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ORIGINAL ARTICLE

Periodontal Outcome after Surgical Exposure of Bucally Impacted Maxillary Canine

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ABSTRACT

Background: Many clinicians refer to the maxillary and mandibular canines as the "cornerstone" of the arch, and when they are in their ideal position, they are essential in providing a well-balanced occlusal scheme that supports dentofacial balance, harmony, stability, and neuromuscular and functional stability.

Objective: This study examined the variations in periodontal health characteristics between palatally impacted maxillary canines (PIMC) and buccally impacted maxillary canines (BIMC) following open method surgical-orthodontic therapy.

Methods: Total 30 patients were presented in this study. Patients were divided in two groups, group A had 15 patients with unilateral BIMC and group B with unilateral PIMC among 15 patients. A year following surgical-orthodontic therapy, the keratinized tissue and probing depth were measured, and the differences between the two sides were examined.

Results: The BIMC group showed considerably lower keratinized tissue values for canines than for the untreated side (P = 0.004) and significantly larger probing depths for lateral incisors than for the untreated side (P = 0.032). In the PIMC group, no discernible variations were found.

Conclusion: Using an open approach for surgical-orthodontic therapy, we found that in BIMC, the treated tooth lost its periodontal keratinized tissue, and the surrounding lateral incisors lost their periodontal connection.

Keywords: BIMC, PIMC, keratinized tissue

INTRODUCTION

It is not enough to just use orthodontic treatment to realign the afflicted maxillary canine. The patient's ultimate periodontal health is a major factor in determining the treatment success of impacted maxillary canines, especially those with severe effects[1]. Some variables that might influence the periodontal health of maxillary impacted canines after surgery are the surgical approach, the side of the impaction, and orthodontic movement or force traction[2,3]. Incorrect placement of the impacted tooth renders the surgical procedure impractical and prevents the appropriate application of orthodontic pressures[2-4]. There is a lack of information on the effects of the maxillary impacted canine's initial vertical and horizontal position on the periodontal state after closed-eruption surgery[5].

While operating on a sick dog, the open or closed methods are typically used. On teeth that haven't erupted yet, the surgical approach can prevent recession of soft tissues and loss of radicular bone with the correct orthodontic, periodontal, and patient treatment[6]

While performing surgical-orthodontic procedures, doctors are not unanimous as to whether an open or closed[7] surgical approach is preferable for treating palatally-displaced canines.

Reviews of the literature on periodontal results following these two surgical methods for canines with palatal impacts have shown no significant difference[8].

Disimpaction treatment outcomes impact not only the treated teeth but also neighboring teeth and periodontal health due to a dearth of quantitative data on the many force application systems involved. This factor is crucial in determining periodontal and dental outcomes[9], since the material used in conventional fixed orthodontic procedures could have a varied effect on the periodontal health.

For lasting stability, it is essential to have an aesthetically pleasing, balanced, and mutually protective occlusal system, and dogs are an integral part of this. They are vital when the doctor is aiming for a canine-guided functional occlusion. A group function occlusion may be the goal of the treating clinician, depending on the patient's clinical presentation. There has been no change to the dog's primary role in this situation. However, there is currently no proof that a group function occlusion is superior than a canine-guided occlusion[10]

The literature reports occurrences of canine impaction ranging from 0.9% to 3%, with females experiencing a higher prevalence than males. There are three main types of canine impaction risk factors: genetic, systemic, and localized. An extremely rare occurrence called transmigration of the afflicted canine occurs when the unerupted canine migrates toward the midline. Between 0.1 and 0.41 percent of cases involve transmigration, with a higher prevalence in the mandible compared to the maxilla. The twelfth Many jaw anomalies, such as cyst formation, crowding in the mandibular arch, retained deciduous canines, odontomas, and trauma histories, can lead to mandibular canine impaction and transmigration. Canine development and eruption abnormalities can lead to a number of significant complications, including the resorption of neighboring teeth's roots (typically the lateral incisors), the formation of follicular cysts, and cosmetic problems. It is critical to identify and treat impacted canines promptly in order to provide adequate occlusion, function, stability, and occlusal harmony.

MATERIALS AND METHODS

This prospective/observational study was conducted at CMH institute of Medical Sciences / CIMS Dental College Multan/ Nishtar Institute of Dentistry Multan from March 2023 to October 2023 and comprised of 15 patients. All patients were enrolled after providing written informed consent.

It was first clinically determined that there was unilateral impaction when a permanent maxillary canine did not erupt into the tooth arch by the expected eruption period and the contralateral canine had already erupted physiologically. The impaction side canine tooth may still be present in the maxillary dental arch. Lateral cephalograms and standard panoramic X-rays confirmed the diagnosis of impaction. On occasion, cone-beam computed tomography was used to ascertain if the impacted canine was located buccal or palatal. Other inclusion criteria included full permanent dentition, submucosal impaction of the impacted canine, excellent oral hygiene, lack of periodontal inflammation (shown as 0 for plaque index and bleeding on probing values), absence of clinical signs of gingival inflammation, recession of the

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gingiva, and tooth mobility. On top of that, the contralateral canine has to be in the right place and normally erupted. Patients underwent orthodontic treatment first, and subsequently underwent standardized combined surgical orthodontics with an open approach to accommodate the impacted canine. The impacted canine in the BIMC group was exposed using an operculectomy, while in the PIMC group it was exposed using an apically repositioned full-thickness mucoperiosteal flap.

An elastic thread was utilized to secure a button at the crown level on the tooth's most accessible and visible surface in order to induce traction. Once every fifteen days, the elastic thread was switched to ensure slow and steady traction, protecting the canine and periodontal tissues. The follicular envelope was surgically removed to the cementoenamel junction if present, to guarantee periodontal ligament reattachment to the tooth and adequate bone healing. To align the canine properly above the mucosa, orthodontic strain was consistently applied using an elastic thread. All orthodontic and surgical treatments were overseen by the same highly experienced operator, S.M.

Periodontal measurements were collected using a World Health Organization-approved probe twelve months after orthodontic treatment was finished and the orthodontic device was removed. Two periodontal parameters were examined in relation to both the treated and untreated canines in terms of their eruption patterns. Mesiobuccal, midbuccal, distobuccal, mesiopalatal, midpalatal, and distopalatal were the six sites on the treated and control canines where the mean PD was measured. Furthermore, PD was observed in areas adjacent to the upper lateral incisors (distal site) and the first bicuspids (mesial site). The measurement of KT was taken from the gingival border to the mucogingival junction at the medial position of the buccal face of the crown. Additionally, the upper lateral incisors and initial bicuspids were found to be KT. Without understanding the purpose of the study or the possibility of a canine eruption as a result of orthodontic treatment, D.M., the sole experienced operator, took all of the periodontal measurements.

The primary objective of this study was to compare the PD and KT of BIMC and PIMC to those of their normally erupting canines on the opposite side. Because of the small sample size, we used the Mann-Whitney U test to look for differences between the two groups. The differences in PD and KT values between BIMC and PIMC were examined using the Mann-Whitney U test, which was also used to assess the secondary outcomes. Statistical significance was defined as a P value less than 0.05. Post hoc power analysis was used to examine the primary result.

RESULTS

There were 17 (56.7%) males and 13 (43.3%) females among all cases. The patients mean age was 22.5±3.52 years. There were 10 (33.3%) cases had history of smoking.(table 1)

Table-1: Baseline details of the presented cases

Variables	Frequency (30)	Percentage
Gender		
Male	17	56.7
Female	13	43.3
Mean age (years)	22.5±3.52	
Smoking history		
Yes	10	33.3
No	20	66.7

Table-2: Analysis of keratinized and pocket depth

Variables	BIMC	PIMC	P Value
keratinized tissue			
Canine	2.44±1.2	3.7±1.8	0.004
Lateral incisor	3.13±0.14	3.5±0.2	n.s
First premolar	1.4±0.2	2.10±1.13	n.s
Pocket Depth			
Canine	2.7±1.3	2.0±0.4	n.s
Lateral incisor	3.2±1.4	2.0±1.1	0.044
First premolar	2.38±1.5	2.3±1.4	n.s

The BIMC group showed considerably lower keratinized tissue values for canines than for the untreated side (P = 0.004) and significantly larger probing depths for lateral incisors than for the untreated side (P = 0.032). In the PIMC group, no discernible variations were found. (table 1)

DISCUSSION

There has been conflicting evidence on the effectiveness of surgical exposure and orthodontic alignment for submucosal impacted canines[13]. Although some research has indicated that therapy has a limited periodontal impact, other research has showed periodontal problems such as increased pocket PDs, loss of connected gingivae, and loss of alveolar bone height[14]. The periodontal outcome following orthodontic eruption was significantly worse in the BIMC group as compared to canines that erupted naturally on the opposite side. In the group that underwent BIMC, the average KT was 1 mm lower, but the PD of the adjacent lateral incisors was 0.75 mm higher. This finding is at odds with a new literature evaluation that found no different outcomes for BIMC-treated compared to untreated dogs[15]. There is a dearth of evidence about periodontal results for BIMC after surgical-orthodontic treatment, as mentioned in that analysis.

Periodontal factor analysis revealed no statistically significant differences between the PIMC group's treated and untreated canines. Previous research[16] found no clinical significance between the surgical and non-surgical groups of PIMC with respect to the 0.2-0.6 mm gap in periodontal attachment. When looking at the two therapy groups side by side, it was clear that BIMC had a significantly lower KT following treatment—about 0.9 mm lower than PIMC—which is relevant to the key outcomes that are being discussed here. There was a 0.9 mm difference in PD between the incisor near to the PIMC and the lateral incisor at the distal location. This shows that BIMC could make periodontal outcomes worse. To the best of our knowledge, only one study has examined the effects of various canine impactions on post-treatment PD and KT outcomes[17]. A KT of almost half a millimeter higher in PIMC compared to BIMC was found, even though no statistically significant differences in PD were seen between the two groups. Consistent with these findings, our research shows that the PD of the adjacent lateral incisor will increase by about 0.75 mm and that a treated BIMC has about 1 mm less KT than its contralateral tooth. The study's shortcomings, such as its tiny sample size, highlight the need for bigger samples in future studies.[18–20] Regardless, the primary result of the study did quite well in the analysis of post hoc power. Another limitation of the study is that it solely considered open technique. If BIMC exposed surgically through the open method and erupted with orthodontic traction, doctors should be warned that their patients will likely lose about 1 mm of KT compared to physiological eruption. A lateral incisor next to it will also have attachment loss of 0.75 mm. For the purpose of forecasting the periodontal health of BIMC patients after orthodontic treatment, this data is useful. Nevertheless, PIMC periodontal outcomes are unaffected by surgical-orthodontic treatment outcomes that employ the open technique.

CONCLUSION

Using an open approach for surgical-orthodontic therapy, we found that in BIMC, the treated tooth lost its periodontal keratinized tissue, and the surrounding lateral incisors lost their periodontal connection.

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