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Piezosurgery In Surgical Exposure of Bilateral Impacted Maxillary Canines: A Combined Periodontal-Orthodontic Approach

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Abstract:

Background*: Impacted teeth are teeth that remain embedded in the alveolar bone and fail to erupt into the oral cavity due to obstruction by bone, soft tissue, or lack of eruptive path. Maxillary canines are among the most commonly impacted teeth after third molars and play an important role in facial aesthetics, arch stability, and functional occlusion. Surgical exposure combined with orthodontic traction is considered an effective treatment modality for impacted canines. The present case report evaluates the management of bilateral impacted maxillary canines using two different surgical exposure techniques in combination with fixed orthodontic therapy*.

Materials and Methods*: A 19-year-old female patient was referred from the Department of Orthodontics with the chief complaint of irregularly positioned teeth and unerupted right and left maxillary canines. Clinical examination revealed absence of erupted 13 and 23 with palatal bulges present bilaterally. Radiographic examination using panoramic radiograph and CBCT confirmed mesioangular impaction of both canines. Orthodontic space was created prior to surgery. Different surgical exposure techniques were planned according to the position of each canine. Closed eruption technique was performed for 13, while open eruption technique was performed for 23, followed by bonding of orthodontic attachments and application of traction using pletcher spring and ligature wire. Periodic activation and clinical-radiographic follow-up were carried out.*

Results*: Healing following both surgical procedures was satisfactory with no postoperative complications. Progressive orthodontic movement of impacted canines was observed clinically and radiographically during follow- up visits. After 6 months, approximately 2 mm eruption was observed in relation to 13 and 1 mm eruption in relation to 23. Both surgical approaches showed favorable outcomes in terms of canine exposure, periodontal healing, and orthodontic traction toward normal arch alignment.*

Conclusion: *Combined surgical and orthodontic management is an effective treatment option for impacted maxillary canines. Selection of the surgical exposure technique should depend on factors such as canine position, prominence, amount of keratinized gingiva, and orthodontic requirements. Early diagnosis and interdisciplinary treatment planning contribute significantly to successful functional and aesthetic outcomes*.

Key Word*: Impacted canine, Surgical exposure ; Fixed orthodontics ; Perio surgery*

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I. Introduction

Tooth impaction is a condition when the tooth is still embedded in the alveolar bone , so it fails to erupt into the mucosa of the mouth[1,2]. The most commonly impacted tooth are the upper canine,lower premolar and 3rd molar[3,4,5].The cause of impaction can be both pathological and nonpathological .Pathological disorder in impacted teeth due to the presence of ameloblastoma or dentigerous cysts[6], ankylosis, vitamin D deficiency. Whereas non- pathological disorders can occur due to the thickening of connective tissue , premature loss by extraction of primary teeth[7] and lack of space[8] . Permanent tooth impaction is more than the primary teeth. This condition is related to the mixed dentition period . In a mixed dentition period , the upper canine has the most potential to become crowded teeth . Prevalence of impacted canine is 1.7% - 4.7% , more common in the maxilla[9,10,11,12] . The prevalence of impacted canine is 65% in females and 35% in males [13]. Labial impactions mainly happen due to insufficient space . in contrast , the etiology of impaction palatally is unknown[15].

II. Case

A 19 year old female patient was referred from department of orthodontics with a chief complaint of irregular positioning of teeth and required exposure of right and left maxillary canine for orthodontic treatment.

III. Clinical examination

Extraoral examination revealed no findings and patient's overall health was good. Intraorally all permanent teeth had erupted except right and left maxillary permanent canine (fig 1,2,3,4) and clinically space was created by orthodontic treatment between lateral incisors and 1st premolar.on palpation prominent bulge was present on palatal aspect of 13 and 23.

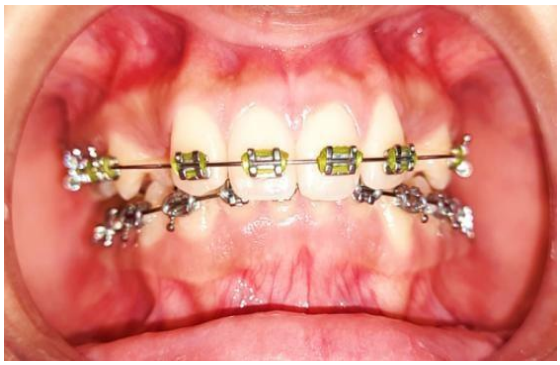

FIG 1

FIG 2

FIG 3

FIG 4

CLINICAL EXAMINATION – FIG 1: Front view showing deep bite , FIG 2 : Side view (right side) showing unerupted 13, FIG 3 : side view (left side) showing unerupted 23 , FIG 4 : occlusal view of maxilla showing unerupted 13 and 23

IV. Radiographic examination

Evaluation of panoramic radiograph shows impacted right and left maxillary canine. Both 13 and 23 were mesially impacted. 13 and 23 were positioned apically to the adjacent teeth(fig5) CBCT for 13 shows mesioangular impaction with the highest position of the incisal tip of the crown at the level of cervical 3rd of crown of 12(fig 6), completely formed single root ,crown abutting the palatal cortex(fig9) and root apex abutting the right antral floor(fig8) and approximate tooth length 26.5 mm. CBCT for 23 shows mesioangular impaction with the highest position of the incisal tip of the crown at the level of cervical 3rd of crown of 22(fig 7) , completely formed single root , crown abutting the palatal cortex(fig9) and root apex abutting the left antral floor(fig 8) and approximate tooth length 26.7

FIG 5

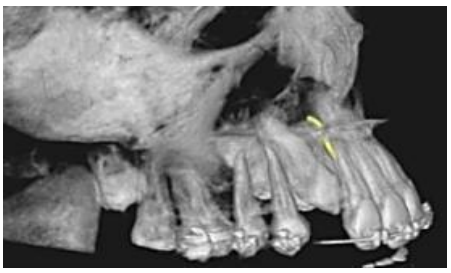

FIG 6

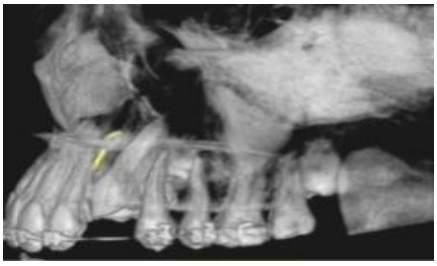

FIG 7

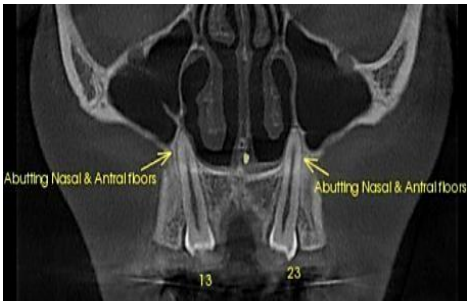

FIG8

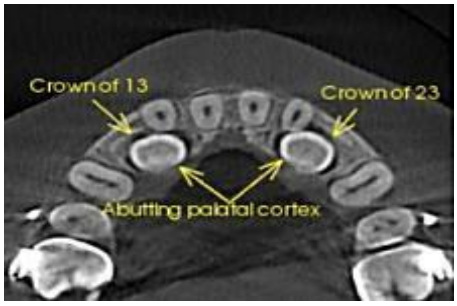

FIG9

RADIOGRAPHIC EXAMINATION – FIG 5 : Panoramic view showing mesially impacted 13&23 , FIG 6: CBCT for 13 showing incisal tip of 13 at level of cervical 3rd of crown of 12,completely formed root , FIG 7 : CBCT for 23 showing incisal tip of 23 at level of cervical 3rd of crown of 22,completely formed root ,FIG 8: Root apex of 13&23 abutting nasal and antral floor,FIG 9 : crown abutting palatal cortex

V. Case management

The treatment plan included dental health education, scaling and root planning as well as combination of surgical exposure and orthodontic treatment for traction of 13 and 23 towards the arch. On the second appointment,vital signs examination was done with satisfactory blood reports and blood pressure of 120/80 mmHg was recorded.
For 13 open technique of canine exposure was planned.First local anesthesia on palatal side of 13 was given then 'U' shaped incision was given and part of palatal portion of gingiva was removed to expose the tip of the canine(fig10)
.Then infected tissue was removed by curettage. Hemostasis was achieved by direct pressure with sterile gauze and cotton pellets.
Once hemorrhage was controlled, the tooth surface was isolated , etched with 50% phosphoric acid , rinsed with water,dried. The appliance used to apply traction to the canine consisted of an orthodontic bracket (fig10) , pletcher spring loop and ligature wire . The assembled appliance then was directly bonded to the etched tooth surface .The appliance was tied onto the arch wire via the ligature tie (fig11),and the flap repositioned and closed primarily with suture(fig12).
Then after 1 week suture was removed in relation to 13 and healing was satisfactory .

Now for 23 before starting the procedure, width of keratinized gingiva on the buccal aspect was recorded and for 23 open eruption technique was planned. After local anesthesia, a single horizontal incision was given on ridge and crevicular incisions were given on both side palatally in relation to 21 ,22 ,24. Then full thickness flap was elevated (fig13).Bone present over impacted canine was removed by piezosurgical unit(fig14) and canine was exposed.
Then in similar way infected tissue was removed by curettage and hemostasis achieved.

Once hemorrhage was controlled,the tooth surface was isolated and similar orthodontic procedure was performed as that of 13(fig15). Then flap repositioned and closed primarily with suture(fig16)
postoperative instructions were given to patient and antibiotics and analgesics were also given.

After 1 week suture was removed. At 1 month intervals(fig17) , the pletcher spring was activated by tightening the ligature tie. Movement of canine was followed radiographically and clinically by observing the amount of spring visible. After 6 months (fig18) patient was recalled and 13 and 23 exposed approximately 2mm and 1mm respectively.

FIG10

FIG 11

FIG12

FIG13

FIG 14

FIG 15

FIG 16

FIG 17

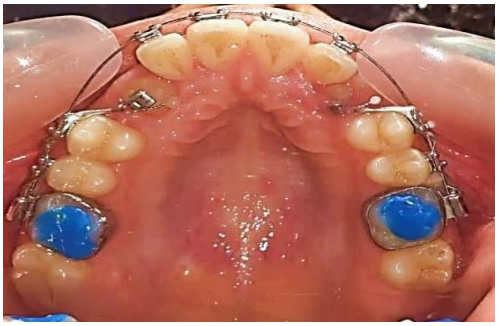

FIG 18

CASE MANAGEMENT- FIG 10 : Irt 13 After giving U shaped incision, part of palatal portion of gingiva was removed to expose tipoff canine and Orthodontic bracket placed irt 13,FIG 11: Appliance was tied onto arch wire via ligature tie irt 13 , FIG 12 : Flap repositioned and closed primarily with suture,FIG 13 : Irt 23 full thickness mucoperiosteal flap was elevated,FIG14:Piezosurgical unit for removal of bone,FIG 15:Orthodontic bracket placed irt 23,FIG 16 : Flap repositioned and closed primarily with suture. FIG 17 : At 1 month interval approximately 1mm exposure of 13 and spring was activated by tightening ligature tie and movement of canine was followed on further appointments , FIG 18 : At 6 month interval approximately 2mm exposure of 13 and 23 exposed by 1mm approximately

VI. Discussion

Canine are crucial for facial appearance, dental aesthetics, jaw development and functional occlusion. Now there are several techniques for canine exposure like closed eruption technique , open technique , gingivectomy (for canines positioned above the mucogingival junction) , apically positioned flap (for canines with a cuspal position apical to the mucogingival junction) , tunnel technique (a modification of closed surgery for mid alveolar impactions) etc

Closed technique for canine exposure is indicated for impacted canine that are high in maxilla , close to the line of the arch , where preservation of buccal bone is necessary . It is also preferred for palatally displased canine to promote natural eruption and preserve periodontal health . So we planned this technique for 13.

Open technique for canine exposure is indicated when the exact position of canine is known with prominent bulge and sufficient amount of attached gingiva is present, also for deeply impacted canines that are likely to require bone removal , canines that are significantly displaced or when faster orthodontic movement required or for canines above mucogingival junction.

A study done by Arshdeep Kohli , Jashan D Goyal et al[14] in 2025 to compare these techniques using clinical and radiographic evaluations to determine their effectiveness in canine exposure and alignment . A prospective analysis was conducted on 50 patients with impacted canines by employing both open and close techniques. Now these 2 techniques were compared across key parameters , including treatment duration , patient's discomfort and periodontal health .conclusion came as the close technique is more efficient in reducing treatment time ,conservative bone removal , faster healing with comparable outcomes in terms of periodontal health and root resorption .

There are severe disadvantages like longer orthodontic treatment time , higher chance of rotation in closed eruption technique on other hand open technique reduce surgical time ,easier rebonding , less intensive but in open technique higher postoperative pain occurs and it also takes long recovery period.

Apically positioned flap for canine exposure is indicated for labially impacted canines that are not significantly displaced and are located above mucogingival junction.

Now in this situation the surgical exposure technique for 13 was closed eruption technique , and for 23 it was open technique . As the bulge of impacted canine was prominent on palatal side of 23 so open eruption technique was planned, but in case of 13 the bulge was less prominent so close technique was done .

As the treatment takes longer duration so it is necessary to pay attention to patient's age , presence of dental space and crowding .the success of combination of orthodontic therapy with flap surgical procedure depends on cooperation of patient and dentist

VII. Conclusion

The combination of surgical and orthodontic treatment for impacted canines has good outcomes in preventing malocclusion . the patient's age , dental space , crown position , inclination and shape of impacted tooth apex,presence of keratinized gingiva all should be considered to decide surgical treatment exposure. The aim of current case reports is to evaluate the implications of surgical exposure in routine dental practice.

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