

EXTRACTION OF FAVOURABLE IMPACTED CANINE – AN ALTERNATE TO TRADITIONAL ORTHODONTICS

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Abstract

Treatment of favourable impacted canines involves interdisciplinary measures. Surgical disimpaction of canine can lead to numerous complications such as, ankylosis or loss of vitality, recurrent pain, root resorption, cyst formation, bone loss, or combinations of these factors. Extraction of favourable impacted canine can be an option if dental esthetics is acceptable and there is good contact between the lateral incisor and the first premolar. This alternate treatment plan also leads to minimal complexity of treatment, patient discomfort and time duration. The present case report describes the extraction of favourable impacted canine with substitute of adjacent premolar in a post-adolescent female patient.

Introduction

Impaction is defined as failure of a tooth to appropriately emerge into the dental arch after the normal age of eruption. The maxillary canine is second only to the mandibular third molar in its frequency of impaction with a reported incidence of 0.8% to 2.8%.^{1,2,3} Surgical disclosure of canine crown and orthodontic traction is the most common treatment procedure in motivated patients.^{4,5}

However, various complications are also associated with canine disimpaction surgery like proper tooth alignment, periodontal problems, changes in tooth color etc. Furthermore, root resorption and changes in periodontium have also been associated with the extruded canine.⁶ Untreated canine impaction leads to frequent infections, intra-arch problem like arch alignment, arch length discrepancy and probability of follicular cyst formation. Because of a general lack of symptoms and clinicians' reliance on 2-dimensional radiographic imaging for diagnosis, impacted canine-associated root resorption (ICARR) has a tendency to be diagnosed late, in relation to both the patient's age and the extent of resorption.

2-dimensional radiograph has its own limitation that can reduce image quality and diagnostic accuracy. Recent advancements in 3-dimensional techniques, especially CBCT have more accuracy of the diagnosis and less exposure to patient.⁷ There are different options about treating an impaction or a transposition. Tooth extraction, surgical repositioning, surgical-orthodontic approach, and dental implant replacement all have been proposed.⁸ Although it is rare in orthodontic practice, surgical removal of an impacted canine can be an option if dental esthetics are acceptable and there is good contact between the lateral incisor and the first premolar.^{9,10}

This case report describes the extraction of favourable impacted canine with substitute of adjacent premolar in a post-adolescent female patient.

HISTORY

A 16-year-old female patient came with the complaint of irregularly placed front teeth. The patient gave no relevant medical or habit history.

Diagnosis

The patient presented with a mesocephalic head type and mesoprosopic facial form with no gross facial asymmetry. Patient also presented with normal vertical proportions and a shallow mentolabial sulcus. Dental examination revealed occlusion in Angle's Class I molar relationship bilaterally with anterior crossbite in 11, 12. Further intraoral examination revealed lingually blocked in 42 and missing 23 along with reduced overjet and overbite. Occlusal features revealed asymmetric maxillary and mandibular arch. The lower dental midline was found to be shifted 5 mm towards the right side with respect to the upper midline. Spacing was seen between 21-22. The smile assessment revealed incompetent lips with 4 mm incisal display at rest and full display on smiling with no gingival exposure (**Figure 1**). The oral hygiene status was good. TMJ assessment revealed no history of pain or clicking on maximum mouth opening and closure. Maximum mouth opening was 42 mm. On assessing models of the patient, arch perimeter analysis revealed 11 mm of space requirement in the upper arch and Carey's analysis revealed 7 mm of space requirement in the lower arch.





Figure1 Pretreatment records

OPG and Cephalometric Analysis

Panoramic radiographic examination revealed optimum bone support for orthodontic mechanotherapy. Impacted canine was clearly visible in the second quadrant. TMJ radiographic examination revealed normal size, shape and position of the condylar heads.

Angulations of the canine was measured in the relation to the bicondylar line on the panoramic radiograph by connecting the most superior points from both condyles bilaterally. The internal angle formed between the bicondylar line and long axis of the canine was measured on the panoramic as illustrated in Fig. 2. If this angle is 45 degrees or more, the prognosis is favorable.

On performing above analysis the angle was found to be 49 degree which indicates favourable path of eruption. (Figure2)

On cephalometric assessment the pretreatment ANB angle was found to be 4° and MPA was 27° pointing to a Class II skeletal base and a hypodivergent growth pattern (Table 1). Furthermore, the I/NA, I/NB and IMPA angulations were found to be 16°, 28° and 95° respectively.

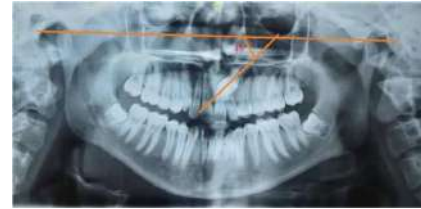


Fig. 2- Angulation of Impacted Canine with Bicondylar Line.

Treatment Objectives and Plan

Treatment objectives were :

- 1) To maintain class I molar relation,
- 2) Achieve ideal overjet and overbite,
- 3) Attain co-ordination of arches,
- 4) Attain an esthetically pleasing soft-tissue profile.

We decided upon two treatment plans first being, extraction of 14, 24, 34, 44 followed by exposing and applying traction force on the impacted 23 to bring it to normal arch alignment.

The second treatment approach was atypical extraction involving extraction of 14, 23, 34, and 44.

The second option was selected, as it provided us with the advantage of maintaining the marginal contact between 22 and 24.

Considering all these factors, we decided to extract 23 instead of 24, so that treatment duration as well as complications can be reduced.

TREATMENT PROGRESS

Preadjusted Edgewise appliance MBT (0.022" × 0.028" slot 3M Unitek™ Gemini , USA) prescription was placed to level and align both arches. Patient was referred for extraction of upper right first premolar i.e. 14, before commencing leveling and aligning. Trans Palatal Arch (TPA) was placed to maintain anchorage. A posterior bite plate was placed in the lower arch to correct anterior crossbite and facilitate leveling and aligning. Leveling aligning was commenced on 0.012" NiTi (3M Unitek Nitinol Super elastic wire) and gradually reached a thicker gauge wire of 0.017 X 0.025" SS in the upper arch in a period of 8 months. Next the patient was directed to undergo extraction with respect to 34 and 44. Following this, banding and bonding (except 42), was done in the lower arch commencing from 0.012" NiTi. An open coil NiTi spring was placed on 0.016" Australian wire to create space for the blocked irt 42.

Parameter	Average Values	Pre Treatment	Post Treatment
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SKELETAL

SNA (angle)	82+/-2°	84°	83°
SNB (angle)	80+/-2°	80°	79°
ANB (angle)	2+/-2°	4°	4°
N prep to pt. A (mm)	0-1	1.8	1.7
N prep to Pog (mm)	-6+/-5	-5.5	-4.5
Mandibular plane (angle)	32°	32°	31°
Facial axis (angle)	90°	97°	98°
Lower anterior face height (mm)	61	65.3	66.0
Nasolabial angle	94-110°	95°	98°

DENTAL

U1 to NA (angle)	22°	22°	18°
U1 to NA (mm)	4	4.5	2.4
L1 to NB (angle)	25°	29°	23°
L1 to NB (mm)	4	7.1	5.1
L1 to A Pog (mm)	1+/-2	6.5	3.3
L1 to MP (angle)	90°	95°	91°
Inter incisal (angle)	131°+/- 5°	130°	138°

SOFT TISSUE

'S' line (mm) –Upper	0	1.3	1.0
-Lower	0	3.0	2.0

Table 1-Pre and Post Treatment Cephalometric Reading.

Gradually with enough space gained, 42 was bonded and included in the main arch wire. With sequential replacement of arch wire to thicker gauge, the alignment of the lower arch was achieved within 6 months. The dental midline was matched with the help of Class II & class III elastics (4 ½ OZ, 5/16") on right and left side respectively. An OPG was taken which revealed the tipped root of the left upper first premolar due to the impacted canine (**Figure 3, 4**). Following a thorough discussion for the removal of the impacted canine, the patient was finally convinced for the extraction. A CBCT was taken, subsequent to which extraction of 23 was done. Remaining space was closed using class I elastics. After 25 months of active treatment Class I molar relationship was maintained, upper and lower anterior were retracted and well alignment of upper and lower arch was achieved. The patient's soft tissue profile appeared more esthetically pleasing. Following this, debonding was done and post treatment records were taken. The cephalometric measurements post treatment are displayed in **Table.1**. The patient was very much satisfied and pleased with her treatment and soft tissue profile. Fixed retainers were placed in both the arches.



Fig. 3 Extraction of Favourable Canine and its Position in OPG and CBCT



Fig. 4 Mid Treatment Records

Result

The post treatment cephalometric analysis revealed no change in ANB i.e. 4° as we followed a conservative treatment approach only masking the skeletal discrepancy (Table 1). There was decrease in 1/ NA which is 18° and retroclination of lower incisors from the previous value hence presented with a reduced IMPA and 1/NB i.e. 91° and 23° respectively. (**Fig. 5 Table1**)

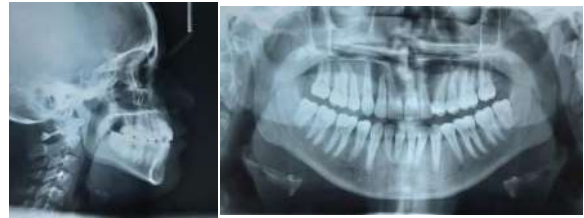


Fig. 5- Post Treatment Records.

Discussion

Treatment of Favourable impacted canines involves multidisciplinary team work. Generally treatment result of these types of cases is based on healthy periodontal support and position of newly disimpacted canine in arch. However, surgical disimpaction of canine can be lead to various complications such as loss of vitality of the neighboring teeth, ankylosis of canine itself, recurrent pain and discomfort, root resorption, cyst formation, periodontal problems, or combinations. External root resorption of various anterior teeth is most common complication after surgical disimpaction of canine.^{6,7}

Disimpacted canine also have the chances of a greater risk for root resorption in neighboring teeth than normally erupted canines.

D'Amico et al reported a study based on various side effects during and after canine disimpaction surgery on 61 patients. 6.5% of sample involved in this study were not satisfied with post treatment esthetic. Satisfactory result were obtained in only 57% of samples.¹¹

The author also stated that there is much inclination difference in normally erupted and surgically erupted canines which can lead to the difference in canine guidance.

Above data sustains that ortho-surgical approach of impacted canine is associated with various risk factors. According to our treatment alternate (extraction of favourable impacted canine) associated risks were eliminated with minimum complexity of treatment, patient discomfort and time duration.

As Thoraton¹² stated, no guidance is superior to each other . So canine guidance can well be providing by premolar guidance .

In present case, canine guidance was obtained by slightly extruding the maxillary first premolars. The patient was referred for build up the premolar to mimic the appearance of canine¹³. But the patient was very much satisfied with her occlusion. Hence it was decided to accept a slight vertical gingival level discrepancy, and neither crown lengthening (a surgical procedures) nor restorative buildups were performed. In addition, a slight positive root torque was added in the final stage to give a natural aspect as similar as possible to a maxillary canine, instead of changing the bracket of canine on premolar.¹⁴

The major objective of premolar substitution is esthetics and smile. The maxillary first premolar is a shorter tooth

than the maxillary canine, thus leading to possible vertical position differences in gingival levels or occlusal margins, depending on the final vertical position of the premolars.¹⁵

Conclusion

The extraction of impacted canines is a valid treatment option in premolar extraction cases. It eliminates various risks associated with canine exposure surgery and the lengthy canine traction procedures. It also decreases the overall treatment duration with good function and pleasing esthetics. However, accurate tooth contacts and anterior tooth positions should be managed during orthodontic finishing .

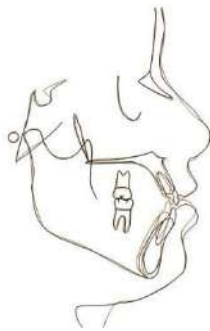


Fig. 6- Superimposition of Pre and Post Cephalometric Tracing(Pre- Black, Post –Red)

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