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Gingival Health after Surgical Exposure of Impacted Maxillary Canines with Orthodontic Traction

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ABSTRACT

Background: Impaction of the maxillary canines is a common clinical issue. Canine impaction may develop from a localized, systemic, or hereditary source. Interdisciplinary approaches are frequently necessary for the treatment of impacted maxillary canines. **Objective:** This study's objectives were to describe a surgical technique for surgically revealing a labially affected maxillary canine, elaborate on how to take care of soft tissue to promote aesthetic results, and evaluate periodontal health following the procedure. **Study Design:** Prospective study. **Settings:** CIMS institute of Medical Sciences. **Duration:** 24 months from 01-06-2020 to 30-05-2022. **Methods:** A total of 53 patients who had orthodontic treatment as well as surgical exposure treatment for a unilaterally labially impacted maxillary canine were included. There was no history of periodontal disease or periodontal collapse in any of the individuals. Informed consent was gained from each patient after thorough explanations of the ambitions, potential advantages, and potential dangers of this clinical study were given to all patients. All cases' gingival health was evaluated following the conclusion of fixed orthodontic treatment. **Results:** There were majority 35 (66.03%) females and 18 (43.97%) males among all cases. 17 (32.1%) cases were aged between 16-20 years, 15 (28.3%) patients had age 21-25 years and 21 (39.6%) cases had age 26-30 years. On the first postoperative day, only 6 patients (13.3%) complained of minor pain, and only 2 patients complained of visible edema and inflammation in 1 patient. Four patients had gingival scars visible. In general, gingival index values were 0.39. By visual inspection or periodontal probing, significant pathologic periodontal illnesses were not found. **Conclusion:** We found in this study that the maintenance of dental follicles encourages soft tissue management following combined surgery and orthodontics procedures for labially impacted maxillary canines to improve periodontal health.

Keywords: *Maxillary canines, Orthodontic Traction, Inflammation, Pain, Gingival health.*

INTRODUCTION

The regular process of a tooth can be delayed or come to a stop due to impaction. Delay in eruption, main retention, submerged teeth, impacted teeth, and other terms are used to define impaction in the literature. When a canine stops growing roots after they have finished forming or when the opposing tooth has been erupted for at least six months after finishing root development, the canine is said to be impacted.[1]

Impaction of the maxillary canines is a common clinical issue. Canine impaction may develop from a localized, systemic, or hereditary source. According to clinical and radiographic exams, the diagnosis and localization of the affected canines is the most crucial step in their care. Interdisciplinary approaches are frequently necessary for the treatment of impacted maxillary canines. Therapy options for the impacted canine include no therapy, an interceptive approach, extraction, auto transplantation, surgical exposure, and orthodontic alignment.[2]

The type of surgical technique depends on the position of the affected tooth. Clinical localization often involves three phases.[3] The first two steps are a visual examination and a digital palpation, and the third and most important step is a radiographic examination. Impacted canines have been found using polytomography, cbct, periapical, occlusal, cephalometric, posterior-anterior, and panoramic radiography.[4-6]

By using the parallax technique (also known as the Tube-shift technique/Clark rule), periapical radiographs provide a fair indication of the canine's labial-palatal placement in relation to the incisors. The vertex occlusal is the occlusal film with the highest degree of accuracy for locating the canine with respect to the midline. Structure superimposition may make it challenging and unreliable to interpret this radiograph. The vertical position, tilt, and anterior-posterior position of the canine are all visible on the lateral cephalogram. Due to less double image generation, a cephalometric video at a 45° oblique angle might be more accurate.[7]

To prevent the problems related to impacted canines, several therapy approaches have been suggested. The most frequent of these side effects is the resorption of the roots of lateral incisors. Other issues include internal or external resorption, infection linked to partial eruption, loss of arch length, and infection related with resorption.[6]

Through early detection, canine impacts may be avoided. The extraction of the primary canine is advised for children aged 10 to 13 if a maxillary permanent canine looks to be erupting ectopically or not at all, according to Ericson and Kurol. The significance of early diagnosis was illustrated by these researchers. Within a year of the excision of the primary canine, a normal course of eruption had been established in 78% of cases where canines were palatably erupting.

An open or closed surgical exposure approach is the orthodontic-surgical treatment of choice for relocating maxillary-displaced canines (PDC), which stands for palatal displacement of the canines. Before the teeth and mucosa are extracted during an open operation, the flap will first be raised to expose the oral cavity. After the local anesthetic pack has been removed, it should be business as usual in terms of the extraction of the tooth. As soon as it has erupted above the mucosa and an orthodontics attachment can be cemented, the process of straightening will begin.[8] In contrast, the closed technique involves elevating the flap, removing only a small amount of bone, and connecting with the palatine mucosa that is located above the exposed crowns in order to establish alignment.[9] Nevertheless, gingival damage as a result of PDC therapy is a possibility regardless of the approach.[10]

Researchers have laid out the benefits and drawbacks of both systems, making it difficult to choose between the two.[11,12] In their presentation from 2018, Sampaziotis and colleagues came to the conclusion that the open approach among the PDC group requires fewer hours than the closed method, and that there is no variation between both of them in terms of periodontal or cosmetic qualities.[13]

Because it provides promote for the lip and muscles of the face, enhances facial aesthetics, serves as an essential guidepost for obstruction, protects the tissue at the corner of your mouth, and is located at the dental arch's pivot point, the canine position is essential for the arrangement of denture teeth. In addition to these benefits, the canine position is at the center of the dental arch. If a tooth is unable to erupt because it is impacted, this might have an effect on the patient's occlusion as well as potentially, their mental development.[11] When compared to alternative methods for the regeneration of periodontal tissue in vitro, it has been demonstrated that the use of tooth follicle cells as seed cells produces superior results.[13,14] This is as a result of the improved biological features that are exhibited by these cells. Therefore, it is believed that the DF plays a key role in both the process of tooth eruption and the creation of the periodontium.

This paper was prepared in order to explain a technically better surgical strategy for exposing a labially damaged maxillary canine.

METHODS

This prospective study was conducted at CIMS institute of Medical Sciences and comprised of 53 patients. Informed consent was gained from each patient after thorough explanations of the ambitions, potential advantages, and potential dangers of this clinical study were given to all patients. Patients with serious medical conditions and those who refused to give written consent were excluded.

After fixed orthodontics, Li-Ru Hu and Wen-Ting Qi measured gingival index (GI), probing depth (PD), created gingival width (WKG), gingival scars (GS), bone loss (BL), and apical root loss (ARR). After scoring mesial, distal, buccal, and palatal surfaces, mean gingival indices were determined for each tooth. Normal gingiva scored 0, minimal inflammation 1, slight discoloration 2, slight edema 3, no bleeding following probing 4, mild discoloration 5, and mild discoloration 6. A score of 2 suggests mild inflammation, itchiness, edema, glazing, and probing hemorrhage, while a score of 3 indicates severe inflammation, visible redness, ulcerations, and a predisposition for bleeding without prodding [22]. The classic periodontal probe assessed PD on each tooth's mesiopalatal, midpalatal, distopalatal, and mesiolabial

surfaces. Locations' average PDs were determined. KG length was measured from the free gingival border to the mucogingival junction. Gingiva scars were sensitive bands. Experimental group teeth showed gingival scarring.

An accurate nasopalatine nerve block and labial infiltration provided sufficient anesthesia for the exposure of the impacted teeth under local anesthesia. Adjustable metal edge brackets with 0.022–0.028-inch slots were used. Nickel-titanium arch wires of 0.014, 0.018, and 0.025 inches were employed for canine traction and arch profile maintenance. Sequential traction may have been needed because the maxillary left medial incisor root and crown clashed during tooth movement. First, the left maxillary canine crown withdrew from the medial incisor root. Every appointment after dental traction includes a complete assessment of the patient's teeth's eruption. After removing the fixed appliance, the affected tooth's bone or gums were measured. SPSS 24.0 was used for data analysis. Descriptive analysis was conducted. Frequency and percentages was calculated for qualitative variables and mean ± SD for quantitative variables.

RESULTS

There were majority 35 (66.03%) females and 18 (43.97%) males among all cases. 17 (32.1%) cases were aged between 16-20 years, 15 (28.3%) patients had age 21-25 years and 21 (39.6%) cases had age 26-30 years. table 1

Table 1: The enrolled cases' demographics

Variables		Frequency	Percentage
Gender	Male	35	66.03
	Female	18	43.97
Age	16-20 years	17	32.1
	21-25 years	15	28.3
	26-30 years	21	39.6

On the first postoperative day, only 6 patients (13.3%) complained of minor pain, and only 2 patients complained of visible edema and inflammation in 1 patient. table 2

Table 2: Post-treatment outcomes among cases

Variables		Frequency (53)	Percentage
Pain	Minor	6	13.3
	No	47	86.7
Visible Edema	Yes	2	3.8
	No	51	96.2
Inflammation	Yes	1	1.9
	No	52	98.1

Four patients had gingival scars visible. In general, gingival index values were 0.39. By visual inspection or periodontal probing, significant pathologic periodontal illnesses were not found. We found higher probing depth among the cases. table 3

Table 3: Association of gingival scars among cases

	Variables	Frequency (n=53)	Percentage
Gingival scars	Yes	4	7.5
	No	49	92.5
	Gingival index value	0.39	
Probing Depth	width of the keratinized gingiva	4.0±1.3	
	Distopalatal	2.1±3.13	
	Midpalatal	1.8±2.5	
	Mesiopalatal	2.13±4.6	
	Midlabial	1.5±6.10	
	Mesiolabial	1.9±3.15	
	Distolabial	2.19±5.87	

We found an apical root resorption, bone-loss and short root length after treatment among all cases. Table 4

Table 4: Treatment-related bone loss and apical root resorption

Variables	Mean	Std.
Apical root resorption	1.98	1.21
Bone-loss	2.61	1.52
Root length	21.5	0.16

DISCUSSION

When it was discovered that no permanent teeth had erupted through the dental arch by the estimated date, the dentist performed a clinical exam to establish whether or not teeth were impacted. The CBCT scan revealed information about the impacted tooth's specific position, as well as the surrounding anatomy and any potential obstructions. The location of the broken tooth was likewise determined to be labial to the alveoli crest. Transplant is a potential treatment for tooth impaction, but it requires sufficient alveolar bone and further research to confirm its long-term effectiveness. Immediate implant placement after extraction is another option, although one that necessitates further surgery.[15] Temporary restorations are required for teens before they can have implants.[16]

Ankylosis, malocclusion, root resorption of neighboring teeth, margin bone loss of adjacent teeth, and dental abscess of the impacted tooth are the most typical outcomes of surgical exposure of untreated impacted teeth.[17] Unfortunately, surgical exposure of impacted teeth is important for their regular function. There is a higher risk of rapid injury to the open wound, which may

lead to pain, inflammation, and edema if exposed to the bacterially rich oral environment. Our patients reported no complications after surgery, and there was no need for retreatment. The excision of the crown is a minimally invasive procedure that spares the maximum amount of intrinsic tissue. Adhesion and scarring during tooth eruption from resected mucosa, submucosa, and muscle affect the aesthetics of the labial gingiva. In our research, a pocket-like structural covering for the wound is created by sewing together DF and mucosa. Because hemostasis lessens incisional drainage, the orthodontist has an easier time adhering brackets to teeth. The continuity of the DF epithelia and mucosa ensures tissue integrity during periodontium renewal prior to tooth eruption.

Since the risk of tractioning the periodontal tissue covering the teeth is a factor in the surgical removal of PDC technique, the orthodontic-surgical approach must mimic the natural process of tooth erupt.[18] Caprioglio *et al*[19] measured the depth of the pockets around the canines before and after the orthodontic treatment, and they found no statistically significant difference ($p > 0.05$) between the two groups. Although Smailiene *et al*[18] found a significant discordance (p 0.05) for this data, they concluded that the difference was not clinically relevant since it was less than 3 mm. There is no statistically significant difference between treatment and contralateral canine outcomes ($p > 0.05$ for any of the examined locations), as determined by our present meta-analytical combination for the probe level of pockets result.

The results of our clinical studies show that WKG is better. Only at the mesiolabial, Distolabial, and midpalatal locations did the PD of the afflicted canines fall below that of the contralateral canines; nevertheless, all values were less than 3 mm. Apical root resorption and alveolar bone loss in the front teeth are common side effects of orthodontic therapy. Bone decreases upward on both the labial (0.97 mm) and lingual sides (0.86 mm) when front teeth move, according to a recent research.[20]

We discovered no statistically significant difference in ARR between the afflicted and contralateral canines; hence, our improved surgical method may be used to treat impacted incisors and lateral incisors in the anterior maxilla. Our technological progress allows us to remove very little bone while preserving almost all soft tissues. Soft tissue maintenance is carefully considered to enhance aesthetic results and post-treatment periodontal health. Since we just make a little incision in the muscle and oral mucosa using our technique, it is less invasive. The exposed crown facilitates traction by forming a channel. Alveolar bone remodelling is substantially aided by restricted DF because it accelerates apical bone formation and increases coronal bone resorption.[21,22] Reduced inflammation and edoema severity after surgery go hand in hand with improved comfort. More skill on the part of the surgeon is required for this method, but good radiography data allow for evaluation after the fact. We found that our method, within the scope of this study, improved both periodontal health and cosmetic outcomes.

CONCLUSION

We found in this study that the maintenance of dental follicles encourages soft tissue management following combined surgery and orthodontics procedures for labially impacted maxillary canines to improve periodontal health.

LIMITATIONS

It was a Single centered study.

SUGGESTIONS / RECOMMENDATIONS

Strict Oral Hygiene: Emphasize the importance of maintaining excellent oral hygiene to the patient. Instruct the patient to brush their teeth thoroughly using a soft-bristled toothbrush, ensuring proper cleaning around the brackets and wires.

Interdental Cleaning: Encourage the use of interdental brushes or floss threaders to clean between brackets and wires. Antimicrobial or fluoride mouthwashes may be recommended, depending on the patient's overall oral health.

Regular Dental Check-ups: Schedule regular dental check-ups to monitor the progress of the orthodontic treatment and assess gingival health. Dentists can provide professional cleanings and offer guidance on effective oral hygiene practices.

CONFLICT OF INTEREST / DISCLOSURE

There is no Conflict of Interest

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