EGYPTIAN DENTAL JOURNAL

VOL. 62, 1113:1119, JANUARY, 2016

I.S.S.N 0070-9484

WWW.EDA-EGYPT.ORG

COMPARISON BETWEEN THE EFFECT OF CORTICOTOMY AND LOW LEVEL LASER THERAPY ON PERIODONTAL HEALTH

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ABSTRACT

The aim of the present study is compare between the effect of surgical corticotomy and LLLT on the periodontal health.

Methods: Orthodontic patients whom treatment necessitated maxillary 1st premolar extraction followed by canine retraction, were recruited. Pre-intervention periodontal assessment was performed. At the day of premolar extraction, both interventions (corticotomy and LLLT) were randomly allocated to both sides of maxillary arch followed by canine retraction. Post-retraction periodontal assessment was done 6 months after start of canine retraction.

Results: A statistical significant decrease by (0.29±0.57mm and 0.49± 0.75mm) was found in the gingival margin level of the maxillary lateral incisor on the corticotomy and Laser sides respectively. No statistical significant difference was found between both sides.

Conclusions: Both interventions showed the same minor changes in the level of the gingival margin of maxillary lateral incisor.

INTRODUCTION

Orthodontic treatment always aims to achieve its esthetic and functional goals with the maximum benefits and the least side effects. For several decades, surgical corticotomy was proven to be an effective and safe method to accelerate OTM[1,2,3,4]. Soft Laser therapy is a special category of Laser application in orthodontic treatment. It is known as soft Laser therapy or low level Laser therapy (LLLT). The discovery of biostimulatory effect of LLLT in 1967[5] paved its way to be used in many indications especially in acceleration of OTM[6]. The aim of the present study is compare between the effect of surgical corticotomy and LLLT on the periodontal health.

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Participants, eligibility criteria and study settings

Patients were recruited according to the following criteria: age range from 16 years to 25 years from both sex, malocclusion that required extraction of the maxillary first premolars followed by canine retraction, normal shape and structure of maxillary canines and patients with healthy periodontal condition. Patients with craniofacial anomalies e.g. cleft lip and palate patients and patients a history of chronic diseases or drug therapy that might affect OTM were excluded from the study.

Interventions

After patients' recruitment and declaring their consent, orthodontic treatment was started by placement of fixed orthodontic appliance*. Upon completion of leveling and alignment stage, periodontal charting was recorded via measurement of the probing depth, gingival margin, plaque index and gingival index of maxillary teeth. Patient was referred to the oral surgery department for extraction of both 1st maxillary premolars.

Low Level Laser Therapy was applied to the assigned side using Laser machine (Biolase Epic 10 Console) with the following criteria: active medium: In-Ga-As Semi-conductor diode and wavelength: 940 ± 10nm. Parameters of soft Laser application for acceleration of tooth movement was adjusted according to manufacturer instructions as following: Power output: 1.43 W/cm^2, continuous wave, 300 seconds, total energy density: 29.3 J/cm^2. The active Laser tip was held against the buccal mucosa at the mid root area of the canine (Figure 1). Laser regimen was performed as single point application according the following time table: L0: At the day of first premolars extraction, L1: after one week, L2: after two weeks, L3: after three weeks. Then every two weeks until the end of the study, i.e. four months after the start of canine retraction.

As for surgical corticotomy, the following steps were followed: Scalpel blade (number 15c) was used to make the bucco-labial incision. Apical limit of the decortication was marked on the bone using number 2 surgical fissure bur. Then, by using a number 2 round bur mounted on low-speed hand piece (22000 to 27000 rpm) and under copious saline irrigation, corticotomy perforations were made around the root of the maxillary canine. Ten to fifteen cortication were made according to the canine root length (Figure 1). Finally, the flap was carefully repositioned and sutured with resorbable 5-0 Vicryl by using the single interrupted technique.

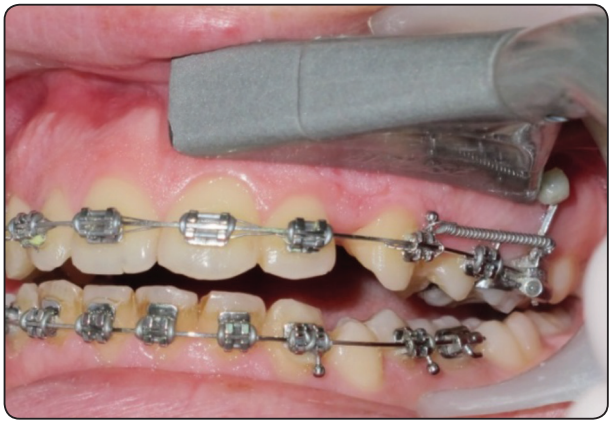

Fig. (1) Active Laser tip

Periodontal evaluation

Periodontal charting was done 6 months after the start of canine retraction. The final periodontal charting was done. All periodontal measurements were done by the same periodontist who were blinded for the assignment of either intervention to a particular maxillary side. Probing depth and gingival margin measurements were done for the whole sample (20 patients), while data for gingival and plaque indices were completely recorded for only 12 patients.

Clinical parameters for assessment of periodontal condition

* Ormco-Mini 2000, adhesive: Green gloo (Ormco) for metal brackets, Medicime glass ionomer(Promedica) for bands

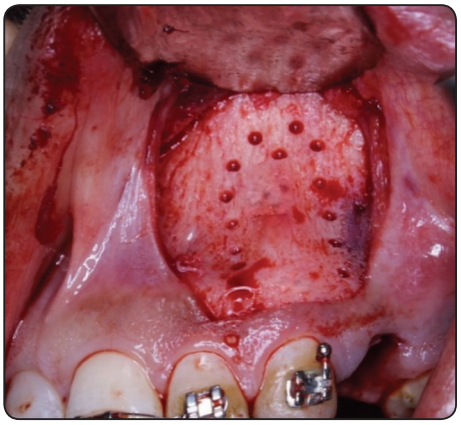

Fig. (2) Surgical decortication

Probing depth

Periodontal depth was measured from the free gingival margin to the base of the sulcus using Williams graduated periodontal probe. The probe was inserted parallel to the long axis of the tooth using light force, readings were approximated to the nearest 0.1 (Figure 3).

Gingival recession

Gingival recession was measured using the periodontal probe as the distance from the cemento-enamel junction to the free gingival margin.

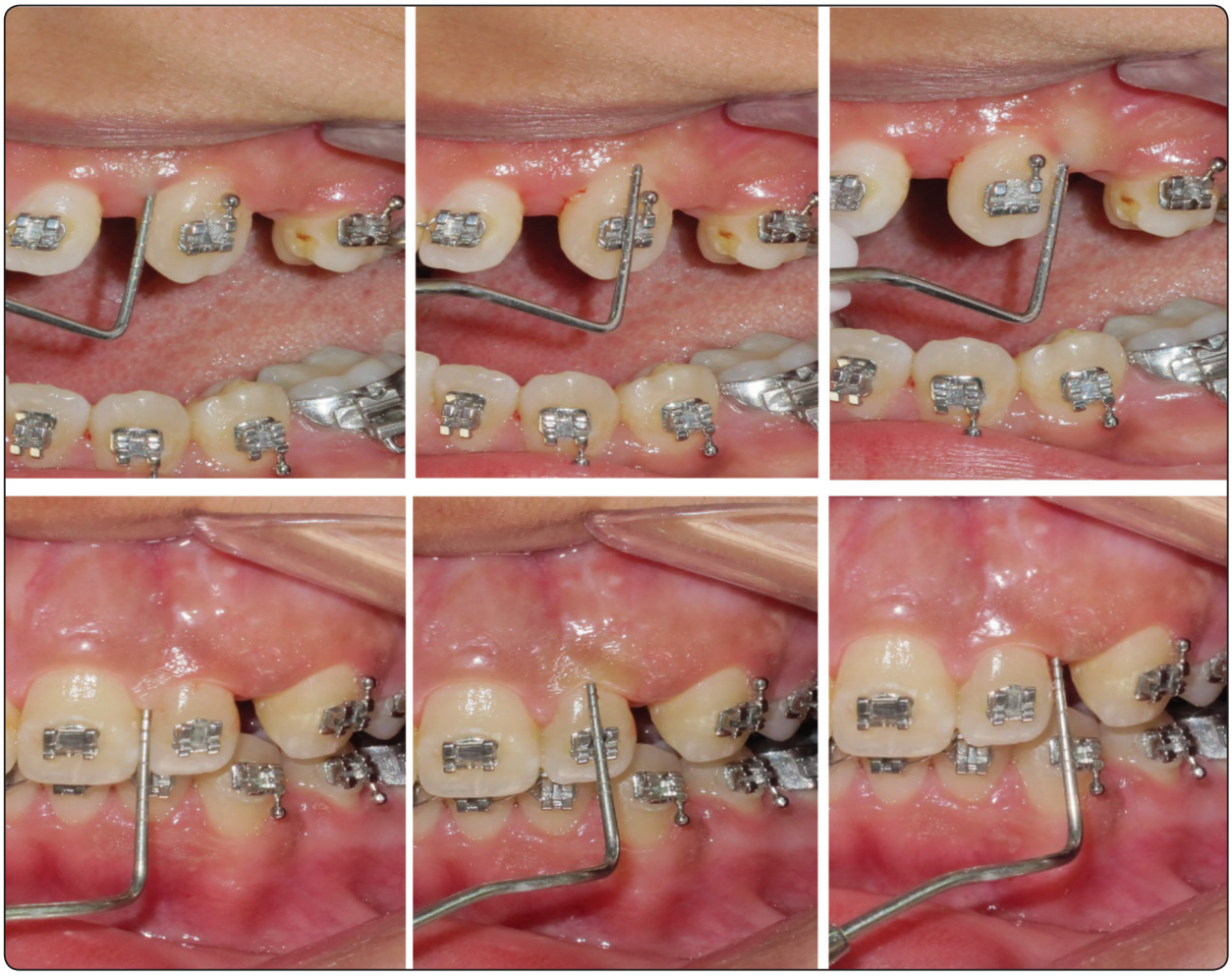

Fig. (3) Measurements of periodontal pocket depth and gingival margin of maxillary canine and lateral incisor at: (a): mesio-labial, (b): mid-labial and (c): disto-labial aspects

Measurements of periodontal depth and gingival margin were recorded for maxillary laterals and canine teeth. Three labial aspects of each tooth were examined: mesio-labial, mid-labial and disto-labial aspects (Figure 3*)*.

Gingival and plaque indices

Gingival and plaque indices were recorded from the central incisor to the 1st premolar in pre-retraction stage and from central incisor to the 2nd premolar in the post-retraction stage on both sides. Six aspects of each tooth were examined: mesio-labial, mid-labial, disto-labial, mesio-lingual, mid-lingual and disto-lingual.

Gingival and plaque indices were recorded according to Silness and Loe methods[8]. Final scores were obtained as a percentage of the total score of all teeth examined divided by the number of all sites examined.

RESULTS

Tests of normality showed that variables used for periodontal evaluation were not normally distributed, consequently non-parametric tests were used. Parametric tests were also added and the results were similar for both tests. Variables for periodontal evaluation were assessed at 2 observation time: pre-intervention and post-retraction.

Corticotomy side

Tables 1 shows results for the paired sample t test comparing the pre and post-evaluation periodontal variables on the corticotomy side. A statistical significant decrease in the mean value of gingival margin level of the maxillary lateral incisor by 0.29±0.57mm in the post-evaluation period was found (table 1). Mean score of gingival index showed an increase from 131.7% to 160% in the post-evaluation period and that increase was statistically significant (table 1). No statistical significant differences were found for periodontal

TABLE (1) Paired sample t test results (18 patients) for the Pre and Post-evaluation mean periodontal pocket depth (mm) and level of gingival margin (mm) of the maxillary lateral incisor and canine on the corticotomy side

		N	Mean	Std. Deviation	Mean diff.	Std. Deviation	Std Error Mean	t	df	P-value
PD2	Pre	18	1.98	0.50	-0.12	0.66	0.15	-0.79	17	0.44123 *
	Post	18	1.86	0.40						
PD3	Pre	18	2.21	0.66	0.02	0.85	0.20	0.08	17	0.93468
	Post	18	2.23	0.43						
GM2	Pre	18	1.94	0.64	-0.29	0.57	0.13	-2.19	17	0.04272 **
	Post	18	1.65	0.81						
GM3	Pre	18	2.63	0.72	-0.03	.03	0.24	-0.14	17	0.89236
	Post	18	2.60	0.59						
GI	Pre	12	131.67	19.92	28.33	34.07	9.83	2.88	11	0.01494 *
	Post	12	160.00	27.30						
PI	Pre	12	104.17	6.69	-2.50	4.52	1.31	-1.91	11	0.08186 **
	Post	12	101.67	3.89						

**** P < 0.05 Significant ** P > 0.05 Non-Significant***

pocket depth of the maxillary lateral incisor and canine, gingival margin level of maxillary canine and the plaque index at the 2 observation time (tables 1).

Laser side

Table 2 shows results for the sample t test comparing the pre and post-evaluation measurements of periodontal variables within the Laser side. A statistical significant decrease in the mean value of gingival margin level of the maxillary lateral incisor was found to be 0.49± 0.75mm in the post-evaluation period (table 2). Mean score of gingival index was increased from 129.2% to 152.5% in the post-evaluation period and that increase was statistically significant (table 2). No statistical significant differences were found for periodontal pocket depth of maxillary lateral incisor and canine, gingival margin level of maxillary canine and the plaque index at the 2 observation time (tables2).

Comparison between the corticotomy and the Laser sides regarding the periodontal evaluation

Tables 3and 4 show results for the independent sample t test comparing the pre and post-evaluation of the periodontal variables on both sides (corticotomy and Laser). Non statistical significant difference was found in all periodontal variables including periodontal pocket depth and gingival margin of maxillary lateral incisor and canine, plaque index and gingival index.

TABLE (2) Paired sample t test results (12) for the Pre and Post-evaluation for periodontal parameters of the maxillary lateral incisor and canine on the Laser side

		N	Mean	Std. Deviation	Mean	Std. Deviation	Std Error Mean	t	df	P-value
PD2	Pre	12	1.85	0.68	-0.14	0.89	0.21	-0.69	17	0.50036 **
	Post	12	1.71	0.49						
PD3	Pre	12	2.13	0.47	0.04	0.81	0.19	0.20	17	0.84191
	Post	12	2.17	0.53						
GM2	Pre	12	2.07	0.62	-0.49	0.75	0.18	-2.81	17	0.01196 *
	Post	12	1.58	0.72						
GM3	Pre	12	2.51	0.56	0.23	0.77	0.18	1.26	17	0.22505
	Post	12	2.74	0.55						
GI	Pre	12	129.17	18.81	23.33	37.01	10.68	2.18	11	0.05150 *
	Post	12	152.50	28.64						
PI	Pre	12	102.50	4.52	-0.83	6.69	1.93	0.43	11	0.67424 **
	Post	12	101.67	3.89						

TABLE (3) Independent samples t test results for the Pre and Post mean periodontal pocket depth (mm) and level of gingival margin (mm) of the maxillary lateral incisor and canine on the corticotomy and Laser sides

		N	Mean	Std. Deviation	Mean Diff.	Std. Error Difference	df	t	P-value *
PD2	Corticotomy	18	-0.12	0.66	0.02	0.26	34	0.09	0.93260
	Laser	18	-0.14	0.89					
PD3	Corticotomy	18	0.02	0.85	-0.02	0.28	34	-0.08	0.93665
	Laser	18	0.04	0.81					
GM2	Corticotomy	18	-0.29	0.57	0.20	0.22	34	0.90	0.37238
	Laser	18	-0.49	0.75					
GM3	Corticotomy	18	-0.03	1.03	-0.26	0.30	34	-0.86	0.39438
	Laser	18	0.23	0.77					

TABLE (4) Independent samples t test results (12 cases) for the Pre and Post mean score (%) of gingival and plaque indices in the corticotomy and Laser sides

		N	Mean	Std. Deviation	Mean Diff.	Std.Error Difference	df	t	P-value*
GI	Corticotomy	12	28.33	34.07	5.00	14.52	22	0.34	0.73387
	Laser	12	23.33	37.01					
PI	Corticotomy	12	-2.50	4.52	-1.67	2.33	22	-0.72	0.48196
	Laser	12	-0.83	6.69					

DISCUSSION

Pre and post-periodontal evaluation on the corticotomy side revealed no statistical significant difference regarding the periodontal pocket depth of the maxillary canine and lateral incisor and gingival margin of the maxillary canine. These results may be attributed to the conservative design of the surgical corticotomy used in the current study, which was also advocated by **Aboul-Ela et al**[9]**, S. Abed** and **Al Bustani et al**[17]**.** These latter authors confirmed our results regarding the safety of the corticotomy procedure on the periodontal health. Similarly, the Laser side showed no statistical significant difference for the previously mentioned periodontal parameters.

As for gingival margin of the maxillary lateral incisor and gingival index, a statistical significant change was found on each intervention side after 5 to 6 months duration. The gingival recession was recorded to be 0.29mm ± 0.57mm on the corticotomy side and 0.49mm ± 0.75mm on the Laser side, while gingival index was increased by 28.33mm ± 34.07 on the corticotomy side and by 23.33 ± 37.01 on the Laser side. Although, these parameters were statistically significant for each intervention side, there was no statistical significant difference when corticotomy and Laser sides were compared. We assumed that, this minor gingival recession of the lateral incisor, found on both intervention sides, may be attributed to the gingival traction accompanying

the distal movement of maxillary canine, rather than the effect of either intervention. Morphologic gingival changes during canine retraction were illustrated by some investigators. As regard the gingival index, **Aboul-Ela et al**[9] reported an increase on the corticotomy side compared to the control. They attributed such a change to be due to time required for complete resolution of the RAP that usually accompany corticotomy procedure. Because nearly the same increase in gingival index was observed on the Laser side as well, we can speculate that these gingival changes may represent specific tissue reaction of each intervention i.e. RAP on the corticotomy side and the heating effect of Laser therapy on the contralateral side. Other assumption may be explained due to time changes while having the orthodontic appliance in place i.e. effect of orthodontic appliance on both sides after 6 months follow up period. The latter finding was confirmed by **Genc et al**[11].

CONCLUSIONS

Both interventions for acceleration of OTM (corticotomy and Laser) showed the same changes in the level of the gingival margin of maxillary lateral incisor and the gingival index score. These changes were considered of minor clinical significance.

REFERENCES

1. Long H, Pyakurel U, Wang Y, Liao L, Zhou Y, Lai W. Interventions for accelerating orthodontic tooth movement: a systematic review. Angle Orthod. 2013 Jan; 83(1):164–71.
2. Gkantidis N, Mistakidis I, Kouskoura T, Pandis N. Effectiveness of non-conventional methods for accelerated orthodontic tooth movement: a systematic review and meta-analysis. J Dent. Elsevier Ltd; 2014 Oct; 42(10):1300–19.
3. Hoogeveen EJ, Jansma J, Ren Y. Surgically facilitated orthodontic treatment: a systematic review. Am J Orthod Dentofacial Orthop. American Association of Orthodontists; 2014 Apr; 145(4 Suppl):S51–64.
4. Kalemaj Z. Efficacy of surgical and non-surgical interventions on accelerating orthodontic tooth movement : Eur J Oral Implant. 2015;8(1):9–24.
5. Mester E, Szende B, Gartner P. The effect of laser beams on the growth of hair in mice. Radiobiol Radiother 1968;9:621-6.
6. Doshi-Mehta G, Bhad-Patil W. Efficacy of low-intensity laser therapy in reducing treatment time and orthodontic pain: a clinical investigation. Am J Orthod Dentofacial Orthop. 2012 Mar;141(3):289–97.
7. Zahnmdizinische Kliniken der Universitat Bern. Periodontal chart online. Http://www.periodontalchart-online.com/uk/index.asp.
8. Loe H, John S. Periodontal Disease in Pregnancy I. Prevalence and Severity. Acta Odontol Scand. 1963; 21(2):531–55.
9. Aboul-Ela SM, El-Beialy AR, El-Sayed KMF, Selim EMN, El-Mangoury NH, Mostafa YA. Miniscrew implant-supported maxillary canine retraction with and without corticotomy-facilitated orthodontics. Am J Orthod Dentofacial Orthop. 2011 Feb;139(2):252–9.
10. S.Abed, A. Al Bustani. Corticotomy assisted orthodontic canine retraction. J Bagh Coll Dentistry. 2013;25(1):160–6.
11. Genc G, Kocadereli I, Tasar F, Kilinc K, El S, Sarkarati B. Effect of low-level laser therapy (LLLT) on orthodontic tooth movement. Lasers Med Sci. 2013 Jan; 28(1):41–7.