Excision of Large Mandibular Complex Odontoma through Unilateral Sagittal Split Osteotomy

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Introduction: There are various alternative surgical approaches for removal of large benign lesions in the posterior part of the mandible. This study describes three cases of large mandibular mixed odontogenic lesions which were excised via sagittal split approach. **Report of Cases**: All three cases were treated by surgical excision via unilateral sagittal split osteotomy under general anesthesia following a 2 weeks period of intermaxillary fixation. **Results**: The lesions were enucleated completely and all three osteotomy sites healed with no consequences with an intact neurosensory function. **Conclusion**: This article suggests the sagittal split osteotomy approach for conservative treatment of large mandibular lesions based on excellent access, limited bone removal and reducing further complications.

Keywords: Sagittal Split Osteotomy; Excision of Mandibular Lesions; Large Mandibular Lesions

Introduction

Sagittal splitting of the mandible is a widely used and well established surgical technique in orthognathic and pre-prosthetic surgeries (1). The procedure has been also described in order to gaining access for the enucleation of large benign pathologic lesions located deeply in posterior parts of the mandible (1, 2). Several cases of large complex odontomas have been reported in literature in whom sagittal splitting of the mandible was used for surgical removal of the lesion (1-6). Odontomas are benign odontogenic lesions and account for 22–67% of all odontogenic tumors representing the most common odontogenic tumor (3). More often complex odontomas are small, measuring a few millimeters in diameter which are diagnosed because of abnormal, or absence of eruption of teeth. They rarely reach a considerable size or produce expansion of the jaw (6).

Surgical excision is the treatment of choice for odontoma (3). Small and superficially placed odontomas can be easily removed by an intraoral approach while a Large or deeply placed odontoma requires either an extraoral approach or necessitate removal of large amounts of bone (5).

Since it is not common for mandibular mixed odontogenic lesions to get very large, little information is available about the optimal surgical approach for these Lesions. Based on the literature they can be treated by an extraoral or intraoral approach including buccal exposure, lingual exposure, or a sagittal split (6).

This study describes three cases of large mandibular mixed odontogenic lesions which were excised via sagittal split approach.

Report of Cases

Case 1

A 15-year-old female was referred to the Department of Oral & Maxillofacial Surgery of Tehran University of Medical Sciences, Tehran, Iran, complaining of an asymptomatic incidental radiographic finding discovered by her dentist in the previous month. The patient's medical history was not remarkable and she was unaware of any problem in her jaw, however, intraoral examination revealed slight expansion of buccal cortex distal to the permanent mandibular right first molar. The right mandibular second and third molars were seen to be absent. Intact sense of lower lip and chin was reported by the patient.

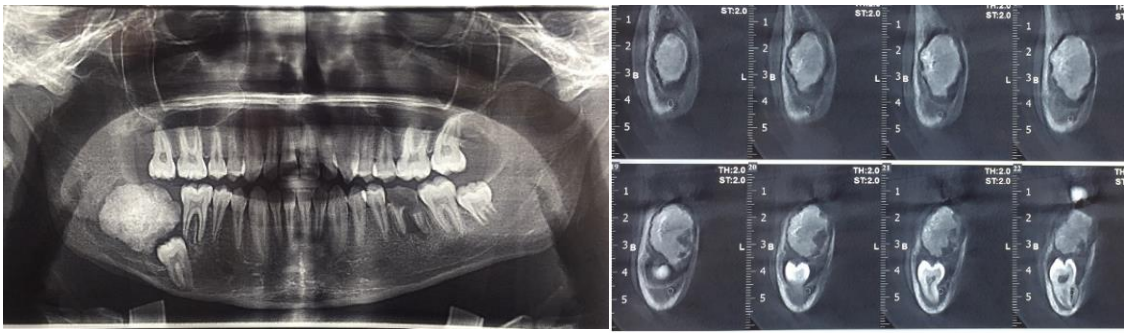

Figure 1. A) Panoramic radiograph revealed a large, well-circumscribed mass of calcified tissue in the right mandibular angle; B) Cone Beam Computed tomography (CBCT) of the mandible showed a well-defined radiopaque mass resulting in expansion of buccal and lingual plates with some erosion of the lingual cortex

Figure 2. A) Intra operative view. The proximal and distal segments were fixed using miniplate and screws placed in the previously drilled holes; B) Decalcified sections of complex odontoma demonstrating dentin material and clefts representative of enamel(x100); C) Post-operative panoramic view

Panoramic radiograph revealed a large, well-circumscribed mass of calcified tissue in the right mandibular angle adjacent to mandibular canal in its inferior border. A well-formed second molar was impacted inferior to the first molar, displaced to the mandibular base, and the third molar was absent (Figure 1A)

Cone Beam Computed tomography (CBCT) of the mandible showed a well-defined radiopaque mass resulting in expansion of buccal and lingual plates with some erosion of the lingual cortex (Figure. 1B).

In view of the clinical and radiological presentations, a provisional diagnosis of complex odontoma was considered.

Taking the large size of the lesion and the young age of the patient in to account, the lesion was planned for surgical excision via an intraoral sagittal split approach under general anesthesia. A standard unilateral sagittal split osteotomy extending to the mesial aspect of the lower right first molar was performed. In order to ensure proper fixation of segments a 4-hole miniplate was placed on mandible before separating the cortices and 4 holes were drilled for screws. Then the plate and screws were removed and the buccal and lingual cortices were separated easily and the lesion was enucleated entirely with the associated impacted second molar. The inferior alveolar nerve was preserved without any complications. The proximal and distal segments were fixed using miniplate and screws placed in the previously drilled holes (Figure 2A). Specimen was sent for further histopathological examination (Figure 2B). Intermaxillary fixation was applied for two weeks using two Ivy loops for each side (Figure 2C).

Case 2

A 16-year-old female was referred to the Department of Oral & Maxillofacial Surgery at Tehran University of Medical Sciences Tehran, Iran, with a chief concern of a pain free swelling over the right area of mandibular angle. The patient reported history of mild asthma with well-controlled symptoms. Intraorally, a firm swelling was found in body and angle area of the mandible with no tenderness on palpation. Evidence of buccal and lingual cortical expansion was obvious. Right second and third molar teeth were not present clinically.

A large, well circumscribed calcified mass was found in panoramic view. A peripheral radiolucent rim was also detectable.

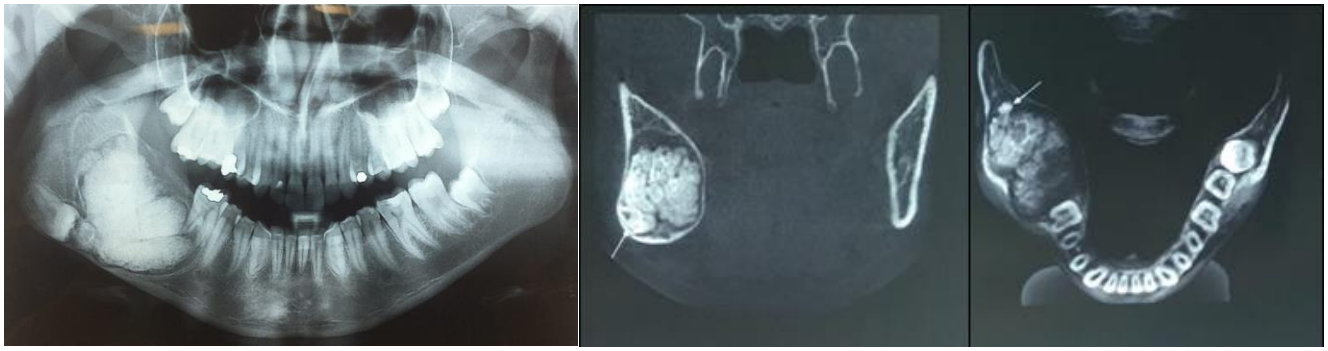

Figure 3. A) Panoramic view. A large, well circumscribed calcified mass; B) CBCT view. Based on coronal and axial views, buccal and lingual cortical plates were extremely thin with some level of erosion on both cortices as well as the inferior border of mandible

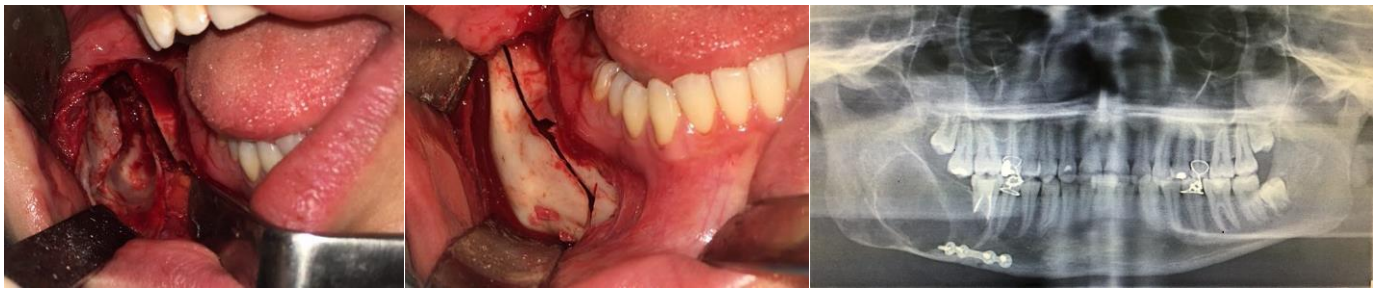

Figure 4. A, B) Intra operative view. The buccal and lingual cortices were separated and the lesion was enucleated with associated impacted molar; C) Post-operative panoramic view. Intermaxillary fixation was applied for two weeks using direct wiring on upper and lower second premolars

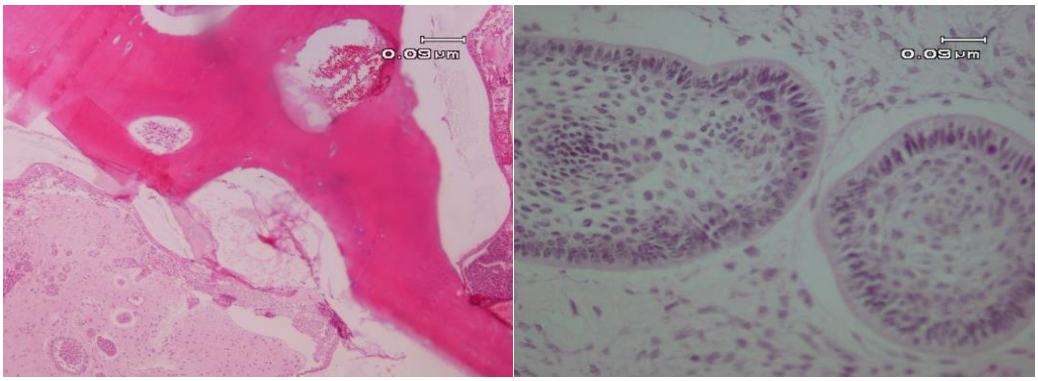

Figure 5. A) Decalcified sections of ameloblastic fibroodontoma, demonstrating fragments of dentin intermixed with enamel clefts. Note the presence of proliferative odontogenic epithelium in a background of cellular mesenchymal tissue adjacent the calcified material (x100); B) proliferating epithelial nests show columnar cells with reverse polarized hyperchromatic nuclei at the periphery and loosely arranged stellate reticulum like cells in the central portion of the nests (400×)

Third molar was absent and a well formed second molar was present just above the inferior border of the mandibular angle. The crown of the impacted tooth was in touch with inferior border of the lesion. The inferior alveolar nerve was pushed inferiorly during the enlargement of the lesion but the patient had no neurosensory loss on lower lip and chin (Figure 3A). Cone beam CT was obtained for further evaluation of the extension and expansion of the mass. Based on coronal and axial views, buccal and lingual cortical plates were extremely thin with some level of erosion on both cortices as well as the inferior border of mandible (Figure 3B).

The described clinical and radiographic findings suggested the provisional diagnosis of large complex odontoma. The patient was treated best via an intraoral sagittal split osteotomy, considering the age of the patient and the extent of the mass. Preservation of the inferior alveolar nerve was a goal as the patient had no complaint of current sensory loss.

Figure 6. A) Panoramic view revealed a large radiopaque mass occupying the whole depth of the mandible in the left mandibular ramus and angle; B) Axial and coronal view of the CBCT revealed eroded buccal and lingual cortices and an extremely thin mandibular border in impacted third molar area

Figure 7. A) The lesion was sectioned into buccal and lingual pieces and each piece was enucleated separately and the impacted third molar was removed afterwards ; B) Sections of tubular dentin and fibrous connective tissue of dental palp are evident (100×) ; C) Post-operative panoramic view. Osteosynthesis was provided using a single miniplate and four screws. The fractured upper lingual cortex was also fixed using a positional screw.

A standard approach of unilateral sagittal split osteotomy was done. Screw holes were drilled on buccal cortex of mandible before splitting. The buccal and lingual cortices were separated, and the lesion was enucleated in pieces. The associated impacted molar was removed after full excision of the mass (Figure 4 A, B).

The proximal and distal segments were fixed using miniplate and screws inserted in previously drilled holes. Intermaxillary fixation was applied for two weeks using direct wiring on upper and lower second premolars (Figure 4C). Definitive diagnosis was confirmed as Ameloblastic Fibro-odontoma after Histopathologic study (Figure 5A, B).

Case 3

A 25-year-old female was referred to the aforementioned department because of an asymptomatic swelling in the left mandibular angle. Facial asymmetry was visible in extraoral examination. The patient claimed no altered sensation of the lower lip.

Expansion of the buccal and lingual cortical plates of mandibular angle was obvious in intraoral examination and the third molar could not be observed clinically.

Panoramic revealed a large radiopaque mass occupying the whole depth of the mandible in the left mandibular ramus and angle, adjacent to second molar roots extending up to ramus. The third molar was displaced inferior to the lesion. The inferior alveolar canal was also displaced to the mandibular base (Figure 6A).

Axial and coronal view of the CBCT revealed eroded buccal and lingual cortices and an extremely thin mandibular border in impacted third molar area (Figure 6B).

Provisional diagnosis of complex odontoma was made based on the clinical and radiological findings. Based on the facial asymmetry, the size of the lesion and consequent risk of fracture of the jaw, it was planned to remove the mass via sagittal split osteotomy approach as this approach provides adequate surgical access to the lesion and also preserves the buccal and lingual plates.

Under general anesthesia, a standard intraoral sagittal splitting of mandible was carried out. Cortical plates were carefully split using small osteotomes. The lesion was sectioned into buccal and lingual pieces and each piece was enucleated separately. The impacted third molar was removed afterwards (Figure 7A). The inferior alveolar neurovascular bundle was preserved. Proximal and distal segments were repositioned in normal anatomical position and osteosynthesis was provided using a single miniplate and four screws. The upper part of the lingual cortex of the distal segment was so thin that it was fractured during the splitting. After removal of the lesion and bone fixation, this fractured segment was also fixed using a positional screw (Figure 7B).

Four intermaxillary fixation screws were used and IMF was applied and maintained for a month preventing the high risk of fracture in such weak mandible.

Histopathological study confirmed the diagnosis of complex odontoma (Figure 7C).

Ethical Approval

Declaration of Helsinki on medical protocol was followed and informed consent was obtained. The study protocol was reviewed and approved by the clinical research ethics board of Tehran University of medical science.

Results

In the first case, post-operative recovery was uneventful. 10 months follow up revealed appropriate healing of the surgical site and preservation of lower lip sensation.

In second patient, despite post-operative mild paresthesia in lower lip and chin area for the first few weeks, sensation improved to pre-surgical level gradually and spontaneously. 18 months of follow up showed a full recovery of sensation and bony defect.

Recovery progressed well with no post op complications in the third case. Patient reported a mild hypoesthesia in lower lip for the first month after surgery but a 6 months post-operative follow up revealed full Sensation recovery of lower lip.

Discussion

Conservative surgical excision is the recommended treatment for all types of odontogenic mixed tumors (7). This could be achieved through a simple intra oral approach when the lesion is in usual size and location. For the larger deeply located lesions, the conventional intra oral approach may lead to sacrifice of large amounts of bone, mandibular fracture and damage to the inferior alveolar nerve (5, 8). Various treatments have been suggested for the large complex odontomas, but the gold standard treatment is still under debate. Different approaches must be considered to obtain good accessibility to the lesion and to confirm its complete removal along with avoidance of complications associated with radical surgery (8).

There are various alternative surgical approaches for removal of large benign lesions in the posterior part of the mandible:

-The intraoral approach via removal of the buccal plate. Removal of the thick buccal cortex (corticotomy) to obtain adequate access, may lead to pathologic fracture of the mandible and injury of the inferior alveolar nerve.

-The intraoral approach via removal of the lingual plate. Corticotomy of the lingual cortex offers limited access and results in weakening of the mandible. The risk of lingual paresthesia is also probable especially if the plane of dissection is not kept subperiosteally.

-Segmental osteotomy via an extraoral submandibular approach and partial resection of the bone. This approach requires bone grafting and rigid internal fixation. It also leaves a visible surgical scar in the lateral aspect of the neck. There is also a potential risk of damage to the marginal mandibular branch of facial nerve. This is a rather aggressive approach, since odontomas are considered to be benign lesions.

-Unilateral sagittal split osteotomy of the ramus or mandibular body (8).

The sagittal split osteotomy was first introduced to gain access for the removal of a large tumor of the mandible in 1979 by Rittersma and Van Gool (9). Barnard in 1983 presented a similar approach in which sagittal splitting of the mandible was used for removal of a large complex composite odontoma (1). Since then several others have used this method for the removal of large deeply seated complex odontomas of the mandible (2-6).

This procedure has several noted advantages over conventional techniques. Sagittal split osteotomy avoids large defects in the cortical bone while giving excellent access to the tumor site (6). By preservation of more cortical bone, it avoids discontinuity of mandible, preventing the fracture of mandible intraoperatively and postoperatively, and Bone healing would hasten without the need for any bone grafts(10). The possibility of inferior alveolar nerve injury is lower than that of conventional methods as there is adequate and direct visibility

of the canal (5). This method also provides large soft tissue attachments for the proximal and distal segments(10). The sagittal split osteotomy is more aesthetic when compared to the extraoral approach due to elimination of the external scar and preservation of terminal branches of facial nerve by an intraoral approach (5).

Discomfort related to a period of maxillomandibular fixation might be a drawback of this method. Moreover, fracture of the thin cortical bone eroded by the large lesion is a potential problem of this technique, as it happened in third case of this study. Though it can still be a treatment option for large lesions by taking the advantages of various modifications of the SSO (11).

"Chrcanovic *et al*., (3) removed a large complex odontoma with a very thin lingual cortex via a two-stage surgical procedure". First, they removed most part of the lesion through the lingual approach, decreasing the risk of a pathologic fracture. The rest of the lesion was removed through the second surgical stage, 3 months after the first one.

The final choice of what method to use, however, should depend on the extension of the lesion, its buccolingual location, and whether the lingual or buccal cortical plates are invaded (6).

Conclusion

Previous reports concluded that the technique allows thorough clearance of the lesion while avoids complications associated with the conventional approaches, as the same of present study ~~(1-6, 9)~~. None of the previous studies reported any change of occlusion in post operation follow up sessions. All three patients in present study had also stable occlusion on 6 months of follow up.

In present study, the advantages of a sagittal split osteotomy outweighed those of more conventional techniques considering young age of the patients, benign nature of the lesion, the location of the lesion in the posterior of mandible, the need for good accessibility and minimum morbidity. By having good surgical access, the risk of inferior alveolar nerve injury decreases which is an important determinative factor especially in younger patients. This technique allows achieving acceptable symmetry of the face compared to other conventional methods, by precise repositioning of the buccal cortex. It is recommended that surgeon consider this approach for large benign, non-infiltrative lesions as well as deeply impacted third molars.

Conflict of Interest: 'None declared'.

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