

The Delayed Mandibular Fracture after Enucleation of Dentigerous Cyst Extending into Mandibular Border

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ABSTRACT

The late or delayed fracture of mandible after surgical operation may occur rarely in dental treatment process. Among all the underlying conditions, the fractures have been sometimes reported before cyst enucleation due to the expanded cyst, but few cases that mean the delayed fracture have been reported after surgery. It is difficult to make intraoperative prediction at initial stage which operation site will develop a more delayed fracture. Here we report a case of a dentigerous cyst on mandible in a 51-year-old man. The cyst was associated with an impacted mandibular third molar tooth. This case report is to investigate the possibility of the delayed fracture after enucleation of dentigerous cyst associated with the impacted third molar. Finally, we discuss suitable treatment and appropriate post-operative care in the event of the delayed fracture.

Key words : Late or delayed fracture, Dentigerous cyst, Enucleation, Impacted third molar

INTRODUCTION

The late or delayed fracture is defined as fracture that occurs after a certain amount of time has elapsed when underlying bone has been weakened by a preceding event, for example, extraction of impacted third molar, enucleation of cystic lesion, or mass excision. This site of lesion where the surgical approach such as extraction or enucleation will be applied undermines the bone and the fracture may result from inadequate trauma or merely normal functional movement. Interestingly, the delayed fracture of mandible is rarely caused by a cyst itself, such as a dentigerous cyst¹⁻³.

Dentigerous cyst is the odontogenic cyst which is associated with the crown of unerupted or impacted teeth. The pathogenesis of these cysts is unknown and they are thought to develop by accumulation of fluid between reduced enamel epithelium and the crown of tooth. Dentigerous cyst, the most

often involving the mandibular third molar, is commonly found in patients aged 10 to 30 years old. These cysts are often asymptomatic and can exist for several years without being found out. Some signs such as moderate swelling and pain may be observed in clinical examinations, but usually there is no associated pain or discomfort⁴. Dentigerous cysts can grow to a considerable size, resulting in expansion of cortical bone and asymmetry of facial contour². Usually, dentigerous cysts exhibit unilocular radiolucent lesion with well-circumscribed borders which is involved with impacted teeth.

In this article, a case of delayed fracture after cyst enucleation involving the impacted third molar will be discussed. We will also review methods of prevention and ways to cope with this sort of fracture.

CASE REPORT

A 51-year-old male patient is referred to our hospital with the dentigerous cyst extending to the inferior border of mandible, involved with the impacted third molar. Generally, he has uneventful medical history. The patient had no clinical

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signs except the highly developed set of masseter muscles (Fig 1). Other abnormalities on extraoral findings were not detected. His chief complaint at first visit was the intermittent swelling on the right submandibular area.

Some degree of swelling and pain were observed. The palpation of the right angle area of mandible was also positive. The radiographic findings showed that a well-circumscribed radiolucency on the right mandible angle area involving impacted third molar (Fig 2). This well-defined radiolucency extended from the distal root of the first molar to posterior region of second molar horizontally and extended from apical tip of molar roots to above the inferior border of mandible vertically. The inferior alveolar nerve was displaced downward to inferior border of mandible. The buccal and lingual



Figure 1. The patient had the highly developed set of masseter muscles.

bone thinning around cystic lesion were also observed (Fig 3). The root canal treatment on the mandibular right second molar was performed before cyst enucleation because the apical area of this tooth overlapped the cystic lesion and the result of pulp vitality test was negative.

Typical enucleation of dentigerous cyst and surgical extraction of impacted third molar under general anesthesia were implemented. No additional procedure including intermaxillary fixation (IMF) or internal fixation was performed because the occlusion was stable immediately after the cyst was removed and the remaining jaw bone was intact. Comprehensively, the patient showed a normal healing state and he was discharged on POD 2 (Postoperative Day 2) (Fig 4A).

There were no abnormal findings including nerve damage when carrying out the follow-up check 10 days after discharge from the hospital. The patient just complained of a little pain at operation site and a slight feeling of heaviness.

This patient's symptoms began to appear on POD 30. He felt a moment of unpleasant sense while chewing to eat during meal time. The surgical site began to swell after that time and he revisit the hospital. Clinical examination revealed unstable occlusion and painful swelling of the surgical site. The unstable occlusion included the sign of premature contact in posterior teeth area. After performing radiographic examination, fracture line was seen on inferior border of the right mandible below the enucleation site (Fig 4B).

Immediate intermaxillary fixation was performed followed by ORIF (Open Reduction and Internal Fixation) through the submandibular approach under general anesthesia. At the time of operation, the large bone defect due to previous sur-



Figure 2. Pre-operative radiographic findings: The cyst extending to inferior border of the right mandible was observed.

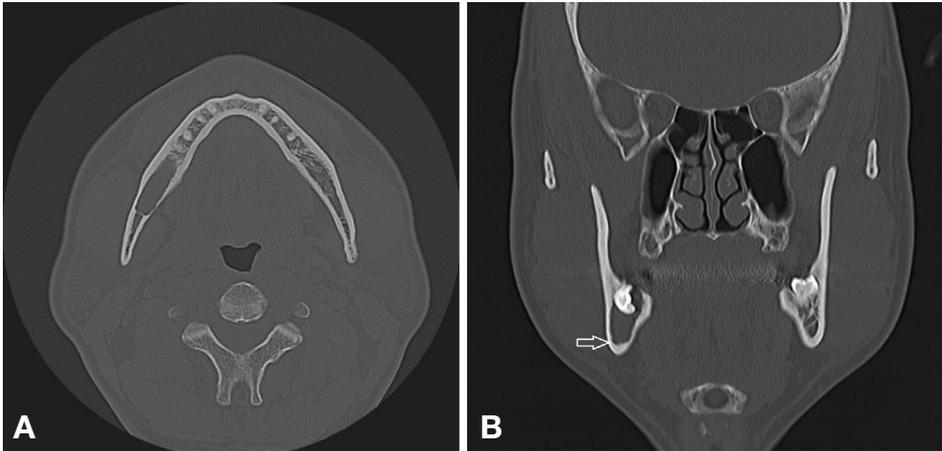


Figure 3. Computed Tomography view of pre-operative axial (A) and coronal views (B): The arrow in coronal view (B) indicates the location of the inferior alveolar nerve.

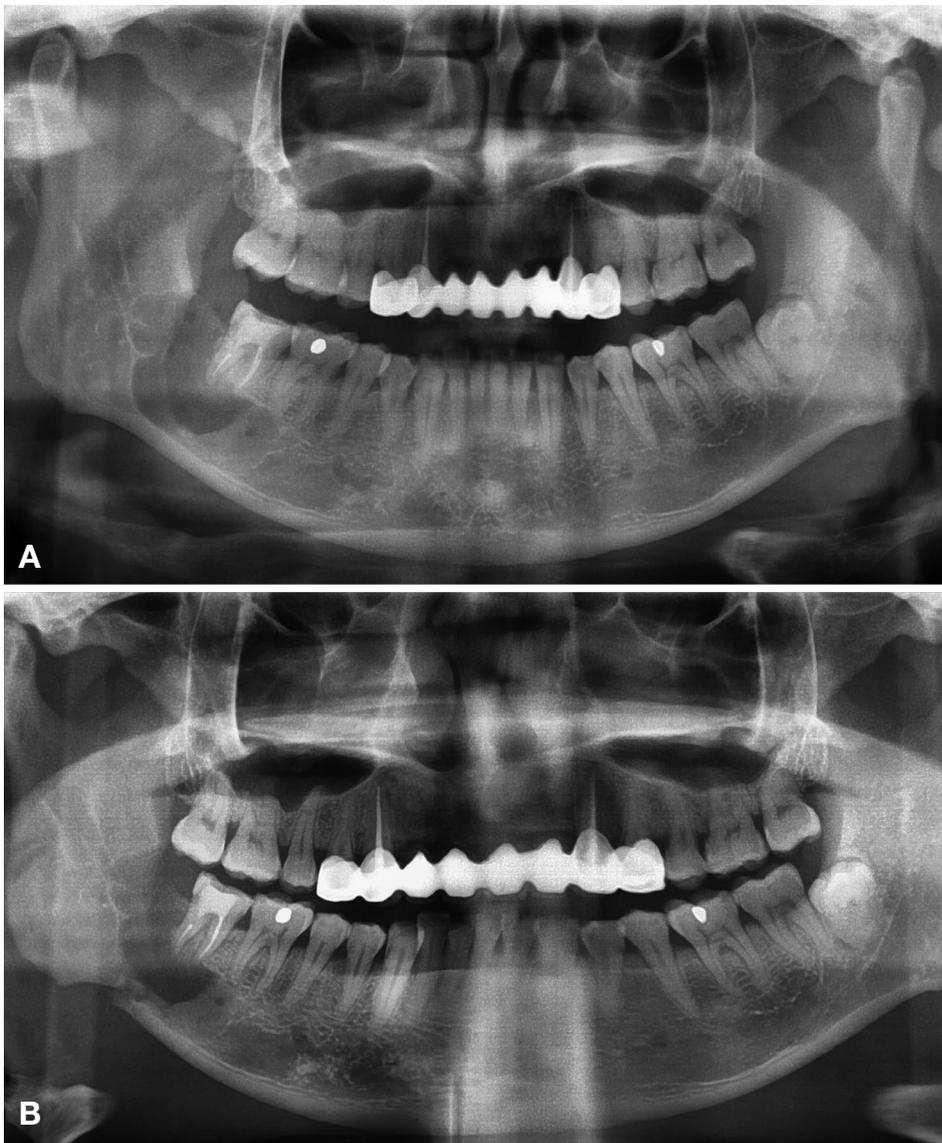


Figure 4. (A) Post-enucleation panoramic view (immediate after cyst enucleation): The cyst enucleation and surgical extraction of the impacted third molar was conducted. (B) Post-enucleation panoramic view (1 month after cyst enucleation): The fracture line was seen under the cyst enucleation site.

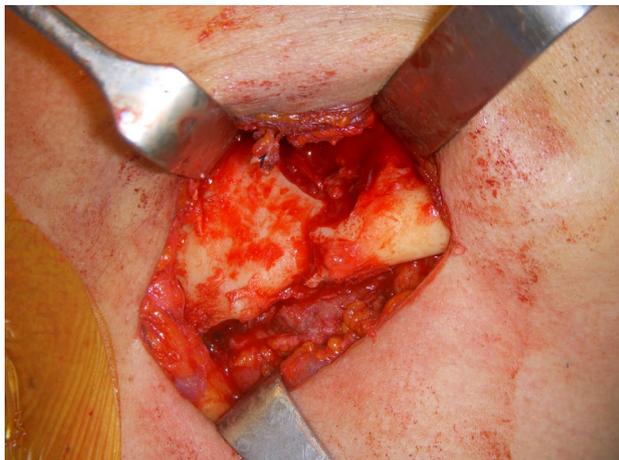


Figure 5. The fracture line was seen under the cyst enucleation site.

gery and the fracture line of the lower border of mandible was observed and a slight discharge of pus was also shown (Fig 5). There was no rigid remaining bone and no suitable space to carry on ORIF with mini-plate through intraoral approach. For this reason, internal fixation was performed on inferior border of mandible using the reconstruction plate without bone graft. The reconstruction plate was applied on fracture site after intra-operative plate contouring (Fig 6A).

Postoperative healing was stable and no sequelae such as facial nerve palsy were observed. The jaw function was started one week after surgery. There was no problem in jaw function and normal postoperative occlusion was achieved. Follow-up check was performed until one and a half years after the operation. Plate removal was conducted after one and a half years, and bone defect caused by the enucleation

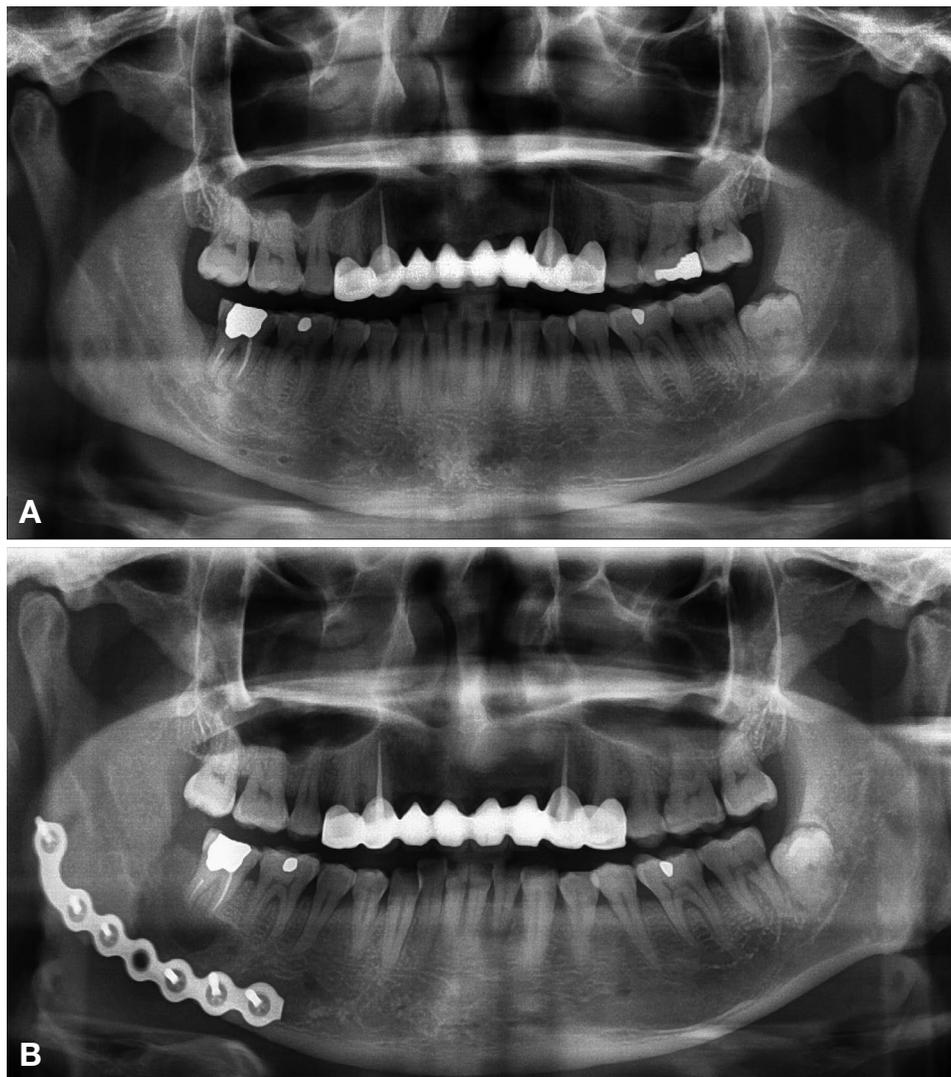


Figure 6. (A) Post-ORIF panoramic view (immediate after ORIF): The fracture was treated with open reduction using reconstruction plate without bone graft. (B) Post-ORIF 4Y panoramic view: The operation site achieved the satisfactory structural recovery.

surgery showed complete healing and bone regeneration to fill defect in the cyst operation site (Fig 6B).

DISCUSSION

Potential complications after cyst enucleation on mandible include the delayed fracture. It was not possible to reliably determine exactly when the fracture occurred since the patient did not visit the clinic for a certain period of time and had no symptoms. Considering the discharge of pus during ORIF surgery, however, the onset of fracture is estimated to be earlier than 30 days after the enucleation surgery. Overall, this sort of fracture corresponds to the delayed fracture.

The delayed fracture occurs from the decrease of strength under environment of the inherent inability of bone to withstand stress. This environment is generally created after surgery, for example, extraction of impacted teeth, cyst enucleation, sequestrectomy of necrotic bone, and so on. As a similar term, pathologic fracture is defined as fracture which can occur both before and after surgery, caused under various conditions that resorb or weaken the underlying bone such as osteomyelitis, osteoradionecrosis, cyst, tumor, etc.

The microfractures in the early stages of delayed fracture may have been propagated gradually and may have reached its point of threshold. The cause of this may be the large masticatory force generated from the masticatory muscles. It is presumed that a factor such as a strong masticatory force acts on weakened bone. In this case, the patient had the highly developed set of masseter muscles (Fig 1). In other words, overload of anatomical structures such as the intensity of the masticatory force and the degree of development of the masticatory muscle of the patient can be one of the potential potent factors for the delayed fracture⁵. The clinicians can consider the preoperative evaluation methods to quantitatively measure the thickness of the masseter muscles by computed tomography or sonography if the patient has a square jaw.

The other possible risk factors that may cause the delayed fractures include the bad habits such as bruxism, clenching, the habit of resting chin in hands and the unilateral chewing. We could not clearly determine whether the patient in this case had such a bad habit in advance. But we can't completely rule out the possibility of such an influence of bad habits. Since chewing hard food may also affect the occurrence of delayed fracture, that is, the risk of mandibular fracture may surge during mastication⁶, postoperative precautions should include avoiding chewing hard food. It is not possible to rule

out the likelihood that the patient may have missed the postoperative precautions.

The thickness of the lingual bone is usually thinner than the thickness of the buccal bone in the mandibular posterior teeth region. Therefore, the perforation of the lingual bone is known to be more common as the cyst grows. In most cases, the thickness of the buccal and lingual bone around the cystic lesion varies. Concerning the possibility of mandibular fracture, the expansion of the cyst may be more problematic in case that the lingual bone is resorbed and the buccal bone is intact. Because the surgical approach side is mostly buccal, the probability of intraoperative fracture and the delayed fracture can increase, even if the fracture due to cystic lesion itself does not occur in the first place. When remaining bone around a cystic lesion shows this pattern, surgeons should be more careful to prevent fracture. If necessary, preventive measures should be prepared from the initial treatment planning stage. The conservative approaches such as marsupialization and decompression can be considered to reduce the range of surgery if the cyst is large enough to weaken the underlying bone.

Further preventive cares can include botulinum toxin treatment and night guard⁷. The night guard reduces or even compensates for abnormal damage caused by the masticatory force rather than reducing the masticatory force itself⁸. On the other hand, there is a considerable research now that the botulinum toxin lessens the masticatory power. The botulinum toxin reduces the masticatory power directly and gradually. Although there is not much academic ground on whether night guard and botulinum toxin injection can prevent the delayed fractures, it can be considered one of the options of postoperative care. The botulinum toxin treatment may be more effective for prevention than night guard because the botulinum toxin is constantly effective for a certain period of time and the night guard only works at night. It would be better to combine both for prevention, but the botulinum toxin may seem to be more useful if we have to pick one thing.

Occasional reviews about the delayed mandibular fracture after extraction of impacted third molar are reported in many literatures⁹⁻¹⁴. In addition, cases with pre-operative fractures due to a large dentigerous cyst can be found in literature review¹⁻³. However, the case of delayed fracture after cyst enucleation is rare. The fractures caused by the cystic lesion itself are easy to cope with. However, since the delayed fracture after cyst enucleation is difficult to predict, surgeon's precise preoperative diagnosis is emphasized. Overall, the surgeon must actively intervene in all three processes; preoperative di-

agnosis & care, intraoperative monitoring, and postoperative management. For patients who are at high risk, it may be advisable to perform preventive internal fixation during surgery to prevent the delayed fractures.

Mandibular fractures usually heal well with proper ORIF and, if necessary, intermaxillary fixation. Large bone defects due to cyst enucleation are known to show good bone regeneration without bone graft^{15,16}. However, as in this case, mandibular fractures in areas where only the lower border remains due to large bone defect after cyst enucleation need to be carefully assessed. After careful evaluation, an integrated treatment plan should be established with consideration of the union of the fracture site and bone regeneration at the same time. Therefore, definitive treatment with a reconstruction plate was performed to ensure early function of the patient. By fixing with a reconstruction plate with sufficient thickness, the stable reduction and fixation of the fracture site was achieved, thereby minimizing the risky influence on the regenerative process in the bone defect due to cyst enucleation. It should be noted that complete structural recovery was achieved well even though bone graft was not performed on the defect site. It also means that the excellent self-healing ability in the cyst enucleation site after the first surgery was not impeded by the delayed fracture of the mandible. As a result of this carefully planned approach, there were not only an outcome of bone regeneration and complete reduction on fracture site but also additional earnings of early functional resumption. Within the limitation of case report, further studies are needed to improve the generalizability of these findings. Comprehensively, the predictable outcome of structural restoration can be expected including bone regeneration and rapid functional recovery at the same time if a delayed fracture is treated based on this case.

CONCLUSION

It is important to consider various methods to prevent the delayed fracture after surgery based on our experience with this case. Patient's cooperation for regular follow-up check and surgeon's full understanding of the treatment plan can be the key factor to prevent possible complications including this sort of fracture. However, when the delayed fracture occurs despite the utmost caution, the surgeon's timely treatment is essential.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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