating orthodontic tooth movement: A systematic review. Angle Orthod. 2013;83(1):164–71.
8. Alikhani M, Alansari S, Sangsuwon C, Alikhani M, Chou MY, Alyami B, et al. Micro-osteoperforations: Minimally invasive accelerated tooth movement. Semin Orthod [Internet]. 2015;21(3):162–9.
9. Zamora Escobar Y, Murillo Samper FJ. Micro-osteoperforations for accelerating tooth movement during canine distalization, split-mouth study. Case report. Rev Mex Ortod. 2017;5(4):e201–9.
10. Attri S, Mittal R, Batra P, Sonar S, Sharma K, Raghavan S, et al. Comparison of rate of tooth movement and pain perception during accelerated tooth movement associated with conventional fixed appliances with micro-osteoperforations–a randomised controlled trial. J Orthod [Internet]. 2018;45(4):225–33.
11. Sivarajan S, Doss JG, Papageorgiou SN, Cobourne MT, Wey MC. Mini-implant supported canine retraction with micro-osteoperforation: A split-mouth randomized clinical trial. Angle Orthod. 2019;89(2):183–9

12. Nicolella DP, Moravits DE, Gale AM, Bonewald LF, Lankford J. Osteocyte lacunae tissue strain in cortical bone. J Biomech. 2006;39(9):1735–43.
13. Brady RT, O'Brien FJ, Hoey DA. Mechanically stimulated bone cells secrete paracrine factors that regulate osteoprogenitor recruitment, proliferation, and differentiation. Biochem Biophys Res Commun [Internet]. 2015;459(1):118–23.

Legend Figures and Tables

Fig. 1: Propel Device

Fig. 2: Force measuring guage (Morelli ortodontia)

Fig. 3: Digital Vernier calliper (workzone)

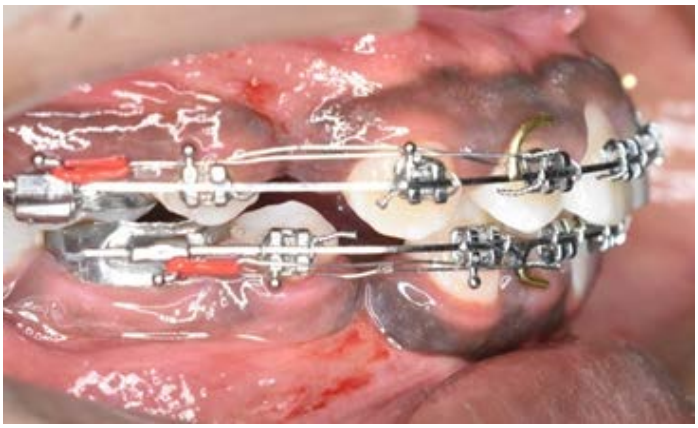
Fig. 4: Pre-Retraction

Fig. 5: Pre-Retracrtion Occlusal View

Fig. 6: Anesthetic Agent Application before MOP

Fig 7 : MOP Procedure In Maxilla

Fig 8: MOP Procedure in Mandible



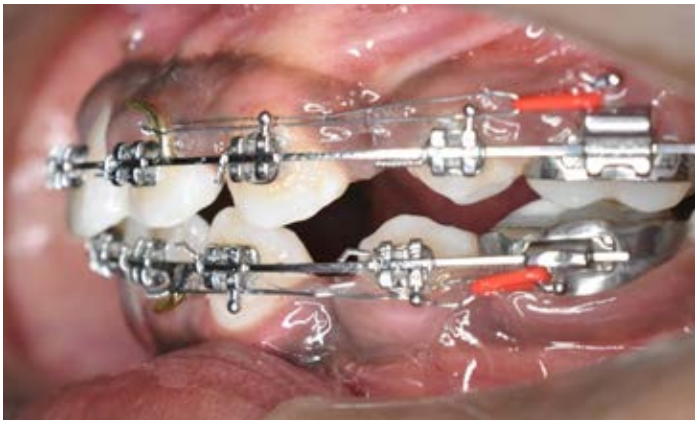


Fig 9 : Beginning of Enmasse Retraction

Fig 10 : Beginning Of Enmasse Retraction (Occlusal View)

Fig 11: Measurement of A Constant Force of 200gm Force Using Dontrix Gauge

Fig.12: After Completion of Enmasse Retraction

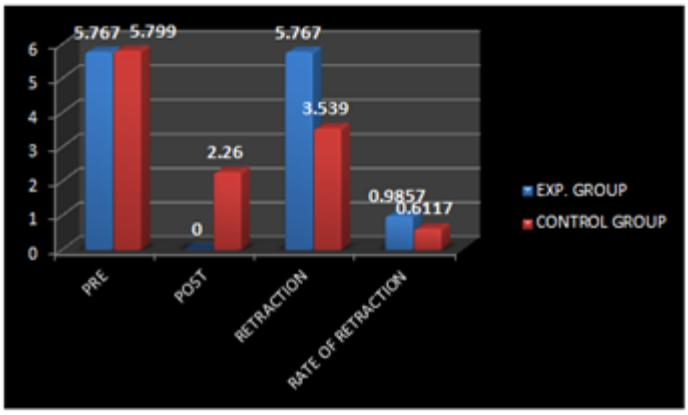
Fig 13: After Completion of Enmasse Retraction (Occlusal View)

Fig 14: Measurement of distance between canine and second premolar in experimental and control sides after completion of Enmasse retraction (T0 and T1)

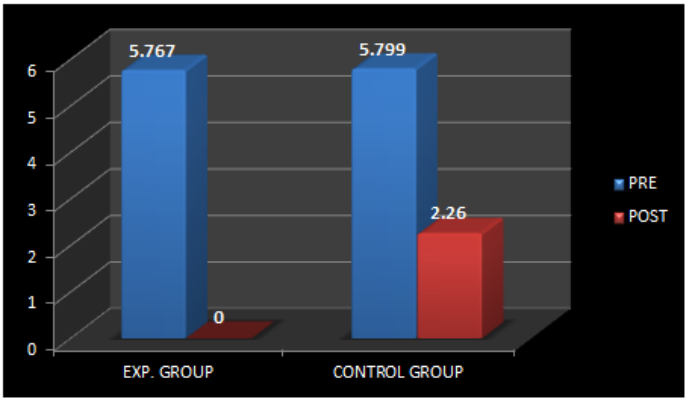
Table 1:Comparison of rate of enmasse retraction with and without microosteoperforations in experimental side and control side.

		Mean	Standard deviation	T	Sig.
Control	Pre	5.7990	1.19715	11.751	0.000 (H.S)
	Post	2.2600	0.72035		
Experimental	Pre	5.7670	1.47250	12.385	0.000 (H.S)
	Post	0	0		
Pre	Exp. Group	5.7670	1.47250	-0.053	0.958(N.S)
	Control group	5.7990	1.19715		
Post	Exp. Group	0	0	9.921	0.000(H.S)
	Control group	2.2600	0.72035		
Retraction	Exp. group	5.7670	1.47250	4.018	0.001(H.S)
	Control group	3.5390	0.95234		
Rate of retraction (mm per month)	Exp. Group	0.9857	0.11871	6.721	0.000(H.S)
	Control group	0.6117	0.12987		

p>0.05, S – Significant



Graph 1: Comparison of the enmasse retraction with and without microosteoperforations in experimental side and control side.



Graph 2: Comparison of the enmasse retraction with and without microosteoperforations in experimental side and control side. during the beginning and completion of enmasse retraction