https://doi.org/10.48047/AFJBS.6.14.2024.3619-3626

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Pain Evaluation for A Self-Ligating Bracket System Combined with Corticision: A Controlled Clinical Trial

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Article History

Volume 6, **Issue** xx, 2024

Received: 03 July 2024

Accepted: 11 August 2024

doi: 10.48047/AFJBS.6.14.2024.3619-3626

Summary:

Objectives: The present study aimed to assess delayed pain for the first week during corticision combined with installation self-ligating bracket system.

Patients and methods: The present study included sixteen patients divided into two groups: a corticision group that included eight patients treated by self-ligating bracket systems combined with a corticision, and a control group of eight patients treated only by self-ligating bracket systems. The primary outcome was the delayed pain assessment.

Results: Corticision group recorded pain levels statistically significant increased more than that recorded in control group ($p \leq 0.001$).

Conclusion: Combining the two methods for acceleration of orthodontic tooth movement increase pain level with orthodontic patients.

Keywords: Pain assessment, delayed pain, corticision, self-ligating bracket system, acceleration of orthodontic tooth movement.

1. Introduction

The goal of establishing good esthetics and an attractive smile as well as proper function became easier to achieve nowadays thanks to multi-disciplinary treatment approaches [(1,2)]. The cooperative interaction between periodontology, surgery, prosthodontics, orthodontics and other dentistry fields contributes to obtaining and maintaining good oral and dental health and esthetics. Despite the great role that orthodontics plays in these approaches, it has a basic disadvantage; long treatment duration [(3-5)].

It is a fact that treatment duration is dependent to a great extent on the nature and severity of the defect being treated. Other factors determining the treatment duration include the treatment plan,

orthodontic maneuver, the patient compliance to instructions of treatment and appointments and maintaining oral hygiene [6-8].

Prolonged treatment duration negatively affects patient compliance regarding types of food being consumed and oral hygiene maintenance and also has its negative psychological effects regarding esthetics especially when orthodontic appliances being used have prominent metallic or non-cosmetic display [9-11]. Clinically, long duration of treatment increases enamel demineralization, dental caries, gingival inflammation and recession, periodontal damage and root resorption [12-14]. A long-term orthodontic therapy would also increase the financial cost on both the patient and the orthodontist and take much from their time and effort [15-17].

Also, the introduction of self-ligating bracket systems attracted the attention for the potential role of low friction mechanics in acceleration of orthodontic tooth movement. It has two types; active and passive. Both types were found to reduce not only the chair time at orthodontic clinic but also the orthodontic treatment duration as a whole [18-22].

The present study aimed to assess delayed pain for the first week during corticision combined with installation self-ligating bracket system.

Patients and methods

Study design

This was a prospective randomized controlled clinical study.

Sample size calculation

Based on Abdarazik et al. (2020), and Kim et al. (2009) and using the G*Power statistical power analysis program (version 3.1.9.4) for sample size determination, a total sample size (n = 16; subdivided to 8 in each group).

Inclusion criteria

The sample included good oral and general health class I orthodontic patients with mild-to-moderate crowding of the upper anterior segment (2–4 mm), in, with no systemic disease or regular medication that could interfere or affect orthodontic teeth movement, and no previous orthodontic treatment, with all permanent teeth erupted.

Study groups

Two groups were randomly created from the sample:

The experimental group included eight patients treated by corticision as a minimally invasive surgical technique for accelerating OTM, combined with self-ligating bracket systems as fixed orthodontic appliances.

The control group included eight patients treated only by self-ligating bracket systems used as fixed orthodontic appliances.

Orthodontic records

The following standardized orthodontic records were taken for each patient for both groups:

1. Extraoral and intraoral photographs before and after orthodontic treatment;
2. Digital lateral cephalometric radiographs before and after orthodontic treatment; and
3. Digital panoramic radiographs before and after orthodontic treatment.
4. Questionnaire for first week after installation of self- ligating bracket system (every day) to assess delayed pain.

Interventional steps:

Experimental group

All teeth were bonded with a self-ligating Roth’s prescription pre-adjusted edgewise bracket system), then the first molars in both dental arches were bonded with Roth’s prescription pre-

adjusted buccal tubes Next, a light-cured orthodontic adhesive was used to bond the brackets and tubes on the labial and buccal surfaces of the teeth

Before starting treatment, corticision was performed as follows: The inter-dental distances were determined to be adequate for the procedure using the panoramic radiograph. Then, an antiseptic mouthwash was prescribed prior to the procedure. A topical anesthetic agent was applied, and infiltration anesthesia solution was administered on the sites of corticision.

Heavy 15T scalpel blades with № 3 handles were present. The scalpel was used on the attached gingiva between teeth with an angle of 45°:60°.

A surgical mallet was used to tap the scalpel handle to gradually insert the blade into the gingiva, cancellous bone.

During the same visit in which corticision was performed, the first arch wire was inserted. The wire series was 0.013, 0.016, 0.018, 0.016x0.022, and 0.018x0.025 inch copper-NiTi arch (Figure 1).

Figure 1: intra- oral photographs for patient sample for a corticision group

B. Control group

The same interventional steps were used as in the experimental group, except for the corticision step; no corticision was performed in this group.

Orthodontic outcomes

The present study aimed to assess delayed pain for the first week during corticision combined with installation self-ligating bracket system.

Delayed Pain Evaluation

The pain reported at the first 7 days after insertion of the initial archwire, the initial archwire will be (0.012- or 0.014-inch NiTi) according to the severity of malocclusion present.

Following the initial archwire placement were given a written questionnaire and instructed how to complete and answer it (Table 3). The given questionnaire contained the following questions - Fig.15:

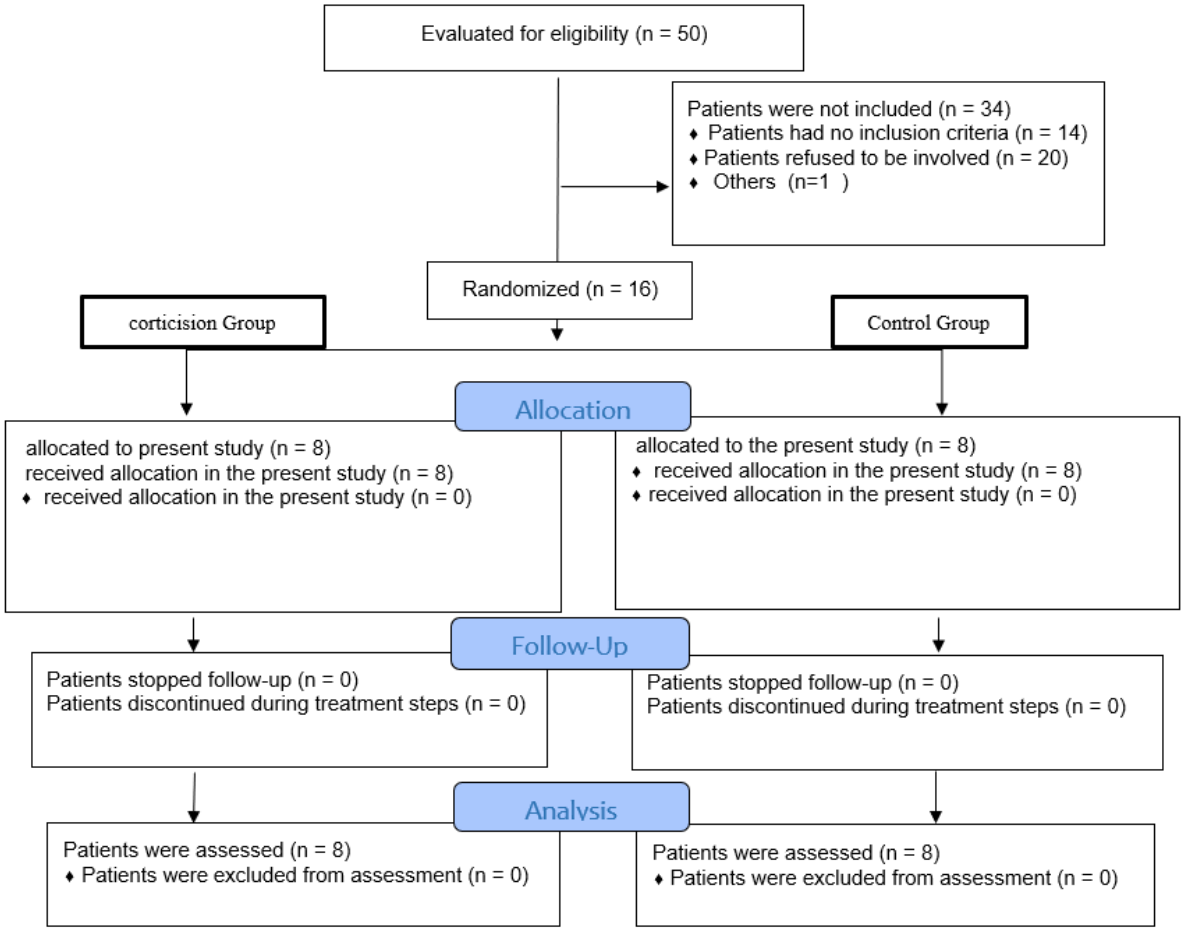
Question1: Have you got pain in (day 1 to day 7), yes, or no?

Question2: Have you consumed any analgesic or pain killers?

Question 3: How much the severity of pain was according to the VAS index?

1- Results

All 16 patients who participated in the present study had a complete delayed pain assessment without any dropouts (see participant flow diagram).



Participants' flow diagram

Delayed pain assessment:

After statistically study of questionnaire that recorded from patients, the following values were obtained (Table.1):

Table (1) Descriptive statistics of Pain Level after Initial Wire Placement-Delayed Pain according to (VAS Index by Linacre) and comparison between groups (Mann Whitney U test):

	Groups	Mean	Std. Dev	Median	Difference	P value

					Mean	Std. Dev	C.I. lower	C.I. upper	
Day 2	**Control Group**	**12.91**	**1.912**	**25.00-**	**17.3**	**4.6**	**9.2**	**9.1**	**.001***
	Experimental Group	**31.3**	**6.2**	**33.1-**					
Day3	**Control Group**	**29.3**	**108.**	**11.2**	**11.3**	**5.2**	**1.3**	**23.1**	**.003***
	Experimental Group	**43.33-**	**14.05**	**33.33-**					
Day4	**Control Group**	**44.4**	**12.1**	**50.9-**	**28.8**	**3.2**	**1603.**	**34.9**	**.001***
	Experimental Group	**73.5**	**3.1**	**63.6**					
Day5	**Control Group**	**43.6**	**15.5**	**44.55**	**16.4**	**6.3**	**3.4**	**29.6**	**.003***
	Experimental Group	**73.6**	**9.7**	**66.93**					
Day6	**Control Group**	**63.6**	**17.11**	**11.5**	**222.2**	**5.83**	**14.30**	**40.70**	**.001***
	Experimental Group	**90.00**	**10.3**	**90.00**					
Day7	**ControlGroup**	**62.85**	**18.8**	**7.6**	**221.1**	**3.1**	**8.1**	**2214.**	**.01***
	Experimental Group	**100.00-**	**00.**	**100.00**					

Significance level $p \leq 0.05$, *significant

Discussion

Sixteen orthodontic patients were chosen for the current study from the outpatient clinic of the Orthodontic Department of the Faculty of Dental Medicine (Boys), Al-Azhar University in Cairo.

In order to properly finish the study, patient cooperation was required, and the patients received strict instructions to follow through on their follow-up appointments and to be totally dedicated to them. So, fortunately, all patients enrolled in the study proceeded until completion, with no one dropped out, so that the statistical analyses were performed on the total pre-calculated sample size [(23)].

Assessment of pain related to fixed orthodontic therapy may differentiate between boys and girls, commonly it's believed that boys can tolerate more pain than girls, regarding orthodontic pain two studies find out that females reported more discomfort/pain than males during fixed appliance

treatment. Concerning orthodontic pain relation with age, most data reveal higher pain levels in adult patients than adolescents and preadolescents [23].

Burstone (1962) classified pain according to time of onset to immediate and delayed pain, immediate pain related to sudden placement of heavy forces while delayed pain related to hyperplasia of PDL which result from a variety of forces magnitude. In the current study we evaluated both types of pain, the immediate pain represented by pain during tying and untying of elastic O-tie modules and delayed pain represented discomfort encountered at first 7 days of archwires activation [24-26].

A variety of pain scales have been used to assess orthodontic pain (VAS by Linacre, MPQ by Melzack etc.) The majority of investigators used VAS scale. VAS scale gives the patient the freedom to choose the exact intensity of pain, easy and no training need, and takes less than 1 minute to complete. In the presenting trial we used VAS scale and prepared questionnaire to evaluate the degree of pain experienced in the first week of appliance activation [27].

The results revealed that the corticision group recorded statistically significant values more that recorded in control group as the corticision act as surgery cause post- operative pain for many hours after surgery this is combined with tissue reactions as a result of response to orthodontic force.

Conclusion

Combining the two methods for acceleration of orthodontic tooth movement increase pain level with orthodontic patients.

Funding: This research did not receive any specific grants from funding agencies in the public, commercial, or not-for-profit sectors.

Patient consent: The objectives of the study were discussed with the patients, parents, or guardians, and an informed consent form and the orthodontic instructions sheet were signed before the start of orthodontic treatment.

Disclosure of interest: The authors declare they have no competing interests.

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