Sagittal Osteotomy for the Removal of Deeply Impacted Mandibular Molars: A Presentation of Series of Cases

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Abstract Sagittal osteotomy was primarily described as a treatment for prognathism and retrognathia. It has been rarely reported as an option for the removal of deeply impacted tooth. The principal indication of this approach is when the tooth is deeply impacted on the mandibular ramus or body and it presents intimate relationship between its root and inferior alveolar neurovascular bundles. In this article the author related three rare cases of lower third molar included. Because of the unusual deeply position of these, the SRRO surgery technique was realized to remove them. Sagittal split ramus osteotomy (SSRO) is technically safe and allows the removal of teeth in situations of deeply impacted mandibular ramus, angle or body with minimal trauma in a short time.

Keywords Osteotomy · Extraction · Impacted teeth

Introduction

Sagittal osteotomy to treat prognathism and retrognathia was first described in 1957 [1]. Few modifications in its design were proposed by Dal Pont [2] and Epker [3]. It has

been rarely reported as an option for the removal of deeply impacted molars when a traditional surgical extraction might cause complications. Such complications include severe bone loss, possible injury on inferior alveolar bundles, adjacent teeth injury and intra/post-operative mandibular fracture [4–9]. The procedure of mandible molar extraction is the most common procedure in oral and maxillofacial surgery [6].

Sagittal osteotomy is chiefly recommended in cases where the tooth is deeply impacted on the mandibular ramus or body, with its root communicating with inferior alveolar neurovascular bundles [4–8]. This approach allows surgeons to detect the roots of impacted molars, verify whether they have affected the inferior alveolar nerve, and then proceed with the tooth extraction with lower risk of surgical complications [4]. This paper describes three rare cases of deeply impacted tooth extraction using sagittal split ramus osteotomy (SSRO).

Case Reports

Case 1

A 28-year-old man was referred to the Oral and Maxillofacial Surgery department of the Cura D’Ars hospital presenting with a missing tooth—right mandibular first molar—whose absence was detected during an epidemiological examination. Cone beam computed tomography (CBCT) revealed that the tooth was not missing, but deeply impacted and very close to the inferior alveolar bundles (Fig. 1A). Unilateral SSRO was proposed because the conventional approaches would lead to greater bone loss, possible transection of the nerve bundles, and mandible fracture. Unilateral SSRO was performed and a great

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Fig. 1 **A** Pre-operative panoramic radiograph (case 1), **B** Post-operative panoramic radiograph (case 1), **C** Pre-operative panoramic radiograph (case 2), **D** Post-operative panoramic radiograph (case 2),

E Pre-operative panoramic radiograph (case 3), **F** Post-operative panoramic radiograph (case 3)

amount of bone between the roots was visualized (Fig. 2). The tooth was cut with a fissure bur preserving the inferior alveolar nerve (IAN). When the tooth was removed, dental caries was observed in the crown, probably due to the communication of the gingival sulcus with the dental follicle. A four-hole plate (2.0 mm system) was used for mandibular fixation. No maxillomandibular fixation was needed post-surgically (Fig. 1B). No sign of impairment, sensibility or occlusal alterations were observed or reported in a one-year follow-up.

Case 2

During an orthodontic pre-treatment examination, a missing tooth (right mandibular second molar) was detected in a 26-year-old woman. Panoramic radiograph showed that the tooth was deeply impacted (Fig. 1C); CBCT was used to see whether the tooth had a close relationship with the IAN. Extracting the tooth using conventional techniques would have resulted in great bone loss and, consequently, substantial trauma to the surrounding tissue. Unilateral SSRO combined with general anesthesia was then used for the tooth extraction. To

ensure the original position of the condyle, the plate was positioned and four screw holes were drilled before sagittal splitting and dental extraction (Fig. 1D). The tooth was removed with minimal bone loss and the four-hole plate (2.0 mm system) was used for fixation of the bone segments. No maxillomandibular fixation was used during the post-surgical period. During one-year follow-up, no signs of impairment, sensibility or occlusal alterations were observed or reported.

Case 3

A 26-year-old man was referred to the same service with one right second molar missing. Panoramic radiograph showed that the tooth was deeply impacted (Fig. 1E) and CBCT revealed the tooth was very close to the IAN (Fig. 3). SSRO combined with general anesthesia was performed to remove the tooth and the IAN was preserved (Fig. 4). A five-hole plate (2.0 mm system) was used for the bone fixation and no maxillomandibular block was used (Fig. 1F). During 1-year follow-up, no sign of impairment, sensibility, or occlusal alterations were observed or reported.

Fig. 2 The arrow points to large amount of bone among the roots of a mandibular first molar (case 1)

Discussion

The conventional exodontia of deeply-impacted lower teeth can lead to substantial bone loss and impairment of the IAN, being a surgical challenge. Patients described were in third decade of life. Advanced age and poor systemic condition are contraindications to some elective surgical procedures. Also, extraction of impacted mandibular molars using an extra-oral buccal approach might jeopardize the marginal mandibular branch of the facial nerve and leave an unaesthetic scar [7].

SSRO was primarily used to correct dentofacial deformities since it enables mandibular motion along the anteroposterior axis. Other advantages are total

Fig. 4 The arrow points to IAN among roots of a mandibular second molar (case 3)

visualization of the IAN, minimal bone loss and excellent access. An impacted tooth in an unusual position can be safely extracted by SSRO [4–7], which allows the root to be sectioned and removed without serious complications [4]; rates of post-operative complications and morbidity related to SSRO are low and it can be performed in a relatively short time [10].

The use of SSRO for orthognathic procedures might result in the same surgical complications—bad split, nervous injuries, lingual fracture, and condylar sag, with bad split being the most prevalent [7]. In cases where SSRO is performed to extract deeply impacted mandibular molars, the osteotomy extends more anteriorly than it does in an orthognathic surgery and the buccal cortex is generally most thinned at region of impacted teeth, increasing the risk of bad splitting due to a long and thin proximal segment. Lingual mandibular fracture might occur if bone structure around the tooth is deficient [8].

Plate and screws were used in cases described above. The risk of nerve injuries is potentialized if IAN lies very

Fig. 3 CBCT shows relationship between mandibular second molar and IAN, the arrow points to the mandibular canal. (case 3)

close to the impacted tooth to be extracted. In the present cases, splitting was carried out gently and the IAN was dissected from the tooth structure to avoid post-surgical complications.

Few studies on the use of SSRO for impacted tooth extraction were found in the literature. Amin et al. [4], was the first to propose sagittal splitting of the mandible as a surgical access to an impacted lower third molar. Infante-Cossio et al. [5], reported a case where the SSRO was used to extract a pre-molar with extreme distal migration. Toffanin et al. [6], reported a case in which a deeply impacted third molar was extracted by means of SSRO. Jones et al. [7] reported a case of one mandibular third molar removed by SSRO. Sencimen et al. [8] showed an extraction of a deeply impacted lower third molar by sagittal split osteotomy without any complications.

Computed tomography is essential to diagnose the relationship between impacted teeth and the inferior alveolar nerve. SSRO is technically safe and allows dental extraction in situations where the tooth to be extracted is deeply impacted in the mandibular ramus, angle or body, with minimal surgical trauma. This surgical approach is preferable to other conventional techniques since it involves a considerable risk–benefit ratio resulting in few or no post-surgical complications, which was observed in these cases series.

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