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Use of Sagittal Split Osteotomy in Removal of Mandibular Cysts

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ABSTRACT

Mandibular cysts were removed by conventional methods as decortication, enucleation and curettage or marsupelization. Sagittal split osteotomy of the mandible (SSO) is recommended as a reliable technique for removal of mandibular cysts as regards exposure, feasibility and safety. Seven patients have mandibular cysts. Sagittal split osteotomy was performed as an approach for exposure and excision of mandibular cyst. Bone cortices were repositioned after cyst enucleation and fixed with lag screws. Transient numbness occurred in four patients and resolved within two weeks to one month. In one patient numbness persisted for a year. Postoperative bilateral temporomandibular joint (TMJ) pain occurred in two patients and resolved within few weeks. Postoperative panorex suggested good healing, with rapid mineralization of the defect and good stability. Recurrence was not recorded.

INTRODUCTION

Treatment of mandibular cysts depends on site, size, number, aetiology and pathology **[1]**. Over a century removal of mandibular cysts has been practiced through intraoral or extraoral approaches. Removal of mandibular cyst in the angle may be done through extraoral approach and removal of buccal cortex **[2]**. It can be removed through intraoral and removal of lingual cortex **[3]**. Savitha described bony lid technique to preserve bony cortex **[4]**. Many techniques were described such as drainage, suction, Partsch I method, Borsch method, enucleation, enucleation and cryotherapy and chemical or mechanical curettage **[1,5]**. Removal can be done in staged manner. Decompression was done as the first stage by means of small polyethylene tubes and cystectomy is done at a later stage. Decompression causes reduction in cystic volume, thinning of cyst walls and regeneration of bone. This lessens damage to bone and recurrence, but it takes months to start the second stage **[6]**. Segmental ostectomy via an extraoral submandibular approach may be needed. It requires partial resection of the mandible and reconstruction with a bone graft **[7]**. Bone cavity may be filled with autogenous or allogenic transplants. There are certain complications which may be encountered in case of multiple or large mandibular cysts. These are damage of the inferior alveolar nerve or adjacent teeth, hematoma, infection, susceptibility to mandibular fracture.

Obwegeser was the one who introduced sagittal split ramus osteotomy in 1955 **[8]**. This osteotomy was widely used in mandibular advancement, set back and recently, mandibular reduction **[9]**. Berhman mentioned complications of SSO. The neurovascular bundle can be damaged during the operation or by rotating instruments, or heavy retraction on the lingual side of the mandible **[10]**. Transient facial palsy was reported after bilateral SSO **[11]**. Various modifications of the surgical technique were innovated for enhancing reproducibility, stability, and safety of the operation by preventing damage to the inferior alveolar nerve, increasing the contact area between bone segments after osteotomy **[12-19]**. Rittersma and van Gool were the first to use SSO as an approach to remove multicystic lesions in the mandible **[20]**. Others use SSO to remove odontomas, myxomas and ossifying fibroma **[21-27]**. In this study SSO was used in management of solitary and multiple mandibular cysts.

PATIENTS AND METHODS

This study includes 7 patients with mandibular cysts. Their age ranged between 22 and 40 years of age. They were 3 males and 4 females. Clinical picture included pain, facial and gingival swellings. Preoperative panorama and CT revealed mandibular cyst (s) (Figs. 1,2). Two cases have multiple cysts. Cysts were located in ramus, body and parasymphyseal regions. Unilateral SSO was performed in six patients and bilateral SSO was performed in one patient. Histopathology reports revealed dental and dentigerous cyst. Postoperative antibiotics, analgesics and anti-inflammatory medications were prescribed. Oral hygiene and liquids were encouraged for 2 weeks then soft food for another 4 weeks. Postoperative panorama was done. Follow-up ranged between 1 and 3 years.

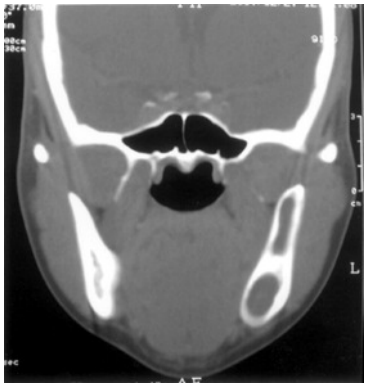

Fig. (1): Preoperative CT shows multiple cysts of left ramus and body.

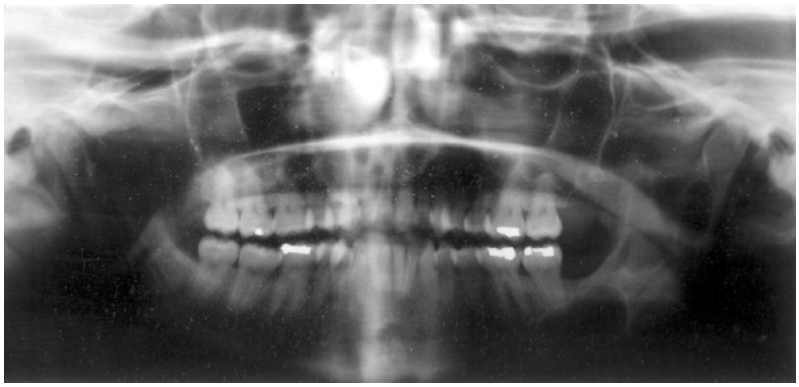

Fig. (2): Preoperative panorex shows multiple cysts in left subcondylar region, ramus and body.

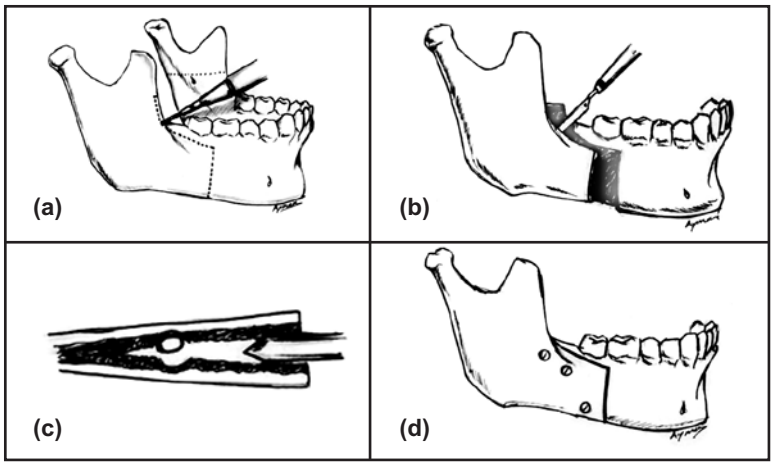

Fig. (3): A diagram shows sagittal split osteotomy of the ramus of the mandible. Line of osteotomies are marked using Lindemann bur (a), Osteotomies are done using reciprocating saw (b), Splitting of ramus using an osteotome (c), Internal fixation using lag screws (d).

Fig. (4): Sagittal split osteotomy of the left ramus and exposure of cysts.

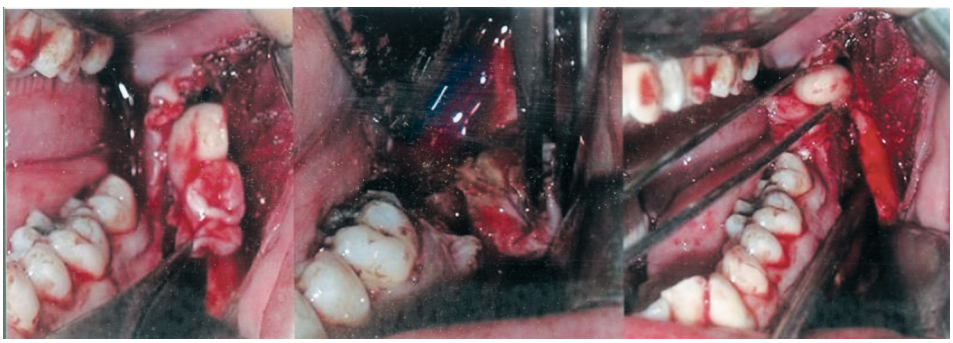

Fig. (5): Exposure and removal of multiple cysts.

Fig. (6): Enucleated cysts.

Fig. (7): Postoperative panorex after 2 years shows good healing.

Technique:

Intraoral incision is made along the anterior border of the ramus following the oblique line. Subperiosteal elevation of both the medial and lateral surfaces is done. Multiple drills are done using Lindemann bur to mark Lines of osteotomies (Fig. 3a). Osteotomies are done using reciprocating saw. The medial cortical osteotomy is placed one cm above the level of the mandibular foramen and is continued along the oblique line. A vertical osteotomy is done at the lateral surface in the region of the second molar tooth (Fig. 3b). Sagittal splitting of the ramus is done using 5mm osteotome then 15mm Obwegeser osteotome (Fig. 3c). Injury of inferior alveolar nerve is avoided by directing the osteotome to the outer Table. Cyst wall is dissected off the surrounding bone and been enucleated (Figs. 4,5,6). Maxillomandibular fixation (MMF) is done preserving the preoperative occlusion. Bone cortices are reset after positioning of the proximal segment upper and backward to ensure the position of the condyle in the TMJ. Rigid fixation is done using 2mm lag screws through percutaneous drilling; 2 at the upper border and one at the lower border (Fig. 3d). MMF is removed. Occlusion is checked. Intraoral wound is closed with Vicryl 3-0.

RESULTS

All cysts were removed in all cases. There were no difficulties as regards technicalities. Occlusion was not affected. There were no hematoma and no infection. Facial swelling occurred in all patients and resolved within few days. Transient numbness of lower lip occurred in four patients and resolved within two weeks to one month. Numbness persisted for more than one year in one patient. Two patients encountered bilateral TMJ pain which resolved with analgesics and soft diet for more than one month. Postoperative panorex suggested good healing, with rapid mineralization of the defect and good stability (Fig. 7). Recurrence was not recorded.

DISCUSSION

The usual technique for removal of benign mandibular cysts is decortication followed by excision or curettage. Decortication may sacrific large amounts of bone with potential of mandibular fracture especially in large cyst. The patient may be prone to pathological fracture. This was reported in cases of impacted teeth associated with dentigerous cysts. A rigid fixation plate could be placed to prevent possible postoperative iatrogenic mandibular fracture **[2]**. This can be done through extraoral, intraoral buccal or intraoral lingual approach. Major disadvantages of the extraoral approach are scar formation and possible facial nerve involvement. With the intraoral buccal approach, external scar and facial nerve injury are avoided. However, there are limited access and increased chance of inferior alveolar nerve injury. Intraoral lingual approach was used in removal of cyst in mandibular angle. There are risks of exposure of the lingual aspect of the ramus, lingual damage to the inferior alveolar nerve and occasional fractures of the muscular process **[28]**.

Sagittal Split Osteotomy may be considered a good technique for exposure of mandibular cysts. It preserves both cortices as it avoids deroofing with partial destruction of the buccal plate. It is better to be used especially if the lingual plate is relatively thin and if the mandibular cyst located in the subcondylar region which may necessitate extraoral approach with the resultant scar. It can be done unilaterally or bilaterally. I provides large soft tissue attachments for both distal and proximal segments. There is good fit of the distal and proximal segments. The broad area of bone overlap facilitates the application of stable internal fixation devices by the use of positional screws and/or miniplates. Fixation across a SSO should prevent rotation of the proximal and distal segments more than countering any other force. Bicortical screws are ideal for preventing rotation of the bony segments, especially when spaced widely apart. When using a miniplate, the amount of metal that is between the holes of the plate becomes very important in calculating the strength of the plates and how much they can resist in-line deformation. Three positional bicortical screws were used that engage the buccal cortex of the proximal segment and the lingual cortex of the distal segment **[8,20,29]**. The miniplate technique, introduced by Michelet et al., uses miniplates with monocortical screws attached to the buccal cortex of the proximal and distal segments **[30]**. If movement across the osteotomy site occurs early in the postoperative interval, the proximal and distal segments rotate around the point of fixation failure. Biomechanical studies have revealed that miniplates have less mechanical stability compared with positional screws **[31-33]**. Loss of fixation may be more likely when a single titanium miniplate is used for fixation than when 3 bicortical screws are used. Shetty et al., demonstrated that a combination of 1 miniplate and one positional screw provided better rigidity than using either technique alone **[33]**. We agree that bicortical screws provide stability to the mandibular sagittal osteotomy. We use lag screws which may provide more stability to the mandible. We think that plates

and screws are not necessary except if the mandible is badly splitted. In this study postoperative follow-up showed good healing and stability.

We did not maintain MMF postoperatively. Patients did not encounter malocclusion or instability. Manstein Found that stability in their series was best with rigid internal fixation with MMF for 14 days **[34]**. Postoperative malocclusion after sagittal ramus osteotomy may result from condylar malposition, loss of fixation, and condylar resorption. Condylar malposition is much rarer as a cause currently because plate and/or screw fixation of the segments allows intraoperative verification of the occlusion before completion of surgery. Interarch elastics may be used to maintain good occlusion while the mandible drifts to a new position. Condylar resorption manifests late TMJ symptoms with radiographic changes **[35]**. We encountered early TMJ pain which resolved with analgesics and soft diet for few weeks.

Incidence of nerve affection in SSO of the mandible was 4.0%, 1.7%, 7.0%, 1.3%, 3.2%, 3.2% **[10,35-39]**. We encountered transient numbness in four patients and persistent numbness in one patient which may indicate injury of the inferior alveolar nerve. Incidence of infection in SSO of the mandible was 5.7%, 0.8%, 7.8%, 2.8% **[36,39-41]**. In this study there was no infection. However, we have small number of cases.

There is no need for autogenous or allogenic bone graft yielding shorter operative time, provides good stability and avoids complications of plating and grafting for the recipient and donor areas. In big mandibular cyst, we do not think that SSO is a good choice as the remaining bone would be too thin to withstand splitting. Bone graft may be needed as there is less bone contact.

Conclusion:

SSO is a good technique for exposure and removal of mandibular cysts. It can be done unilateral or bilateral. It is better than the conventional methods as it preserves both cortices without bony defect. There is neither scar nor facial palsy as this may happen with the extraoral approach. Inferior alveolar nerve injury can be avoided. There is less risk of intra- or postoperative fracture of the mandible and expected good healing and stability. It is indicated in multiple mandibular cysts and cysts located in the ramus and angle. It is not a preferable method in atrophic mandibles or in large mandibular cysts. Certain pathologies can not be excised by this technique as it may mandate removal of both bony cortices. Awareness of possible postoperative complications, such as anaesthesia or paraesthesia of the lower lip, chin, teeth, and gingiva is essential.

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