Extraction of a severely impacted mandibular third molar using a sagittal split osteotomy – a case report

Abstract

Statement of the problem: Mandibular third molar tooth impaction is a frequently encountered pathological phenomenon in oral and maxillofacial surgery. Deeply impacted mandibular third molars require extensive bone removal to facilitate extraction. Sagittal split osteotomies provide an alternative treatment option, which can preserve bone and reduce the risk of pathological or iatrogenic jaw fracture in high-risk cases.

Purpose of the review: Clinical awareness of alternative extraction techniques is fundamental to the attainment of optimal patient outcomes. This case report provides an overview of the indications, risks, procedure and outcomes of the sagittal split osteotomy as a technique for the removal of a deeply impacted mandibular third molar.

Method: A case report of surgical removal of an impacted third molar and associated dentigerous cyst by sagittal split is presented. Patient consent was obtained prior to surgery. The chart was reviewed, and clinical information gathered and compiled into a case report. A review of the literature was then carried out to compare the technique presented with similar cases.

Conclusion: This case report highlights the value of sagittal split osteotomy for the removal of deeply impacted mandibular third molars. As part of informed consent, clinicians should consider the sagittal split osteotomy as an alternative treatment option for patients with a high risk of mandibular fracture.

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Case report

Clinical presentation

A 47-year-old woman presented to the Oral and Maxillofacial Surgery (OMFS) Department at the Dublin Dental University Hospital (DDUH) following referral from her general dental practitioner (GDP) regarding a cystic lesion associated with a displaced mandibular third molar. On initial presentation, the patient was complaining of a "lump" along the lower border of her right mandible, which she believed to be a swollen gland. The patient was not complaining of any pain from the site but did, however, note the presence of purulent discharge intra-orally, resulting in a foul taste and smell.

Clinical examination revealed a palpable lump at the lower border of the right mandible, which was neither painful nor mobile. She had no asymmetry, swelling, lymphadenopathy or altered sensation in the region. Intra-orally, the patient was partially dentate with retained roots and caries. The lower right second molar was found to be vital on testing with Endo-Frost.

Radiographically, the lower right third molar was vertically impacted with its apex extending below the lower border of the mandible. The orthopantomograph (OPG) also revealed a large radiolucency from the cementoenamel junction (CEJ) of the tooth, encompassing the crown. The extent of the radiolucent area was significant, as shown in **Figure 1**. Furthermore, there was some difficulty in evaluating the proximity of the lesion to the inferior alveolar nerve from the OPG alone.

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Table 1: Common differential diagnoses of radiolucency associated with an impacted mandibular third molar.

Differential diagnoses	Features
Dentigerous cyst	▸ Epithelium-lined developmental odontogenic cyst enclosing the crown of an unerupted tooth at the cementoenamel junction ▸ Typically diagnosed in patients between 30 and 40 years of age ▸ Identifying the crown of a tooth projecting into the cystic cavity is pathognomonic
Keratocystic odontogenic tumour (KCOT)	▸ Characteristic lining of parakeratinised stratified squamous epithelium ▸ Tend to grow in an anteroposterior direction within the jawbone without causing considerable expansion ▸ The lesion is multiloculated, often with daughter cysts that extend to the surrounding bone; therefore, high recurrence rate after resection
Ameloblastoma	▸ Neoplasm of odontogenic epithelium, principally of enamel organ-type tissue that has not undergone differentiation to the point of hard tissue formation. The slow growth of the tumour can lead to significant expansion of the mandible ▸ Classified as unicystic, multicystic or solid, and histologically can be plexiform or follicular ▸ The expansile, radiolucent tumour can be unilocular or multilocular, with a characteristic 'soap bubble-like' appearance ▸ Erosion of the roots of adjacent teeth is unique to ameloblastoma and indicates the aggressive behaviour of the tumour ▸ Patients typically present in the third to fifth decades of life with a slow-growing, painless mass

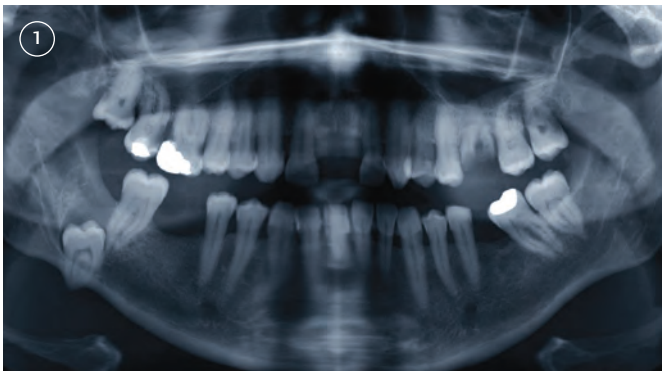


FIGURE 1: Baseline orthopantomograph showing displaced tooth 48 and associated radiolucency.

Differential diagnosis

At presentation the most common differential diagnoses for consideration included: a vertically impacted lower right third molar with associated dentigerous cyst; a keratocystic odontogenic tumour; or, an ameloblastoma (**Table 1**).

Investigations

A biopsy of the radiolucent area was planned in order to gain a definitive diagnosis and enable further treatment planning. In addition to this, a cone-beam computed tomography (CBCT) scan was arranged to more accurately determine the relationship of both tooth and lesion to adjacent anatomic structures.

The CBCT displayed the buccal location of the inferior alveolar nerve with thinning of the lingual plate and a superior location of the cyst (**Figures 2** and **3**). It also identified the proximity of the roots of the lower right second molar to the crown of the lower right third molar (**Figure 4a** and **4b**).

Management

The diagnostic biopsy of the site was carried out under local anaesthetic with

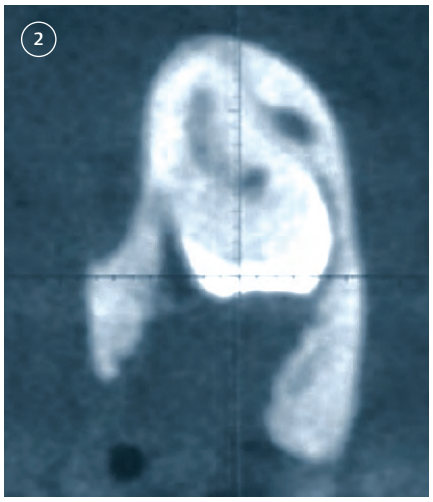


FIGURE 2: Coronal section of CBCT showing the proximity of the inferior alveolar nerve to the displaced wisdom tooth (located buccal to the tooth) and the cyst (located superior to the tooth from the CEJ).

FIGURE 3: Sagittal section of CBCT showing the wisdom tooth to be placed lingually, with thinning of lingual bone in this area. Again, the cyst is visible superior to the tooth, and the inferior alveolar nerve is visible buccal to the tooth.

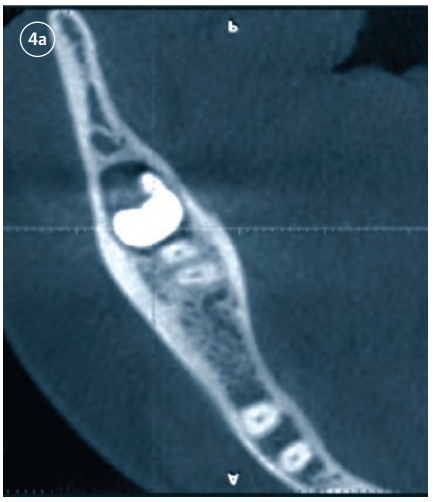


FIGURE 4a: Axial section of CBCT showing the crown of the wisdom tooth to be located adjacent to the tips of the roots of the second molar.

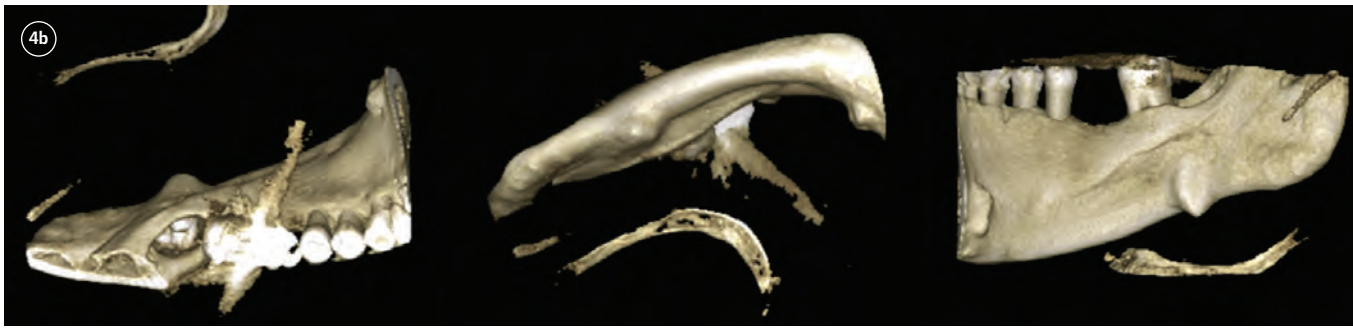


FIGURE 4b: 3D CBCT images in three views.

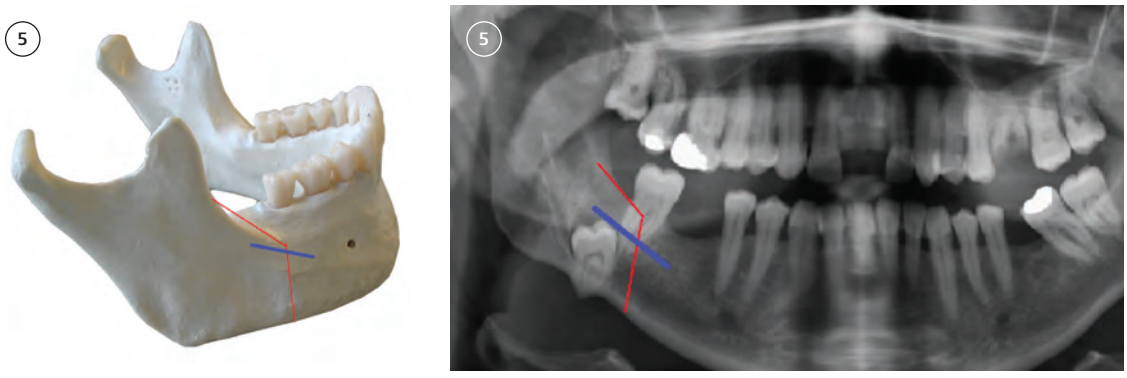


FIGURE 5: Sagittal split bony incisions (red) and plating (blue).

Table 2: Treatment modalities for removal of displaced third molars.

APPROACH	ADVANTAGES	DISADVANTAGES
No treatment	• Least invasive approach	• Potential for life-threatening infection at the site • Patient was aggravated by purulent discharge and the extra-oral lump • Progression of the lesion with possible pathological fracture of the mandible
Conventional approach (buccal mucoperiosteal flap) with extraction or decoronation	• Less invasive than extra-oral or mandibular sagittal split approaches	• Risk of pathological or iatrogenic fracture of the mandible by excessive bone removal • Poor access to surgical site • Increased risk of damage to the inferior alveolar nerve due to poor access • Technically difficult
Cyst marsupialisation	• Less invasive than extra-oral or mandibular sagittal split approaches • Minimal risk of damage to the inferior alveolar nerve • Potential to apply traction to the impacted tooth into a position that allows conventional surgical extraction	• Requires maintenance, regular appointments, and long-term follow-up • Source of the problem, i.e., the impacted tooth, remains
Extra-oral approach	• Good access to site • Relatively lower risk of damage to inferior alveolar nerve due to good visualisation	• Risk of damage to marginal mandibular branch of the facial nerve, resulting in drooping of the lower lip and face • Extra-oral scar postoperatively
Mandibular sagittal split osteotomy	• Allows visualisation of the inferior alveolar nerve, resulting in a relatively lower risk of damage • Allows good access to the surgical site • Minimal scarring, with no extra-oral scarring • Minimal risk of damage to the marginal mandibular branch of the facial nerve	• Risk of damage to inferior alveolar nerve • Risk of 'bad split' • Possible devitalisation of adjacent teeth • Operator skill dependent • Possible malocclusion postoperatively if incorrect realignment

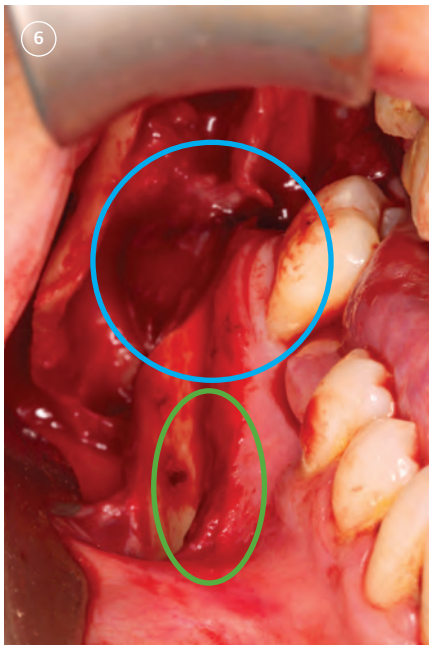
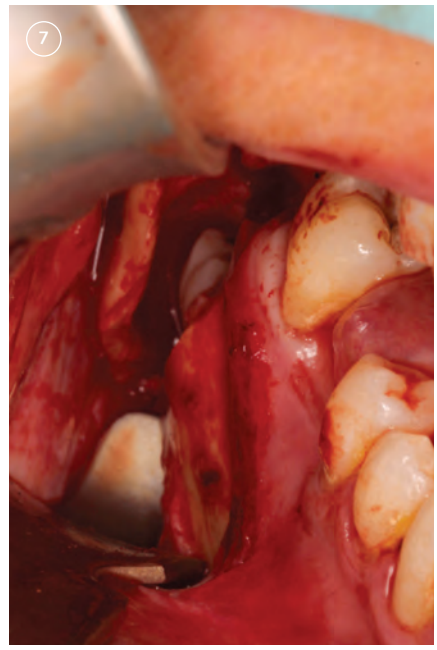
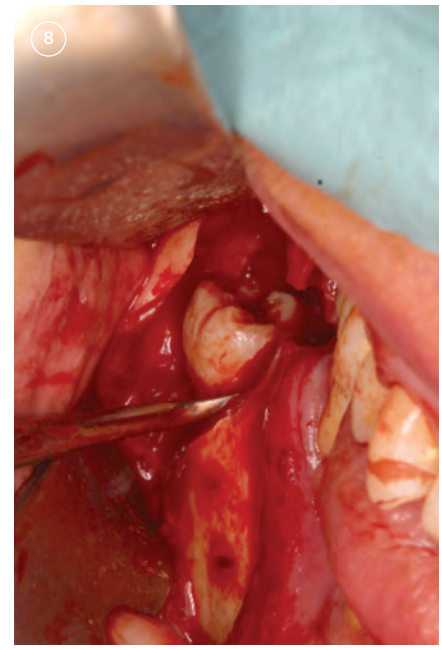


FIGURE 6: Sagittal split with cyst lining circled in blue and screw perforations circled in green.





FIGURES 7, 8 and 9: The tooth before elevation, during elevation and following removal (with cyst lining attached at the CEJ).

FIGURE 10: The patient's occlusion was confirmed prior to final closure.

intravenous conscious sedation. An envelope flap was raised with distal relieving incision, allowing sufficient access to the site. A small amount of buccal bone was removed and samples of the cyst lining and cyst contents were sent for histological examination.

The histology report confirmed a dentigerous cyst. As the patient was symptomatic, it was decided to surgically remove the tooth and cyst. However, given the extent of the cyst, the risks to the patient were significant, including possible fracture of the mandible and damage to the inferior alveolar nerve. In order to provide adequate informed consent, a number of treatment options were discussed with the patient (**Table 2**). Taking into consideration the risks and benefits of each technique, the patient opted for removal of the tooth and cyst using the sagittal split approach under general anaesthetic (GA).

Under GA, a full thickness mucoperiosteal flap was raised to allow access to bone. The initial sagittal split osteotomy cut was made and a four-hole, two-spaced plate was sited (**Figure 5**). Four 6mm screws were then removed and the split was completed. This measure ensured that the plates could accurately re-approximate the split once the procedure was done. Following this, the sagittal split was completed, thus separating the two segments of the mandible.

On separation of the two segments, the cyst lining and associated wisdom tooth were readily visible (**Figure 6**).

Once access and visualisation was obtained, the cyst was enucleated and sent for histological evaluation. The tooth was then elevated with a curved Warwick James instrument, resulting in its complete and intact removal (**Figures 7**, **8** and **9**). It is worth noting at this stage that the inferior alveolar nerve was visible inferior to the surgical site and appeared to be intact prior to closure.

With both the tooth and the cyst removed, the segments were realigned and held in handheld occlusion. The plate and screws were resited. Before final tightening of the miniplate was completed, the occlusion was re-evaluated to ensure that no changes in the patient's occlusion had been created (**Figure 10**). Finally, the soft tissues were sutured with 3/0 Vicryl Rapide to allow healing of the mucosa by primary intention. A 'grenade' drain was also placed to reduce haematoma formation. This drain was removed the following morning at review. The patient was prescribed co-amoxiclav (625mg three times daily for

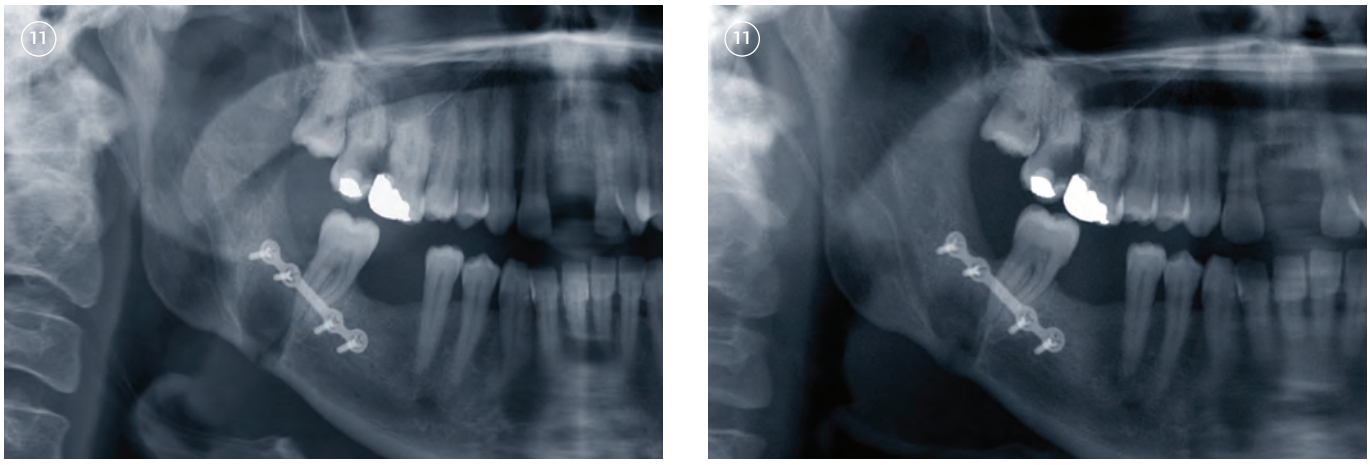


FIGURE 11: Postoperative OPGs at three-month and six-month reviews, respectively.

five days) and given postoperative instructions, with particular emphasis on a soft diet until healing of the surgical site occurred.

The patient was reviewed at one week and 12 weeks after the procedure. At one-week review, the patient reported postoperative numbness on the right hand side. However, at 12-week review, the patient reported the return of some sensation and tingling of the lip and chin. At six-month review, the patient regained some sensation in the lower lip but was still complaining of a 'pins and needles' sensation. It is hoped that this numbness will resolve entirely at further review, as often occurs following sagittal split procedures. The improvement in the patient's sensation at 12 weeks is encouraging, and indicative that healing of the nerve has commenced. The patient noted at review that her occlusion appeared and felt unchanged. A hemi-OPG was taken at 12 weeks and at six months, which showed good positioning of the plate and some bony infill at the site (**Figure 11**). Furthermore, at subsequent appointments it is expected that additional bony infill at the site where the tooth and cyst were previously situated will be visible radiographically.

Discussion

This case report highlights an alternative treatment option for removal of a lower right third molar. Removal of third molars is among the most frequently undertaken procedures in oral and maxillofacial surgery (Coulthard *et al*., 2014). However, the technique suggested in this case report is undertaken far less frequently, as more conservative measures are usually sufficient.

Various treatment options were considered for the management of this case, as outlined in **Table 2**. Ultimately, the sagittal split osteotomy was decided upon by the patient and clinicians as the most effective course of treatment.

Fracture of the mandible is a very rare complication of routine removal of third molars, with an approximate incidence of only 0.0049% (Libersa *et al*., 2002). Given the large size of the dentigerous cyst associated with the tooth in this case, it was felt that a conventional approach to the removal of this tooth would likely result in pathological or iatrogenic fracture of the mandible. Access to the tooth by conventional techniques would have required excessive bone removal, which is known to increase the risk for such fractures during treatment (Iizuka *et al*., 1997).

The use of a mandibular sagittal split osteotomy to remove displaced mandibular third molars has been documented to be a safe and predictable technique when good case selection is applied (Catherine and Scolozzi, 2017; Jones *et al*., 2004; Sencimen *et al*., 2009). Another technique that has been documented in the literature is the removal of a displaced tooth by an extra-oral approach. Pitfalls with this technique have historically included damage to the marginal mandibular branch of the facial nerve and the presence of an extraoral scar postoperatively (Jones *et al*., 2004). This leads to an unacceptably poor aesthetic result, potentially affecting both facial expression and facial aesthetics.

In this case, the impacted tooth was associated with the presence of a dentigerous cyst, which had first been biopsied under LA and conscious sedation to ensure the correct diagnosis before management was undertaken. In 2008, Wang *et al*. recorded the characteristics of 11 mandibular third molars that were displaced into the ramus region of the mandible. Although not well documented throughout the literature, approximately 72.7% of the displaced mandibular third molars reported in this study had an association with a cystic lesion. Furthermore, 67.5% of those teeth found to be associated with a cystic lesion transpired to have a diagnosis of dentigerous cyst on histologic evaluation (Wang *et al*., 2008). Our findings in this case are consistent with this consensus from the literature, as the final diagnosis of the cyst following complete removal was that of a dentigerous cyst.

The mandibular sagittal split osteotomy approach is not without shortcomings. The most significant of these is the risk of damage to the inferior alveolar nerve and the likelihood of postoperative numbness. There is extremely variable reporting on the incidence of inferior alveolar nerve injury post sagittal split osteotomy, varying from 1.3% to 18% apparent at operation, and from 9-85% postoperatively (Agbaje *et al*., 2015). The authors in this study concluded that the significant variation in incidence reported was due to lack of a standardised assessment and variation in reporting of the paraesthesia. Sagittal split osteotomy is a technique more frequently used in orthognathic surgery. Incidence of postoperative paraesthesia in orthognathic cases has been documented at 22-78% immediately following the procedure, and reduces to 5-25% of patients six months postoperatively (Yip and Korczak, 2001).

Conclusion

This case report highlights the value of sagittal split osteotomy for the removal of deeply impacted mandibular third molars. As part of informed consent, it should be considered as a treatment option for patients when the risk of jaw fracture is high.

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CPD questions

To claim CPD points, go to the MEMBERS' SECTION of www.dentist.ie and answer the following questions:

1. Dentigerous cysts arise from:

- ○ A: Reduced enamel epithelium
- ○ B: Epithelial rest of Malassez
- ○ C: Dental lamina

2. By definition, a dentigerous cyst occurs in association with:

- ○ A: An impacted tooth
- ○ B: An unerupted tooth
- ○ C: A deciduous tooth

3. The most common odontogenic cyst in the jaw is the:

- ○ A: Radicular cyst
- ○ B: Dentigerous cyst
- ○ C: Odontogenic keratocyst

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