



## Orthodontic-surgical treatment of four impacted canines in an adult patient: A case report

Ortodontsko-hirurško lečenje četiri impaktirana očnjaka kod odraslog pacijenta

Jasna Pavlović\*, Saša Z. Tabaković†, Sanja Simić\*, Amila Vujačić\*,  
Vladanka Vukićević\*

\*Clinic of Orthodontics, †Clinic of Maxillofacial Surgery, Faculty of Medicine,  
University of Priština, Kosovska Mitrovica, Serbia

### Abstract

**Introduction.** Full impaction of canines, in both jaws, is a rare phenomenon. It is usually coupled with the persistence of deciduous canines, or any other irregularity in the dental arch. **Case report.** Panoramic radiograph of a 24-year-old female patient showed bilateral canine impaction in both jaws. Due to vestibular, apical and medial position of canines in the upper jaw, the surgical approach implied the apically positioned flap technique. The position of impacted mandibular canines was vertical with more coronal position relative to the upper canines, thus requiring a closed eruption technique. **Conclusion.** Inadequate position of impacted canines in the bone fully justifies the use of orthodontic-surgical treatment.

### Key words:

tooth, impacted; radiography, dental, digital; oral surgical procedures; orthodontics; treatment outcome.

### Apstrakt

**Uvod.** Impakcija očnjaka u gornjoj i donjoj vilici zajedno, retna je pojava. Najčešće se javlja dok su još prisutni mlečni očnjaci, kao i zbog drugih nepravilnosti zubnoga niza. **Prikaz bolesnika.** Panoramski snimak 24-godišnje pacijentkinje pokazao je obostrano impaktirane očnjake u obe vilice. Hirurški pristup oslobađanju zuba sproveden je sa apikalno pozicioniranim flapom zbog vestibularnog, apikalnog i mezijalnog položaja očnjaka u gornjoj vilici. Položaj donjih impaktiranih očnjaka bio je vertikalisan sa koronalnijim položajem u odnosu na gornje očnjake, pa su hirurški tretirani metodom zatvorene erupcije. **Zaključak.** Neadekvatan položaj impaktiranih očnjaka u kosti u potpunosti opravdava primenu ortodontsko-hirurške terapije.

### Ključne reči:

zub, impakcija; radiografija, stomatološka, digitalna; hirurgija, oralna, procedure; ortodonticija; lečenje, ishod.

### Introduction

Tooth impaction is a very common and well-known anomaly. Although any tooth may be impacted, the most commonly impacted teeth are third molars, followed by canines, upper premolars, second lower premolars or upper incisors<sup>1,2</sup>. The prevalence of impacted canines in the upper or lower jaw ranges from 0.008% up to 8.8%, whereas the upper canine impaction alone ranges from 0.8% to 2.8%<sup>1-5</sup>. Impacted canines are more common among females<sup>1-6</sup>.

The prevalence of impacted canines in the upper jaw is 10 to 20 times higher compared to the lower jaw canine impaction<sup>4</sup>. Impacted canines can be positioned buccolabially, orally or along the crest of the alveolar ridge. The incidence of palatally impacted canines ranges from 0.27% to 2.4%, being more frequent than labially impacted canines<sup>5</sup>. The incidence of impacted mandibular canines ranges from 0.10%

to 0.31%<sup>2-7</sup>. Chu et al.<sup>6</sup> reported 5 out of 7,486 assessed patients, i.e. 0.07% diagnosed with a mandibular canine impaction. Their position is more commonly vestibular and rarely lingual<sup>7</sup>. Relative to the alveolar ridge of the mandible, they may have vertical, angular or horizontal positioning.

Impaction of all four canines is a rare phenomenon, and based on the available literature, there seem to be no precise data concerning the prevalence of the respective anomaly.

The causes leading to upper canine impaction may imply: atypical position of the tooth germ prior to the formation of enamel, a long duration of eruption process, bone density, atypical position and shape of the adjacent teeth, lack of space in the dental arch or injury. Canine impaction is often accompanied by the persistence of deciduous teeth, dental ankylosis and cysts. The question whether they are the cause or the consequence of impaction, is still rather vague<sup>8</sup>. The main reasons for mandibular canine impaction imply: lack of space,

supernumerary teeth, premature loss of deciduous teeth, persistence of deciduous canines, crown oversize, genetic factors, endocrine imbalance, tumors, cysts and trauma<sup>9</sup>.

The treatment of impacted teeth may imply extraction, followed by an implant-supported or a prosthetic replacement procedure. If their position in bone allows an orthodontic-surgical treatment, the procedure consisting in surgical release and orthodontic traction of an impacted tooth to the dental arch is the method of choice. Treatment duration, surgical approach, orthodontic technique and potential problems likely to occur in the course of treatment, mainly depend on the position of the impacted tooth.

### Case report

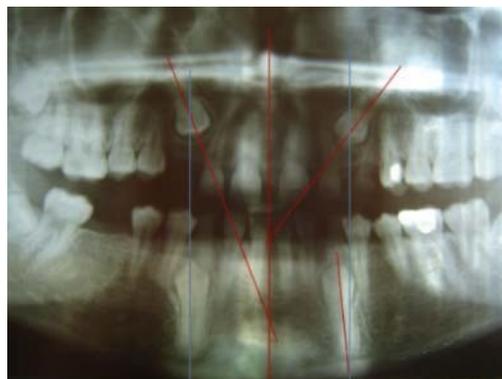
A 24 year-old female patient came to the Department of Orthodontics for orthodontic evaluation for aesthetic reasons. Clinical examination determined a protrusion of upper incisors with diastemas, severe overjet and deep overbite, with the teeth striking gingival groove. The upper jaw on the left side lacked a permanent canine, while the right side showed a persistent deciduous canine. The lower jaw assessment demonstrated persistent deciduous canines. The deciduous canines were conspicuously small and short, revealing marked attrition of the occlusal surface. The right side revealed excessive spacing, created due to the extraction of the first permanent molar. Gnatometric analysis of the study models confirmed the Class I malocclusion (Figure 1) with the protrusion of upper incisors, severe overjet (8 mm) and increased overbite (6 mm).



**Fig. 1 – Pretreatment study models show protrusion of upper incisors with diastema, missing of the right maxillary permanent canine, and severe overjet and overbite.**

Panoramic radiograph demonstrated bilateral impaction of permanent canines in both jaws. The analysis of the orthopantomogram showed an increased angle between the upper canines and the midline and the upper canines and the lateral incisors, which indicated their mesial inclination (Figure 2). The position of the impacted lower canines was nearly vertical.

After a detailed analysis of the study model and the radiographic imaging, we decided to apply orthodontic-surgical treatment. The results of the index on the severity of the treatment, showed a heavier treatment of the impacted upper canines and moderately heavy treatment of the impacted mandibular canines.



**Fig. 2 – Orthopantomogram analysis demonstrates vertical position of the impacted canines relative to the mucogingival line and to lateral incisors.**

The aim of the pre-surgical orthodontic treatment was to ensure sufficient space for the correct positioning and alignment of permanent canines. During this phase of the treatment, other orthodontic corrections were also conducted: protrusion of upper incisors, diastema closure and overbite correction. After three months, surgical release of impacted upper canine followed. The key criteria guiding our selection of the case-specific surgical method were as follows: vertical position of the tooth in relation to the mucogingival junction, and mesiodistal position of the impacted canine crown.

The radiograph-based clinical examination identified the vestibular and apical position of the upper canines. Increased angles between the impacted teeth and lateral incisors indicated the potential risk of root resorption of the lateral incisors due to the orthodontic canine traction (Table 1). For this reason, the applied method implied surgical procedure involving the apically positioned flap technique.

**Table 1**

#### Radiological analysis of impacted canines (KPG index)

Parameters	Maxillary canines		Mandibular canines	
	right	left	right	left
Width of permanent canine (mm)	7,5	7,5	6,7	6,5
Width of the dental follicle (mm)	8,6	8,4	7,4	7,1
Grade of root development	2/3 of root	completely	completely	completely
Angle canine/midline (°)	16	37	0	6
Angle canine/lateral incisor (°)	24	40	8	1
Distance canine /occlusal plane (mm)	10	8	7,5	7
Deciduous canine	absent	non resorption	resorption without contact maxillary canine	resorption with contact maxillary canine
Evaluation of orthodontic treatments	23**	25**	7*	9*

(\*) Easy to moderate orthodontic treatment (0 to 14); (\*\*) difficult orthodontic treatment (15 to 30); KPG index – three-dimensional classification system.

Seven days after surgical release of the teeth, an elastic chain was used to attach the impacted teeth to the  $0.016 \times 0.022$  mm steel arch wire, followed by the routing and traction of the impacted teeth (Figure 3).

The position of impacted mandibular canines did not impose any restrictions on the selection of the surgical treatment method. Given that the upper jaw was undergoing the surgical procedure involving the apically positioned flap technique, for the sake of an easier postoperative recovery and patient comfort, a surgically closed eruption procedure was conducted. Following full flap elevation and exposure of the crown, the brackets were bonded on the exposed vestibular surfaces of the impacted teeth using wire ligature. Upon completion of the flap suture, the ligature wire descending from the bonded brackets through the flap, being ligated to the existing lower  $0.016 \times 0.022$  mm steel arch wire (Figure 4)

Traction of the canines on the left and the right side and bringing them into occlusion, was achieved by means of the postsurgical fixed orthodontic treatment. Along with the im-

acted canine traction procedure, the ongoing malocclusion corrections such as the protrusion of the upper incisors and the deep bite proceeded further on (Figure 5).

Since the patient was satisfied with the therapeutic and aesthetic results, upon her personal request, the treatment was discontinued after 24 months (Figures 6 a–c). A set of retainers was attached to both jaws and 18 months thereafter, the result of the treatment was quite satisfactory (Figure 7).

### Discussion

The key factors disrupting the proper development and eruption of canines can lead to serious consequences in both functional and aesthetic aspect. Impacted canines may pose a risk likely to cause the occurrence of follicular cysts and infections that may threaten the lateral incisor vitality and cause their root resorption<sup>8, 9</sup>. If, however, the impacted canines do not cause any real problems, they often remain inside the jaw undiagnosed.



**Fig. 3 – Orthodontic traction of the canine into the dental arch after surgical treatment by apically positioned flap technique.**



**Fig. 4 – Orthodontic-surgical treatment of impacted mandibular canines is illustrated by surgical exposure and alignment of impacted canines by the closed-eruption technique, orthodontic traction, exposure and alignment of the canines into the dental arch.**



**Fig. 5 – Final alignment of the canines into the dental arch.**



**Fig. 6 – Final results after orthodontic-surgical treatment of impacted canines: a) and b) intraoral views; c) gingival scarring of the upper right canine.**



**Fig. 7 – Treated canines 18 months after orthodontic-surgical treatment.**

Dealing with impacted canines falls within the competence of oral surgeons, orthodontists and prosthodontists. Impaction of all four canines and the ability to achieve proper alignment into the dental arch is a challenge for any therapist. The best solution for the patient's teeth is to be naturally settled into the jaw. However, the patient's age and the position of the teeth largely determine the type of treatment<sup>10</sup>. Tooth extraction and implant restoration is the method recommended for adult patients<sup>11</sup>. However, the favorable position of impacted canines, should trigger any dentist to attempt surgical-orthodontic treatment regardless the patient's age. In this particular case, the impacted upper and lower canines were diagnosed at the age of 24. Up to that moment, the patient had not been aware, nor had she ever been warned about the presence of impacted canines. The full impaction of all four canines was coupled with the persistence of deciduous canines.

Vestibular position and mesial inclination of the impacted canine in the upper jaw was the reason for opting for the apically positioned flap method applied<sup>10, 12</sup>. This method enabled monitoring of the distal tooth movement. However, the labially impacted maxillary anterior teeth, treated by apically positioned flap technique, might exhibit certain aesthetic drawbacks compared to the closed eruption method<sup>12</sup>. Gingival scarring on mesial side of the upper right canine possibly occurred as a consequence of the surgery (Figure 6 c). However, 18 month of a retention period following the orthodontic treatment, the problem seemed to be spontaneously consolidated. An increase in clinical crown length was also determined in both canines. This may be the result of positioning of the flap during surgery<sup>13, 14</sup>.

Looking at the size of the clinical crown of the lower canines treated by closed eruption technique, it was also observed that the clinical crown extended considerably, which did not fall within the scope of the expected results of this method<sup>15</sup>. No trace of gingival scarring was observed as an advantage of this method. The closed eruption method seemed to imitate the natural tooth eruption.

An index based on the position of impacted canines can predict the level of severity and duration of the treatment, indicated to the potential severe treatment of upper and a moderately severe treatment of impacted mandibular canines<sup>16</sup>. Therefore, the traction treatment of impacted canine was initiated in the upper jaw first. This was also confirmed based on the duration of postoperative orthodontic treatment of impacted canines in the upper (18 months) and lower (15 months) jaw.

### Conclusion

The canine position and its significance from the functional and aesthetic perspective, fully justify orthodontic-surgical treatment in case of canines impaction. The potential aesthetic disadvantages of surgical treatment are related to gingival scarring and increase in the clinical crown length, which may require additional periodontal treatment. Orthodontic-surgical traction of impacted canines and their exposure and alignment into the dental arch exclude the need for prosthetic therapy and provide a nice smile to patients and proper occlusion.

### R E F E R E N C E S

1. Grover PS, Lorton L. The incidence of unerupted permanent teeth and related clinical cases. *Oral Surg Oral Med Oral Pathol* 1985; 59(4): 420–5.
2. Aktan AM, Kara S, Akgünlü F, Malkoç S. The incidence of canine transmigration and tooth impaction in a Turkish sub-population. *Eur J Orthod* 2010; 32(5): 575–81.
3. Halınoğlu K, Çörekeçi B, Celal I. Incidence of impacted teeth and transmig, 42-50rated canines- a radiographic study in Turkish dental patients. *Clin Dent Res* 2012; 36(3): 42–50.
4. Sharma G, Nagpal A. Transmigration of Mandibular Canine: Report of Four Cases and Review of Literature. *Case Rep Dent* 2011; 2011: 381382.
5. Becker A. Palatally impacted canines. In: Becker A, editors. The orthodontic treatment of impacted teeth. 2<sup>nd</sup> ed. Hampshire: Thomson Publishing Services; 2007. p. 93–142.
6. Chu FC, Li TK, Lui VK, Newsome PR, Chow RL, Cheung LK. Prevalence of impacted teeth and associated pathologies--a radiographic study of the Hong Kong Chinese population. *Hong Kong Med J* 2003; 9(3): 158–63.
7. Becker A. Orthodontic Treatment of Impacted Teeth. 3<sup>rd</sup> ed. Hampshire: Thomson Publishing Services; 2012.
8. Araújo EA, Araújo CV, Tanaka OM. Apicotomy: Surgical management of maxillary dilacerated or ankylosed canines. *Am J Orthod Dentofacial Orthop* 2013; 144(6): 909–15.
9. Nagaraj K, Upadhyay M, Yadav S. Impacted maxillary central incisor, canine, and second molar with 2 supernumerary teeth and an odontoma. *Am J Orthod Dentofacial Orthop* 2009; 135(3): 390–9.
10. Kokich VG. Surgical and orthodontic management of impacted maxillary canines. *Am J Orthod Dentofacial Orthop* 2004; 126(3): 278–83.
11. Bishara SE. Impacted maxillary canines: A review. *Am J Orthod Dentofacial Orthop* 1992; 101: 59–71.
12. Vermette ME, Kokich VG, Kennedy DB. Uncovering labially impacted teeth: apically positioned flap and closed-eruption techniques. *Angle Orthod* 1995; 65(1): 23–32.
13. Chausbu S, Brin I, Ben-Bassat Y, Zilberman Y, Becker A. Periodontal status following surgical-orthodontic alignment of impacted central incisors with an open-eruption technique. *Eur J Orthod* 2003; 25(6): 579–84.
14. Chapokas AR, Almas K, Schincaglia G. The impacted maxillary canine: a proposed classification for surgical exposure. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2012; 113(2): 222–8.
15. Crescini A, Nieri M, Buti J, Baccetti T, Prato GP. Orthodontic and Periodontal Outcomes of Treated Impacted Maxillary Canines. *Angle Orthod* 2007; 77(4): 571–7.
16. Algerban A, Jacobs R, Fieuws S, Willems G. Comparison of two cone beam computed tomographic systems versus panoramic imaging for localization of impacted maxillary canines and detection of root resorption. *Eur J Orthod* 2011; 33(1): 93–102.

Received on April 1, 2015.

Revised on May 19, 2015.

Accepted on May 22, 2015.

Online First January, 2016.