

ASSESSMENT OF THE PAIN PERCEPTION FOLLOWING PIEZOTOME - CORTICISION ASSISTED ORTHODONTICS DURING RETRACTION OF CANINE (RANDOMIZED CLINICAL TRIAL)

Samer Al Refaii¹, Nadia El Harouni², Aly Osman³

Abstract

Objectives: The aim of this study to assess the patient perception of pain, discomfort satisfaction after piezotome-corticision assisted. **Methods:** Fifteen patients were submitted for upper first premolars extraction to facilitate canine retraction. They were randomly divided into test and control side. On the test side the canine was retracted using piezosurgery, while at control side without piezosurgery. Both groups were loaded with 150g for canine retraction. Pain, swelling and discomfort were evaluated at day 1, 3, 5 and 7 after piezosurgery using a questionnaire. **Results:** At all times, pain was greater in the test side, although the intensity of pain in the test side was in the mild range, while for day 7 there was no statistically significant difference on either sides. The swelling was statistically significant between the test and the control side at day 1 and 3, whereas there was no statistically significant difference at day 5 and 7. The discomfort was statistically significant at day 1 and 5 at the test side, while there was no discomfort at the control side. **Conclusion:** Patients reported only mild pain locally at the spot of precision as well as mild swelling and discomfort on test side.

(Keywords: Piezotome-corticision assisted orthodontics - pain - swelling)

Introduction:

Pain during orthodontic treatment is a topic of concern. The pain perception from the orthodontic treatment may increase 1 day after the start of the treatment than reduced to normal levels 7 days later ⁽¹⁾. As corticotomy

has gained orthodontist's attention as a means of accelerating treatment time, it might be faced with patient avoidance due to anxiety and fear of pain ⁽²⁾. Most patients reported pain and discomfort during orthodontic treatment ⁽³⁾. Therefore, patients might be concerned about pain after the piezotome-corticision procedure. The corticotomy-assisted orthodontics acceptance among patients were generally low, may be due to the invasive procedures and postoperative discomfort and complications ⁽⁴⁾. The introduction of flapless piezocision-assisted corticotomy has been found to have some advantages over the traditional methods of corticotomy and is considered a minimally invasive tooth acceleration technique ⁽⁵⁾. Although various techniques of piezocision flapless corticotomy have been reported to be successful in practice ⁽⁶⁾, scientific evidence on their accompanying pain, discomfort, acceptance and quality of life is little in the literature and more high-quality RCTs investigating those aspects are required. In a study by Tseng et al ⁽⁷⁾ that assessed the pain perception following mini-implant assisted orthodontics using a Visual Analogue Scale (VAS), pain perception peaked 24 hours following the procedure. In another study by Chen et al ⁽⁸⁾ that assessed changes in the level of pain in patients undergoing microimplants, no significant difference was seen in the pain generated in comparison to other orthodontic

¹ Clinical Assistant Prof, Department of Developmental Sciences, Faculty of Dentistry, Beirut Arab University, Lebanon

² Professorm Department of Orthodontics, Faculty of Dentistry, Beirut Arab University, Lebanon

³ Assistant Prof, Department of Developmental Sciences, Faculty of Dentistry, Beirut Arab University, Lebanon

procedures. The highest intensity of pain was 40 mm or more in mean VAS score the day after placement of an elastic separator, appliance, or archwire, and fell to less than 10 mm 7 days later. However, the experience of pain varies substantially among subjects. Therefore, we promoted this study to assess to assess the patient perception of pain, discomfort, and satisfaction between piezotome-corticision assisted and conventional orthodontics using questionnaires.

Materials and Methods:

The estimated sample size was calculated according to <http://epitools.ausvet.com.au>, by taking the means and the variance of a similar study conducted by Al Naoum et al ⁽⁹⁾ where the mean for the test side was 0.739 and the mean for the control side was 0.201 and the variance was 0.133, the confidence level was set to 95% and the power was set on 80%. The calculated sample size was 14 patients. Ten percent was added to the sample size to eliminate the probability of dropout throughout the treatment. Therefore, 15 patients (30 operating sides) who required for first premolar extraction were recruited from the outpatient clinics Department of Orthodontics, Faculty of Dentistry.

The selected patients were fulfilling the following inclusion and exclusion criteria according to Cassetta et al ⁽⁴⁾: patient's age ranged from 18-30 years with Class II division 1 malocclusion, in which extraction of upper first premolars are required. All patients exhibited a good oral and gingival health. The study was a split mouth design, each patient had a test side (T) and the control side (C). Randomization was performed of the selected side by tossing a coin, the face was the test side (T) and the back was the control side (C) for

both right and left side. *Pre-surgical phase:* Fabrication of TPA in the lab and then cementation on the upper first molars for anchorage considerations. Maxillary teeth on second premolar to second premolar were bonded with 0.018-inch slot brackets. Leveling and aligning started with 0.14 NiTi wire till reaching heavy arch wire 0.16x0.22 stainless steel. Patients were asked to rinse with mouth wash before the surgical intervention. Local anesthetic was injected using Lidocaine hydrochloride 2%. The local anesthesia was administrated through infiltration beside the upper canine.

Surgical phase; the test sides underwent the piezotome-corticision procedure after one month of extraction of upper first premolar. This procedure was performed by the technique explained by Kesser et al ⁽¹⁰⁾. Bard-Parker blade (15C) was used to make incisions through the gingiva, 4mm above the interdental papilla to save the coronal attached gingiva. The incisions were 4mm in length mesial and distal to the upper canine. After the incisions were made, the gingiva was slightly elevated laterally by the aid of periosteal elevator to visualize the bone. A piezosurgery insert(OT7) which is an ultrasonic microsaw, was used to create the cortical alveolar incisions to a depth of 1mm within the cortical bone. The vertical level of the measurement was established to be 4mm apical to the crest of the alveolar bone.

Immediately after the piezosurgery, the canines of the test and control sides were moved distally along the orthodontic wire with a continuous force of 150g ⁽¹¹⁾ using nickel titanium closed coil springs on 0.016 × 0.022-in stainless steel arch wires. Pain was evaluated at the following assessment times at day 1, day 3, day 5 and day 7 after piezosurgery procedure, using a questionnaire.

The questionnaire contained 5 questions that used a 4-point scale and one question used a 3-point scale.⁽⁹⁾ The patients were asked to mark their subjective opinion about pain during eating, pain during the day, pain that awakened them during the night and the feeling of the swelling and discomfort on the test side as well as on the control side using a Visual Analogue Scale (VAS)

The VAS is a simple, reproducible scale that allows the severity of the pain

experienced to be expressed as a numeric value. The VAS is represented as a plain horizontal 10 cm line. The patients were instructed to bisect the line at a point appropriate to their present discomfort.

A 0 value was regarded to be pain free whereas the most severe pain was rated at 10. (It was arbitrarily defined that a score of 9 or 10 was very severe, 7 or 8 severe, 5 or 6 moderate, 3 or 4 mild, and 1 or 2 asymptomatic)⁽¹²⁾ (fig.1).

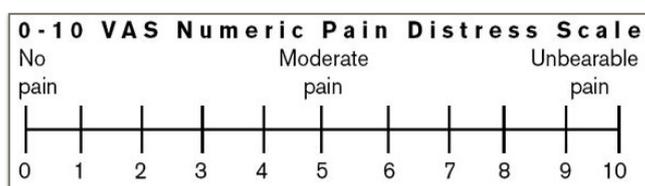


Fig. (1): Visual Analogue Scale, the patient selects the intensity of pain.

Statistical analysis:

The mean and standard deviation of the various variables were calculated. To calculate the change from one time point to the next, the values were subtracted. Normality was checked using Kolmogrov Smirnov test. Differences were compared between groups using paired t test and Wilcoxon signed ranks test as indicated. P< 0.05 was considered to be

statistically significant. Statistical analysis was conducted using SPSS version 22.0.

Results

There were significantly more pain on the test than the control sides during the day at day 1 and day 3, where as there were no statistically significant differences between test and control groups at day 5 and day 7, although pain on the test side was in the mild range (fig2).

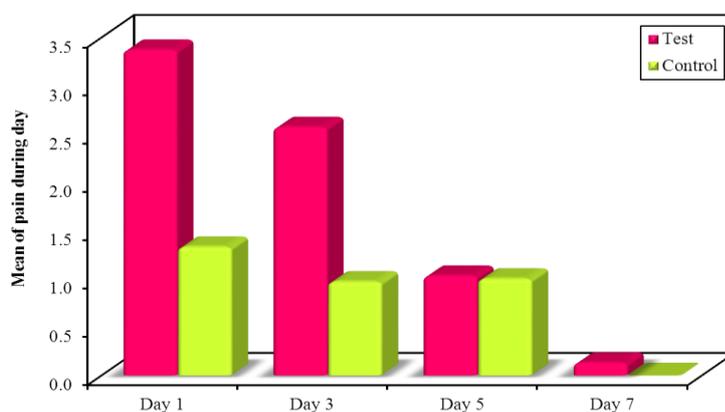


Fig (2): Comparison between the studied groups according to pain during day.

There were statistically significant differences between the test and control sides in pain during night at day 1 and day 3, where as there

were no statistically significant differences between test and control groups at day 5 and day 7 (fig.3).

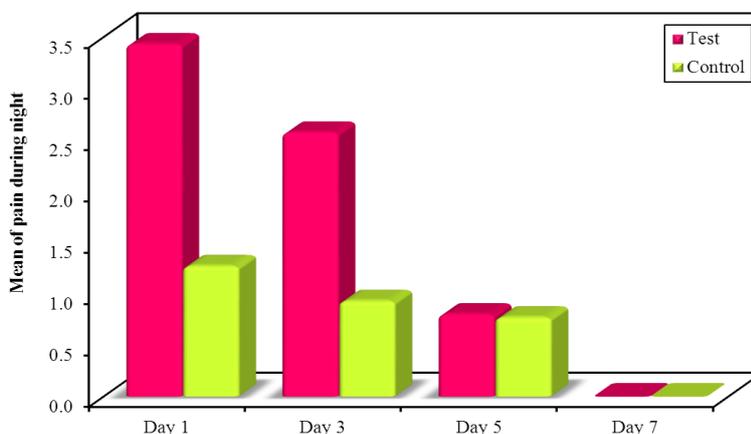


Fig (3): Comparison between the studied groups according to pain during night.

There were statistically significant differences between the test and control sides in discomfort at day 1 and day 3, where as there were no statistically significant differences at day 5 and

day 7. The discomfort was significant at day 1 and day 3 on the test side where as there were no discomfort at the control side (fig.4).

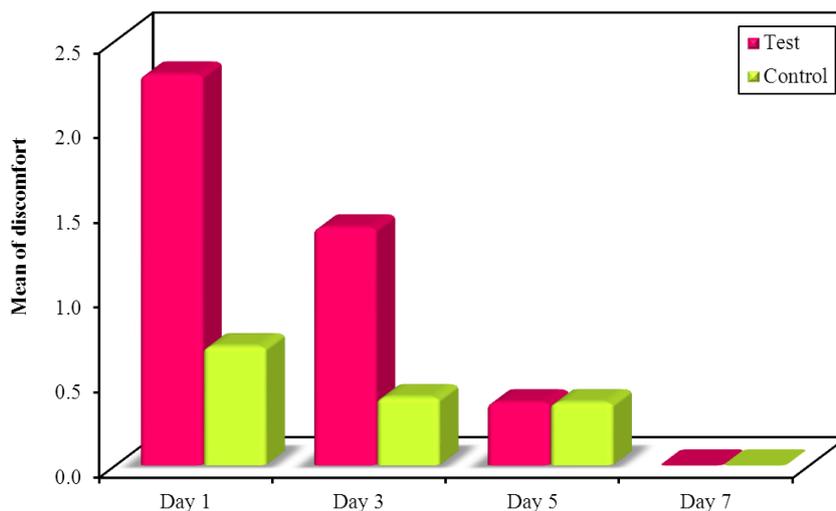


Fig (4): Comparison between the studied groups according to discomfort.

Discussion:

Treatment time is an important issue for orthodontic patients. In recent decades major efforts have been made to shorten the length of treatment to minimize the complications and to increase satisfaction of the patient. Multiple approaches have been demonstrated to enhance the rate of orthodontic tooth movement, such procedures as local injection of prostaglandins which is biochemical in nature and have been limited to animals.

The combination of orthodontics and corticotomies described up to 2009, show a positive power in terms of reducing overall orthodontic treatment times⁽¹³⁾. However, these techniques have not been widely embraced by the dental community since they require extensive full thickness flap elevation and in cases of osteotomy, an invasive procedure associated with postoperative discomfort and a high risk of complications such as possible damage to teeth and bone, possible marginal osteonecrosis risk and impair bone regeneration leading to a low acceptance by the patient⁽¹⁴⁾.

High pain was detected during eating for the first 2 days. The level of pain began to decrease at the third day and continued decreasing until the end of the first week. A high proportion of patients had moderate to severe swelling immediately after corticotomy that had decreased substantially at 1 week postoperatively.⁽⁹⁾

Piezoelectric incisions are now suggested because of their safety and effectiveness in different types of surgeries⁽¹⁵⁾. It is a micrometric and selective cut procedure in which precise osteotomies is done without any osteonecrosis⁽¹⁶⁾. Similar clinical outcomes were demonstrated between piezocision and classical decortication but piezocision has the added advantages of being quick, minimally invasive, and less traumatic to the patient. It

takes typically 1 hour to complete both arches as compare to 3 to 4 hours with earlier methods⁽¹⁷⁾. This technique is quite flexible because it allows soft-tissue grafting at the time of surgery to correct mucogingival defects if needed, as well as bone grafting in selected areas by using localized tunneling.

The present study design was a randomized controlled clinical trial that engaged the split-mouth technique. Randomization was employed to assign both the test and control sides for each patient. The advantage of the split-mouth design was the elimination of the inter-subject variability. The present findings assessment of pain during day and night were similar to those conducted by Al-Naom et al, but with a moderate pain. The difference in the level of pain maybe attributed to the more invasive technique that used in the study by Al Naom et al.⁽⁹⁾

This finding was generally in agreement with the clinical observations of Wilco et al⁽¹⁸⁾. Regarding discomfort was significantly higher in the test side during day 1 and 3 than that of the control side but within a mild intensity. Regarding the question was postured about which was the more disturbing experience between the two surgical procedures (premolars extraction vs piezosurgery), all the patients stated that premolars extraction had been more painful.

This finding maybe attributed that the piezosurgery was conducted on one side only while extraction of premolars on both side and also this piezosurgery procedure conducted in the current study appeared to be well tolerated by the patients with mild pain in general.

Conclusion:

- Piezocision is an innovative, minimal invasive, flapless procedure and less traumatic for the patient.

- Patients reported only mild pain locally at the spot of piezocision as well as mild swelling on the test side.

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