



## Case Series

# Management of ectopically placed and impacted canine based on their position: A case series

Swabhiman Behera<sup>1</sup>, Ananya Pyne<sup>1</sup>, Nisha Mahawar<sup>1</sup>, Ragni Tandon<sup>1</sup>

<sup>1</sup>Department of Orthodontics, Saraswati Dental College, Lucknow, Uttar Pradesh, India.

### \*Corresponding author:

Swabhiman Behera,  
Department of Orthodontics,  
Saraswati Dental College,  
Lucknow, Uttar Pradesh, India.  
swabhimanortho@gmail.com

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## ABSTRACT

The maxillary canine, also known as the cornerstone of the dentition, plays a key role in esthetic and function. During orthodontic treatment of an impacted maxillary canine patient, thorough investigation is required for treatment planning. Precise biomechanics and controlled traction are the keys to success in these cases. This case series highlights the diagnosis, treatment planning, and technique required for management of impacted canines in three different anatomical positions.

**Keywords:** Canine impaction, Ectopically placed canine, Canine exposure, Traction

## INTRODUCTION

Canines are the second most commonly impacted teeth with an incidence of 1-3%<sup>[1]</sup> and a female predilection. Fournier *et al.* reported a palatal-to-buccal impaction ratio of 3:1, while Jacoby reported a ratio of 12:1.<sup>[2]</sup>

Ericson and Kuroi suggested that palpation of the buccal alveolar ridge distal to the lateral incisor helps determine the canine position.<sup>[3]</sup> Even in the absence of the “canine bulge” clinically, an evaluation through periapical, occlusal, and panoramic radiographs is required to confirm the diagnosis. Orthopantomography is routinely used for predicting the difficulty of the eruption pathway of an impacted canine. According to the Sector analysis, the pathway for eruption becomes easier to difficult as the canine moves from Sector 1 to 4, with Sector 1 being the most favorable for eruption and Sector 4 being unfavorable and requiring surgical intervention.<sup>[3]</sup> If the angle between the long axis of the canine and the dental midline on OPG is more than or equal to 31°, then there is a high chance that the canine is impacted according to power and short analysis.<sup>[4]</sup>

The prognosis and treatment of such a canine depends on factors such as the severity of impaction, its position, patient's cooperation, condition of other teeth in the arch, general oral health, and age of the patient.<sup>[1]</sup> Various treatment options are available for the management of impacted or ectopically placed canines such as interceptive orthodontics, extraction, auto-transplantation, and surgical exposure of the teeth followed by orthodontically assisted eruption as shown in Figure 1.<sup>[5-8]</sup>

For orthodontically assisted eruption of canines into proper occlusion, the methods employed include the Ballista Spring, K-9 spring, Kilroy spring, temporary anchorage devices (TADs), and piggy back technique.<sup>[9]</sup>

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Ballista, K-9 and Kilroy springs involve complex biomechanics, precise wire bending, frequent activation, and are uncomfortable for the patient. TADs are technique sensitive and dependent on factors like bone density. There is always a search for simplified procedures and precise biomechanics in orthodontics. Piggyback and Off-set bend traction techniques satisfy these requisites. The following case series displays orthodontic traction of differently angulated canines following these methods.

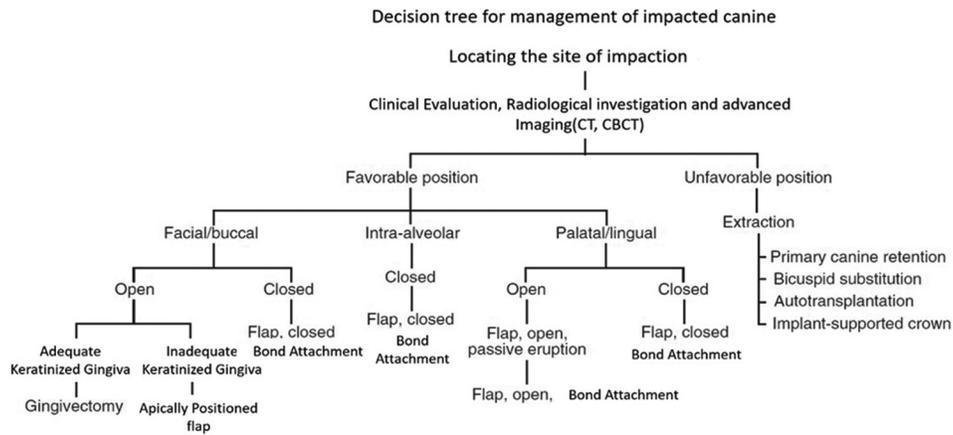
## CASE REPORTS

### Case 1

An 11-year-old female patient reported with a complaint of forwardly and irregularly placed teeth in the upper and lower jaws. She had no relevant medical or dental history. On

hard tissue clinical examination of the maxillary arch, there was presence of deciduous left maxillary canine and early eruption of permanent left maxillary canine was seen which was buccally placed [Figure 2a and e].

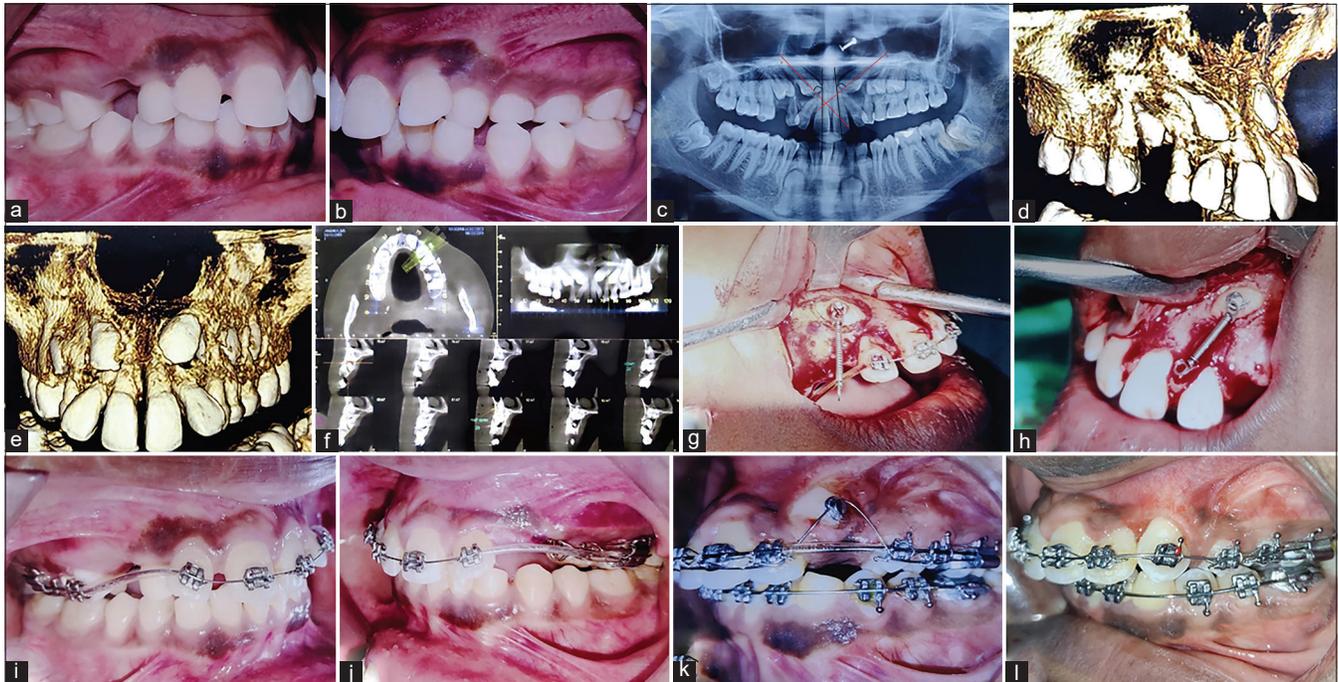
It was planned to keep the deciduous canine to maintain bone height and to begin leveling and aligning of maxillary arch using 0.014" NiTi wire [Figure 2b and f]. An informed consent was obtained from the patient following which the deciduous canine was extracted in the following visit, and levelling and aligning of the arch was done without any ligation on 23. Canine traction was initiated on a 16x22" SS wire with an offset bend and a beggs bracket bonded to 23 [Figure 2c and g]. An MBT 0.22x0.28 bracket was bonded to the canine after retraction to a suitable position, and 0.016" NiTi was used to level the canine in the arch [Figure 2d and h]. The overall time for aligning the canine was 4 months.



**Figure 1:** Decision chart for management of impacted canine.



**Figure 2:** (a and e) Intraoral image of a 11-year-old girl with a retained deciduous and ectopically erupted 23. (b, d, f, and h) treatment progress and offset bend with traction used to bring the canine into the arch.



**Figure 3:** (a-f) Pre-treatment intraoral photograph, panoramic radiograph and CBCT of a 18-years-old female revealing multiple retained deciduous tooth along with multiple impacted tooth. (g and h) open window surgical technique. (i-l) treatment progress, after initial traction with closed coil spring, piggy back technique was used to bring the canine into the arch.

### Case 2

An 18-year-old female patient reported having a complaint of forwardly placed teeth and spacing in the upper front region of the jaw for 5 years. The patient gave history of extraction of retained deciduous 1<sup>st</sup> molar on the right side. Intraoral examination revealed proclined incisors, a bilateral Class I molar relationship, with retained 53, 63, 64, 65, 72, 73, 83, and crossbite with respect to 64/34 and 65/35 [Figure 3a and b]. Radiographic examination revealed multiple impacted teeth [Figure 3c-f].

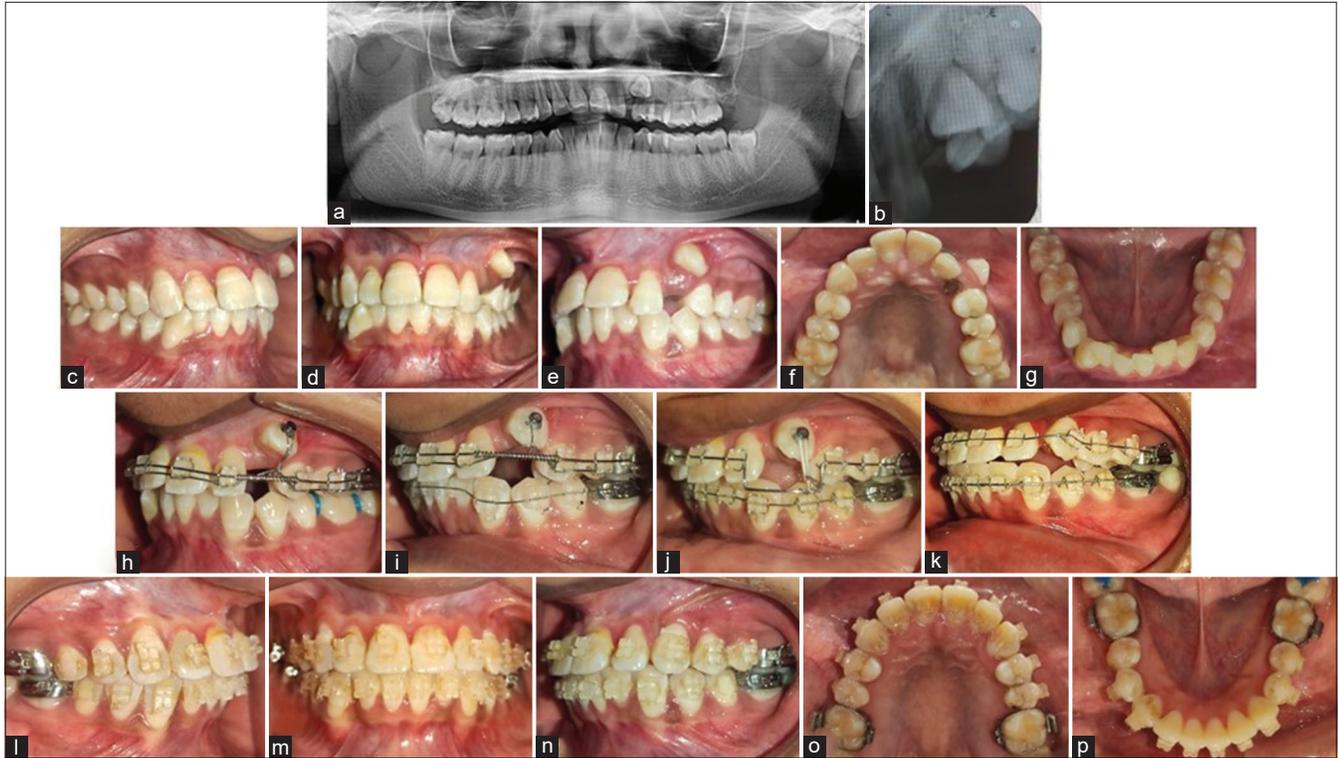
An informed consent was obtained from the patient following which treatment was started with the extraction of 53, 63, and 64. Surgical exposure of 13 and 23 was done, which was followed by lingual button placement on the exposed surface [Figure 3g and h]. A NiTi closed coil spring (9 mm) was ligated on lingual button. Fixed mechanotherapy using MBT prescription was started, and 0.014 NiTi archwire was ligated [Figure 3i and j]. Once the initial alignment of the maxillary arch was achieved, traction of both the canines was initiated by activating the coil spring on 0.016 × 0.022 NiTi archwire. After 1/3<sup>rd</sup> eruption of the crown of 23, Piggyback technique was used with 0.018" AJ Wilcock wire as main archwire and 0.012" NiTi wire as accessory archwire passing over the lingual button [Figure 3k]. Similar mechanics were used for the traction of 13. After 2 months, brackets were bonded on 13

and 23 and final leveling and aligning was completed with a total treatment duration of 10 months [Figure 3l].

### Case 3

A 20-year-old female patient reported with complained of crooked teeth since childhood. Patient gave history of extraction of retained deciduous canine in the upper left jaw at a private clinic. Intraoral examination revealed mild bimaxillary crowding, buccally impacted 23 (with 1/3<sup>rd</sup> crown visibility), an upper midline deviation (2 mm), and bilateral Class I molar relationship [Figure 4a-g]. Radiographic examination revealed the root of 23 was tipped palatally and crown buccally.

A written informed consent was obtained from the patient following which treatment was initiated with MBT prescription, and a lingual button was bonded on the buccal surface of the canine. After initial leveling and aligning of the arches, a NiTi open coil spring (10 mm) was used on a 0.016" × 0.022" NiTi wire to create space for 23. Simultaneously, 0.014" NiTi wire was used as auxillary wire passively tied to 23 [Figure 4h and i]. After 3 months of traction, a 0.016" × 0.022" SS wire was ligated with an offset bend between 22 and 24 along with active traction using a module [Figure 4j]. Within the next 3 months, the canine was aligned and a 0.014" NiTi wire was ligated [Figure 4k]. A 30° Labial root torque was incorporated into a 0.017" × 0.025" SS wire and ligated. After 7 months of active treatment, the canine aligned in the arch [Figure 4l-p].



**Figure 4:** (a-g) Pre-treatment intra-oral photograph and radiograph of a 20-year-old female, diagnosed with ectopically placed canine in the vestibule region. (h-k) treatment progress, Simultaneous traction and space opening for the canine using auxiliary wire and open coil spring. (l-p) after 7 months of treatment, successful torque control was achieved along with well aligned arch.

## DISCUSSION

Etiological factors of canine impaction include arch length discrepancies, retained deciduous canines, cysts, and malformed lateral incisors. Impaction of canines can be broadly categorized based on their position with respect to the alveolar ridge, axial inclination, and depth of the impacted teeth.<sup>[10]</sup> Other factors which can cause canine impaction can be classified into four groups; mainly local obstruction, local pathology, and hereditary or genetic factors.<sup>[11]</sup> Chapokas classified ectopic maxillary canines into three types, based on their position and relation to the adjacent lateral incisor.<sup>[10]</sup> These classification systems enable the clinician to plan a suitable treatment based on the position of the canine. After the retraction of canine, the correct positioning of the canine is of great importance for the function, stability, and esthetics.<sup>[12]</sup> A deeply impacted canine will inevitably require surgical intervention, whereas canine impactions and ectopic canines that are superficially placed can be treated conventionally (i.e., Piggy back/Double wire technique and orthodontic wire traction). Advantages of piggy back technique include improved stability from the rigid SS wire, whereas the super elastic NiTi wire provides a continuous eruptive force.<sup>[13]</sup> The above cases present labially impacted or ectopically positioned canines in different positions. Case 1 shows a buccally placed canine, whereas

Case 2 shows bilateral and deeply impacted canines. Case 3 presented ectopically positioned canine in the buccal region with palatal tipping and minimal crown visibility. In Case 2, the technique was used once the canine was exposed and was in a suitable position. Despite the variations in the presentation and angulations of the canines, favorable results were yielded in all the three cases. Hence, this approach can be considered efficient and adequate in canine impaction cases when it is in a suitable position.

## CONCLUSION

Early diagnosis and appropriate treatment plan play an important role either to avoid impaction or to bring the tooth into the arch. Piggyback technique is reliable as well as easier for orthodontist to implement in a patient. From patient's perspective, the discomfort level is much lower than several other methods. Radiographic evaluation should be done between every 2-3 appointments to avoid complication. Finally, being an important tooth, we should always try to preserve the natural tooth rather than extracting it.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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### Conflicts of interest

There are no conflicts of interest.

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