ISSN NO. 2320-5407

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

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Class II with ectopic canines in upper arch and severe crowding in lower arch treated by segmented arch technique- A case report.

Pratik Patel, Ravi Shanthraj, Nekta Garg, Anisha Vallakati, Subodeep Paul.

Manuscript Info

Manuscript History:

Received: 14 January 2016
Final Accepted: 19 February 2016
Published Online: March 2016

Key words:
T-loop, Mulligan's arch, Crowding, Class II, Headgear, Segmented arch technique.

Corresponding Author

Pratik Patel

Abstract

Fifteen years old female presented ectopically erupted upper canines with severe lower anterior crowding and Class II malocclusion. First premolars were extracted to correct ectopic position of upper canines and severe lower anterior crowding. Segmental 0.017×0.025" TMA T-loop and Mulligan's arch were used in upper and lower arch respectively for individual canine retraction. Combi-pull headgear was used to correct Class II molar relation bilaterally. Post treatment results showed ectopic position of upper canines was corrected, lower anterior crowding relieved and bilateral Class I molar relation achieved. Ideal overjet and overbite were attained with improved inclination of upper and lower incisors. At the end of treatment, patient showed pleasing smile with improved smile arc. The overall treatment took 20 months.

Introduction

Anterior dental crowding is perhaps the most frequently occurring characteristic of malocclusion; yet the term crowding is one of the most ambiguous terms in the dental vocabulary. Patients, parents, public, and the profession are unquestionably aware of and concerned with dental crowding and avidly seek its correction. Terms such as dental irregularity, overlap, and crowding are subjective, nonquantitative, even emotional terms which can represent a diversity of clinical meaning. Robert little described incisor irregularity into perfect alignment, mild, moderate, severe and very severe forms[1]. Crowding occurs due to arch length tooth material discrepancy. Ectopically erupted canines are one of the most frequently encountered conditions in orthodontic practice[2,3]. The prevalence of impacted or ectopically erupted teeth is 1.0%–2.2%[4–9]. Ectopic canines are believed to occur due to wide range of systemic and local causes. Environmental factors may contribute to this anomaly due to the long, tortuous eruption path of canine[10]. Diagnosis and treatment of ectopically erupting permanent maxillary canines requires timely management by the orthodontist.

Continuous mechanics in severely crowded cases results in round tripping with proclination of the anterior teeth during leveling and aligning. This is followed by en-masse retraction of the entire anterior segment thereby increasing treatment time. On the contrary, the segmental mechanics[11] involves placing brackets only in the posterior segment and the canine initially and individually retracting the canine into the premolar extraction space. This provides space for unraveling the crowding in the upper and lower arch without proclining the anterior teeth. The segmented arch has been designed to deliver relatively light constant forces with reasonable control over the anchor units[12,13]. Mulligan's bypass arch is used for individual canine retraction in severe crowding cases[14]. It is usually made with 0.018″ stainless steel archwire. This article describes correction of ectopic canines with T-loop in upper arch and severe crowding with mulligan's arch in lower arch.

Fig 1: Pre treatment facial photographs

Fig 2: Pre treatment intra oral photographs

Case report

15-year-old female patient reported with the chief complaint of ‘‘I want to get braces because my teeth are irregularly placed.” The patient showed no relevant medical history. The patient had poor oral hygiene, gingival inflammation and occlusal caries detected on the mandibular and maxillary first molars. Facially, the patient had a convex profile, a long lower face height, excessive exposure of maxillary anterior teeth at rest. She had incompetent lips, a shallow mentolabial sulcus, deficient chin and excessive lip strain on closure (Fig 1). Her dentition was characterized by end-on molar relation bilaterally with ectopic canine in upper arch and severe crowding in lower arch (Fig 2). Carey’s/Arch perimeter analysis showed 14 mm tooth material excess in upper arch and 12 mm in lower arch. She showed increased overbite with lower midline shifted to left side in relation to facial midline. The panoramic radiograph showed presence of 32 teeth and third molars were in their eruptive stage. There was no evidence of root resorption of ectopic canines. The lateral cephalometric radiograph showed ANB of 5° and Wits appraisal of 3.5 mm; it indicative of a Class II skeletal pattern. SNB of 70° suggested retrognathic mandible. As evidenced by the SN-mandibular plane angle of 45°, the skeletal pattern was hyperdivergent. The patient had well angulated maxillary incisors and proclined mandibular incisors(Fig 3).

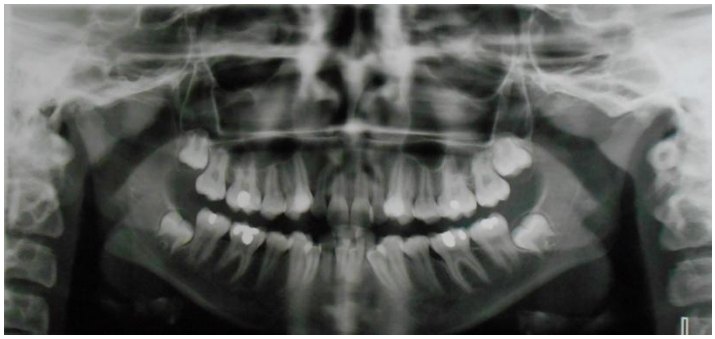

Fig 3: Pre treatment panoramic and lateral cephalometric radiographs

Diagnosis and treatment objectives

The patient was diagnosed as Angle's Class II malocclusion with severe crowding on Class II skeletal jaw bases with vertical growth pattern.

The primary skeletal objective was to maintain the skeletal divergence. Extrusion of the patient's maxillary molars would rotate her mandible downwards and backwards, increasing the divergence and worsening her profile. In the maxillary dentition, the treatment objectives were to correct ectopic position of canines and alignment of incisors. Treatment objectives in the mandibular arch included resolving the severe anterior crowding, uprighting the incisors, and reducing the dental proclination. Treatment objectives for the occlusion were to correct end-on the molar relation decrease overbite, maintain overjet, and achieve canine guidance with anterior disclusion. Treatment objective for soft tissue was to achieve lip competency and ideal facial profile.

Treatment plan

Ectopically erupted upper canines, severe lower anterior crowding and Class II molar relation were the main criteria in determining the applicable treatment plan. Extraction of first premolars was planned to improve ectopic position of upper canines, relieving lower anterior crowding and achievement of Class I molar relation. Thus absolute anchorage was planned to retract canines and prevent mesial movement of the molars. To enhance the anchorage, T-loop was planned along with transpalatal arch and headgear in the maxilla. Mulligan's arch with lingual arch was considered in the mandible.

Table 1. Cephalometric findings

Variable	Standard	Pre-treatment	Post-treatment
Skeletal			
Sna	82° ± 2°	75°	76°
Snb	80° ± 2°	70°	71°
Anb	2°	5°	5°
Go gn – sn	32°	45°	44°
Wits appraisal	0 mm	3.5 mm	3.5 mm
Dental			
U1 – sn	102° ± 2°	90°	100°
U1 – na	4 mm / 22°	4 mm / 14°	5 mm / 23°
L1 – nb	4 mm / 25°	7 mm / 36°	5.5 mm / 27°
Impa	92° ± 5°	102°	91°
Soft tissue			
Nasolabial angle	98 mm	86°	92°
U lip – s line	0 mm	4 mm	2 mm
L lip – s line	0 mm	4 mm	2 mm

Treatment progress:-

MBT appliance with 0.022×0.028″ slot (Ormco, Glandora, CA, USA) was used. A transpalatal arch with combi-pull headgear in the maxilla and lingual arch in the mandible was used to enhance the anchorage. Alignment and leveling of anchor teeth was done with progressive archwire change. The inner bow of combi-pull headgear was inserted into the headgear tube of banded maxillary first molars. The patient used to wear headgear 4 hours during daytime along with night sleep. Combi-pull headgear exerted 12 ounce of force. (Fig 4) After alignment and leveling of anchor teeth, sectional 0.019×0.025″ stainless steel archwires (Ormco, Glandora, CA, USA) placed in posterior segments and Segmented 0.017×0.025″ TMA T-loop was employed at the bracket of ectopic canine and accessory molar tube. T loop was activated by 3 mm at subsequent appointments. The activation was done by pulling the distal arm and cinching it distal to the first molar. (Fig 5) Mulligan's arch was used in the lower arch which made by 0.018″ stainless steel wire. The Mulligan's arch was placed at molar and canine and incisors were bypassed. E chain was engaged between molar hook and canine hook. (Fig 6) The canines started moving distally and complete retraction of individual canines was achieved in a period of 5 months. After individual canine retraction, alignment and leveling both dentitions was accomplished with following sequence of archwires: (a) 0.016″ heat activated nickel-titanium archwires (b) 0.018″ stainless steel archwires and (c) 0.017×0.025″ stainless steel archwires (Ormco, Glandora, CA, USA). The archwires were cinched distal to molar to avoid maxillary and mandibular incisor proclination (Fig 5). Diagonal elastics were used to correct lower midline in relation to facial midline on 0.017×0.025″ stainless steel archwires (Ormco, Glandora, CA, USA). After molar and midline correction, arches were coordinated on 0.019×0.025″ stainless steel archwires (Ormco, Glandora, CA, USA). A 0.021×0.025″ titanium molybdenum alloy archwire (Ormco, Glandora, CA, USA) was placed for two months. Finishing and detailing was carried out by 0.021×0.025″ braided stainless steel archwires (Ormco, Glandora, CA, USA). At the debond visit, the patient was given a maxillary and mandibular removable circumferential retainer from second molar to second molar. The patient was instructed to wear the retainers full time for 6 months, half time for 12 months, then once per week at night indefinitely. The overall treatment was accomplished in 20 months. The patient is being recalled every six months for check up.

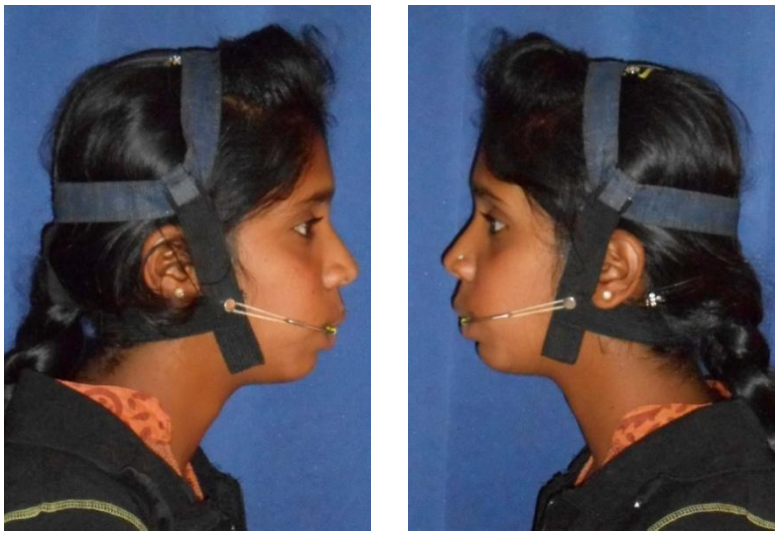

Fig 4: Distalization with combipull headgear

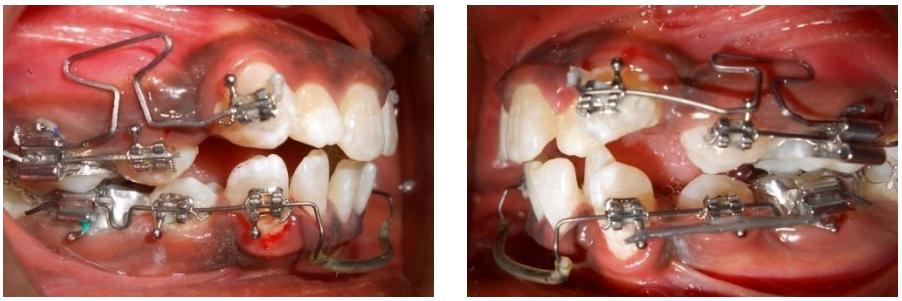

Fig 5: Individual canine retraction using T-loop

Fig 6: Mulligan's arch placed at molar and canine

Treatment result:-

The change in the patient's smile was the most impressive part of her treatment (Fig 7). With extraction of the first premolars, 7 mm retraction of upper and lower canines was achieved (Fig 8). The ectopic position of canine was corrected and severe crowding relieved. The Class II molar relation was fixed into Class I relationship and overbite was corrected. The vertical dimension of face was maintained during orthodontic treatment. Post treatment intraoral photographs and lateral cephalogram (Figs 8-9) showed that the maxillary and mandibular incisors were inclined appropriately. The panoramic radiograph (Fig 9) showed adequate root parallelism in both upper and lower arches.

Fig 7: Posttreatment facial photographs

Discussion

Ectopic eruption and impaction of canines is a commonly seen clinical problem. The incidence of impaction ranges between 1 % and 3%. The cause of canine impaction can be the result of localized factors or can be a polygenic multifactorial inheritance and associated with other dental anomalies[11]. There are a number of possible sequelae to canine impactions, ranging from loss of space in the arch to resorption of the roots of the neighboring teeth. 85 % of impacted maxillary permanent cuspids are palatal impactions, and 15% are labial impactions[2,5,15]. Inadequate arch space and a vertical developmental position are often associated with buccal canine impactions.[15] If buccally

impacted cuspids erupt they do so vertically, buccally and higher in the alveolus.[15] Due to denser palatal bone and thicker palatal mucosa, as well as a more horizontal position, palatally displaced cuspids rarely erupt without requiring complex orthodontic treatment.[16] Palatally erupting or impacted maxillary canines occur twice as often in females than males, have a high family association and are 5 times more common in Caucasians than Asians.[16,17] It is not unusual for maxillary canine impaction to occur bilaterally, although unilateral ectopic eruptions are more frequent.[18] Although the management of the ectopically erupting teeth necessitates the combined expertise of a number of clinicians, the orthodontist should have the primary responsibility of coordinating these efforts to provide the patient with the optimal treatment options with the most stable and favorable outcome. Treatment options for the management of impacted teeth are separated into four categories: observation, intervention, relocation and extraction[19-21].

Fig 8: Post treatment intraoral photographs

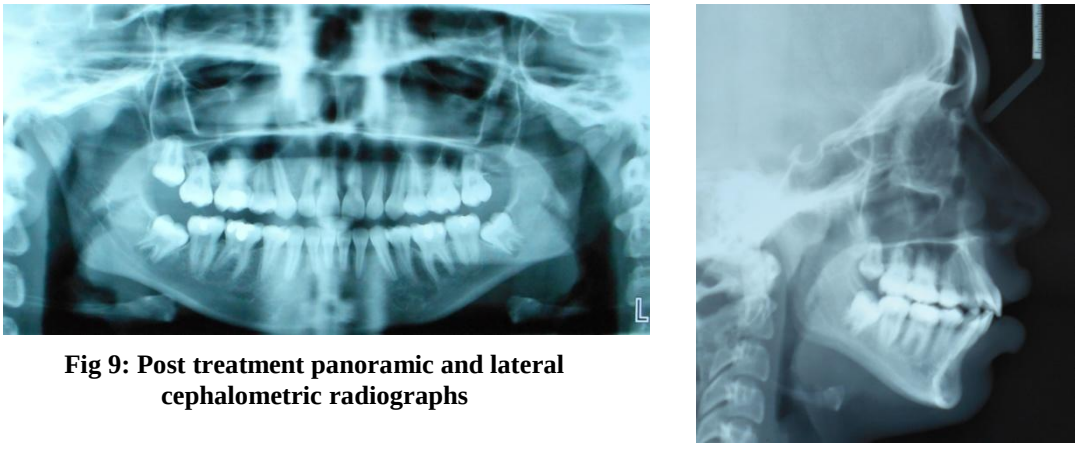

Fig 9: Post treatment panoramic and lateral cephalometric radiographs

The segmented 0.017×0.025″ T-loop was used to retract ectopically positioned upper canines. The titanium molybdenum wire is preferred over stainless steel wire due to its formability, low LDR, spring back and average stiffness. Segmented TMA T-loop showed three dimensional controls[22]. Segmented T-loop served as a retraction spring, which offered not only a distal driving force on the canine but also a moment for anti-distal tipping as well as torque control of canine[23-25]. As the retraction progressed, the ectopic tooth was moved distally from root of lateral incisor. In the last stage, a vertical component of force operating on the canine became more desirable. Hence segmented T loop was adjusted to exert an extrusive force to bring the canine toward the occlusion however it produced reciprocal intrusive forces on the molar which is anticipated with 0.019×0.025″ stainless steel wires in

posterior segment. Once the ectopically erupted canines were positioned into their ideal positions, combipull headgear was continued to correct bilateral end-on molar relation. Headgear was considered to augment anchorage, to prevent extrusion of molar and to correct molar relation. The patient used to wear headgear 4 hours during daytime along with night sleep. In the lower arch, canines were retracted individually with mulligan's bypass arch. It is usually made with 0.018″ stainless steel archwire. Incisors were bypassed and small 'U' loop was made anterior to molar to prevent mesialization of molar. E-chain was engaged from first molar to canine hook which delivered 150 grams of force. Mulligan bypass arch group provided a more controlled and faster tooth movement and minimize round tripping[26].

Conclusion

Ectopically erupted canines in upper arch and anterior crowding in lower arch are frequently associated with arch length deficiency. Extraction of four first premolars is extremely successful in correcting position of ectopic canines in upper arch and to relieve crowding in lower arch. Segmented 0.017×0.025″ TMA T-loop was used successfully in retraction of highly placed canines in upper arch. Mulligan's arch has great success in individual canine retraction and minimize round tripping during crowding correction. Differential moments are generated with T loop and mulligan's arch which augment the anchorage.

Acknowledgement

The authors wish to acknowledge Dr. Shivalinga BM, Dr. H. Jyothikiran & Dr. Bhagyalakshmi, Dept. of Orthodontics, JSS University, Mysore for their guidance.

Referances

1. Robert little. The Irregularity Index: A quantitative score of mandibular anterior alignment.American Journal of Orthodontics 1975;Volume 68, Issue 5,554-563
2. Bass TB. Observation on the misplaced upper canine tooth. Den Pract, 18:25-37, 1967.
3. Harry Jacoby. The etiology of maxillary canine impactions. Am J Orthod, 84:125-132, 1983.
4. Dachi SF, Howell FV. A survey of 3874 routine full mouth radiographs. II. A study of impacted teeth. Oral Surg Oral Med Oral Pathol. 1961; 14:1165-69.
5. Thilander b, jakobsson So. Local factors in impaction of maxillary canines. Acta Odontol scand. 1968; 26:145-168.
6. Kramer RM, Williams AC. The incidence of impacted teeth. A survey at Harlem Hospital. Oral Surg. 1970;29:237-41.
7. Thilander B, Myberg N. The Prevalance of malocclusion in Swedish school children. Scand J Dent Res.1973;81:12-20.
8. Ericson S, Kurol J. Longitudinal study and analysis of clinical supervision of maxillary canine eruption. Community Dent Oral Epidemiol. 1986;14:172-176.
9. Ericson S, Kurol J. Radiographic assessment of maxillary canine eruption in children with clinical signs of eruption disturbance. Eur J Orthod. 1986;8:133-40.
10. Fearne J, Lee RT. Favorable spontaneous eruption of severely displaced maxillary canines with associated follicular disturbance. Br J Orthod 1988;115:93-98.
11. Burstone CJ. Rationale of the segmented arch. Am J Orthod 1962 Nov;48(11):805-822.
12. Burstone CJ. Baldwin JJ. Lawless DJ. The application of continuous forces to orthodontic. Angle Orthod 1961:31:1-14.
13. Burstone CJ. The mechanics of segmented arch techniques. Angle Orthod 1966:36:99-120.
14. Mulligan TS, Common Sense Mechanics, J clinical ortho 1980;14(12):855-86.
15. Rayne J. The unerupted maxillary canine. Dent Pract Dent Rec 1969; 19:194-204.
16. Bishara SE. Impacted maxillary canines: a review. Am J Orthod Dentofacial Orthop 1992; 101:159-71.
17. Peck S, Peck L, Kataja M. The palatally displaced canine as a dental anomaly of genetic origin. Angle Orthod 1994; 64:249-56.
18. Shapira Y, Kuftinec MN. Early diagnosis and interception of potential maxillary canine impaction. J Am Dent Assoc 1998; 129:1450-4.
19. Pratik Patel, Anisha Vallakati, Ravi Shanthraj. Management of impacted canine. Lambert Academic Publishing; 2015.

20. Ericson, Sune, and Jüri Kurol. "Early treatment of palatally erupting maxillary canines by extraction of the primary canines." The European Journal of Orthodontics 1988;10, no. 1: 283-295.
21. Frank, C. A. Treatment options for impacted teeth. Journal of the American Dental Association. 2000;131.5: 623.
22. Burstone, Charles J., and A. Jon Goldberg. Beta titanium: a new orthodontic alloy. American journal of orthodontics 1980;77.2:121-132.
23. Tanne, Kazuo, Herbert A. Koenig, and Charles J. Burstone. Moment to force ratios and the center of rotation." American Journal of Orthodontics and Dentofacial Orthopedics 1988;94.5: 426-431.
24. Burstone, Charles J., and Herbert A. Koenig. Force systems from an ideal arch. American journal of orthodontics 1974;65.3:270-289.
25. Burstone, Charles J. The biomechanics of tooth movement. Vistas in orthodontics. Lea & Febiger Philadelphia 1962;197-213.
26. Chetan.S, Gopla Krishna B.R, Naveen Shamnur, Anup Singhvi. Individual canine retraction: RCT comparing Mulligan bypasses arch and Active laceback ligatures IOSR Journal of Dental and Medical Sciences 2014;Volume 13, Issue 5 Ver. IV., PP 34-37