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Prevention of Pathological Fracture with Rigid Fixation after Removal of Cystic Lesion in Impacted Third Molar: A Case Report

Santos IC[1], Dias AM[1], Chaves MGAM[1], de Matos JDM[2]*, Queiroz DA[3], Rodrigues DC[4], Soares MPRS[5] and Andrade VC[5]

[1]Department of Dentistry, Universidade Federal de Juiz de Fora UFJF-GV, Brazil

[2]Department of Multidisciplinary Health, University Center Mauricio de Nassau (UNINASSAU), Brazil

[3]Department of Restorative Dentistry & Prosthodontics, The University of Texas Health Science Center at Houston (UTHealth) School of Dentistry, USA

[4]Professor of Maxillofacial Surgery, Department of Dentistry, Universidade Estadual de Montes Claros UNIMONTES, Brazil

[5]Department of Dentistry & Oral and Maxillofacial Surgery, Universidade Federal de Juiz de Fora UFJF, Brazil

***Corresponding author:** Jefferson Matos, Department of Multidisciplinary Health, University Center Mauricio de Nassau (UNINASSAU), Juazeiro do Norte - CE, Brazil, Email: jefferson.matos@unesp.br

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Abstract

Objective: The objective of this study is to report a surgical case where rigid internal fixation was used as a preventive strategy after the removal of a cystic lesion associated with an impacted third molar in the mandibular angle region.

Methodology: This is a descriptive observational study with a single-arm design, involving a 58-year-old female patient who underwent the proposed surgical procedure after providing voluntary informed consent.

Conclusion: It was concluded that the accurate diagnosis of the case, knowledge of the lesion's characteristics, and a thorough study of the remaining bone structures provided appropriate preventive planning, using miniplates to meet the patient's needs while avoiding postoperative fractures and potential future complications.

Keywords: Dentigerous Cyst; Third Molar; Internal Fractures Fixation

Abbreviations

TMJ: Temporomandibular Joint; ICF: Informed Consent Form; CT: Computed Tomography; CBCT: Cone-Beam Computed Tomography.

Introduction

The dentigerous cyst originates from the separation of the follicle present around the crown of an impacted tooth and is considered the most common developmental odontogenic cyst, representing approximately 20% of all epithelium-lined cysts in the gnathic bones [1,2]. The pathogenesis of the dentigerous cyst is uncertain, but it may develop due to the accumulation of fluid between the reduced enamel epithelium and the crown of the tooth, occurring in association with any impacted tooth, particularly the lower third molars [1].

Dentigerous cysts are commonly discovered in patients between the ages of 10 and 30, although the age range may

vary. There is a slight male predilection, with a reported 1:1 ratio in the literature, and the prevalence is higher in Caucasians compared to individuals with darker skin tones [1,3,4].

Radiographically, dentigerous cysts present as a unilocular radiolucent area associated with the crown of an impacted tooth, often detected during routine evaluations [1,5,6]. However, a final and conclusive diagnosis can only be achieved through histopathological examination due to its clinical and imaging features being similar to other odontogenic lesions, such as keratocyst, central giant cell granuloma, and unicystic ameloblastoma [1,6-9].

The presence of cysts and odontogenic tumors in the region of the third molars can lead to serious consequences, such as pathological mandibular fracture and facial asymmetry [7,10]. Pathological mandibular fractures are defined as fractures caused by underlying pathology, representing approximately 2% of all fracture cases [11]. The mandibular angle and body are the most frequently observed locations in fractures associated with benign cysts of the oral cavity [10,12,13]. The presence of pathological changes can weaken the mandible, further predisposing it to fracture, especially in the presence of an impacted third molar, increasing the likelihood of a fracture in this already compromised region [14-19].

A pathological mandibular fracture associated with the removal of impacted teeth may occur during the procedure or in the immediate postoperative weeks, usually between the second and third weeks, as a result of excessive bite force or minor trauma to a weakened mandible.10,20 Mandibular fractures can lead to deformities, whether due to displacements or non-restored bone loss, with alterations in dental occlusion or the temporomandibular joint (TMJ), and thus should be prevented and treated appropriately [20]. Therefore, imaging exams are crucial for accurate diagnosis and determining the appropriate course of action, with panoramic radiography and computed tomography being recommended [21,22].

The most common treatment for a dentigerous cyst is careful enucleation along with the removal of the unerupted tooth [1]. The prognosis for most dentigerous cysts is excellent, with recurrence being rare after complete cyst removal, and the possibility of malignant transformation is minimal [1,6]. The objective of this study is to report a clinical case of rigid fixation as a preventive strategy for fracture after the removal of a cystic lesion associated with an impacted third molar in the mandibular angle region.

Methodology

This is a descriptive, observational, single-arm study, which was submitted to the Ethics Committee of the Federal University of Juiz de Fora (Appendix 2). The study presents the clinical case of a 58-year-old female patient, residing in Montes Claros, Minas Gerais, Brazil. The patient was diagnosed with a cystic lesion in the mandibular angle region, associated with an impacted right third molar. Clinical and imaging analyses indicated the potential risk of a mandibular fracture. Consequently, rigid internal fixation was performed intraoperatively as a preventive measure.

The study adhered to ethical principles for research involving human subjects, ensuring the confidentiality of the participant's identity. The patient was fully informed about the publication of the case. After the initial diagnosis, the condition was thoroughly explained to the patient, and she was referred to Santa Casa Hospital in Montes Claros, where the case was managed. The patient voluntarily signed the Informed Consent Form (ICF), agreeing to the use of images, data collected during clinical care, medical records, photographic documentation, and histopathological and imaging exams. Every effort was made during the drafting process to protect the patient's identity.

The collected data were not linked to the patient's identity, which was kept confidential. The images used did not allow for the identification of the patient. This case has a follow-up period of nearly two years.

Case Report

A 58-year-old female patient with a mixed-race background presented to the dental clinic after being referred by another healthcare professional, already in possession of a computed tomography (CT) scan.

Upon initial clinical examination, no abnormalities were observed. However, imaging studies, particularly the facial CT scan, revealed a hypodense lesion approximately 17 mm in diameter in the posterior region of the mandible, associated with the crown of an impacted tooth 48, positioned mesio-angularly. The lesion caused expansion of the buccal and lingual cortical plates and continuity of the buccal, lingual, alveolar crest, and lingual base cortices of the mandible. Periosteal bone proliferation was noted in the mandibular base region. The buccal cortical bone displayed expansion and fenestration, giving the lesion a multilocular appearance.

Additionally, hyperostosis of the adjacent bone and external root resorption of the apical and middle thirds of tooth 48 were observed. The middle third of the root was in contact with the mandibular canal, while the apical third was located at the mandibular base. The path of the mandibular canal was displaced towards the external lingual cortical

plate, with cortical layers ruptured in some areas (Figure 1). The imaging findings were suggestive of a dentigerous cyst, though the possibility of ameloblastoma was not ruled out.

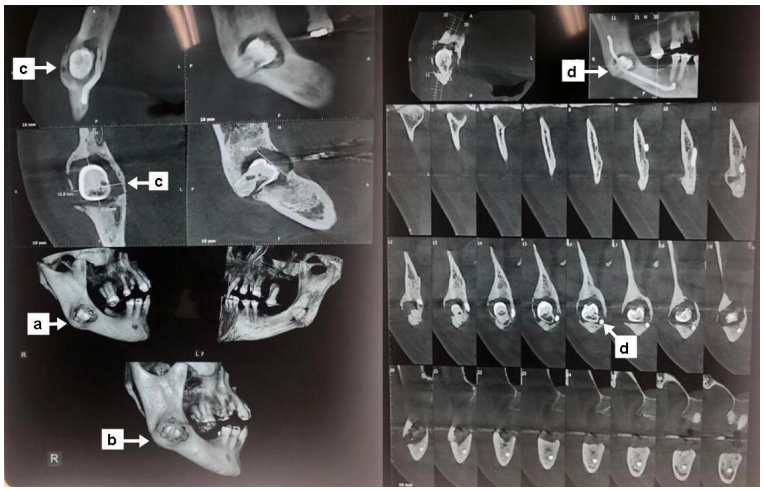

Figure 1: Cone beam computed tomography showing hypodense lesion in the posterior region of the mandible associated with tooth 48.

The arrows (in a and b) indicate the position of the tooth at the base of the mandible, indicating the risk of pathological fracture of the mandible when attempting to remove the impacted element 48. In (c) the expansion of the vestibular and lingual cortical bones. In (d) the proximity of tooth 48 to the mandibular canal.

The surgical approach began with the enucleation of the lesion followed by the removal of the associated tooth, with the patient under general anesthesia. An extraoral approach was chosen due to the need for rigid fixation (Figure 2). Complete removal of the lesion was achieved, and during the procedure, fixation was performed using a 2.0 system miniplate in the mandibular angle region (Figure 3). The excisional biopsy was sent for histopathological analysis, which, together with the clinical information and imaging, confirmed the diagnosis of a dentigerous cyst.

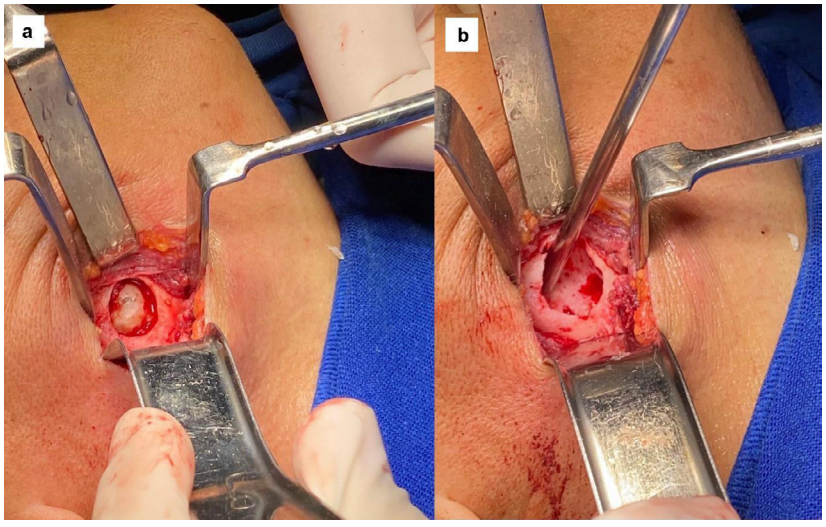

Figure 2: Extraoral access followed by enucleation and removal of element 48.

The image in (a) demonstrates the cyst-crown relationship, where the cyst surrounds the crown of the tooth and the crown projects into the cyst, which is the most common. In the image in (b) it is possible to observe the bone cavity.

A postoperative panoramic radiograph of the face was taken,

showing the correct adaptation of the plate in the mandibular angle region (Figure 4). Postoperative medication was prescribed, including Sodium Dipyrone (500 mg) every six hours for three days, Amoxicillin + Clavulanic Acid (875/125 mg) one tablet every 12 hours for seven days, and Meloxicam (15 mg) one tablet per day for three days. Postoperative care instructions were clearly explained to the patient.

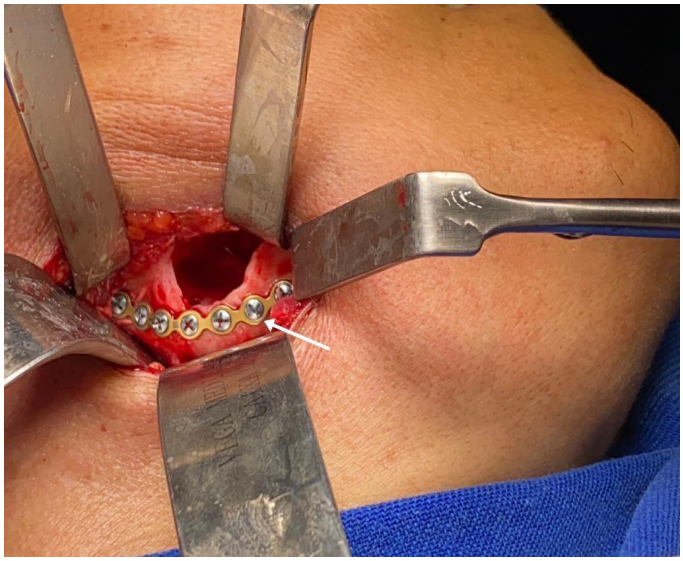

Figure 3: Fixation of the miniplate of the 2.0 system in the mandibular angle region.

The arrow shows the installation of the 2.0 system miniplate during the surgical procedure of tooth and lesion removal, as a strategy to prevent future pathological fracture.

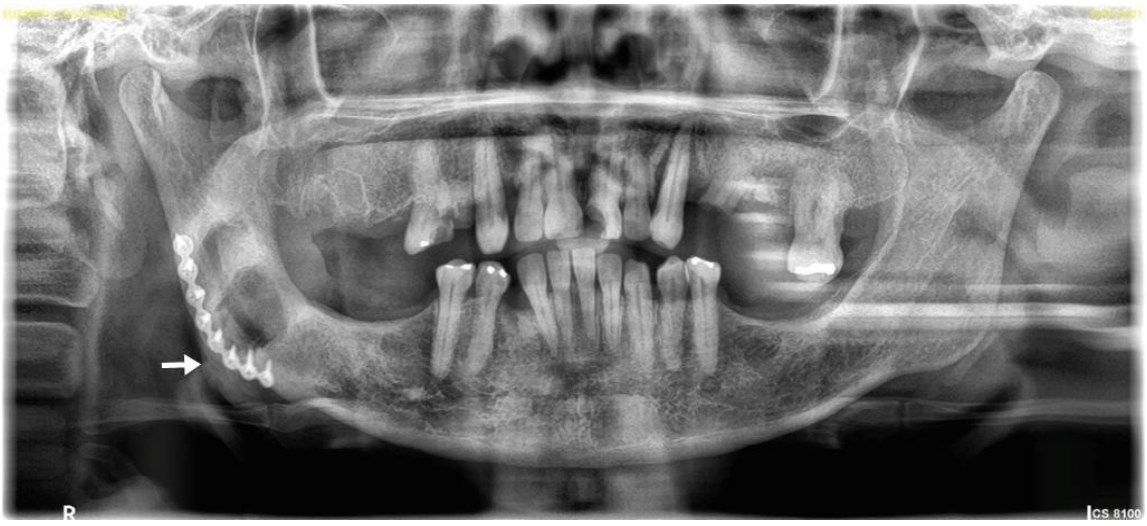

Figure 4: Radiografia panorâmica pós-operatória imediata.

The arrow shows the miniplate of the 2.0 system installed in the mandibular angle, where the correct adaptation in the region can be observed.

The patient returned after 1 year and 8 months, showing good healing of the extraoral access site (Figure 5). A new follow-up panoramic radiograph was taken, which demonstrated healing within normal limits and consistent with the surgical procedure (Figure 6).

Figure 5: Clinical image of the extraoral approach.

The arrow shows the scar from the extraoral access performed after one year and eight months, which appears satisfactory.

Figure 6: Panoramic radiograph after one year and eight months.

The arrow shows the maintenance of the miniplate of the 2.0 system after almost two years, where the alignment of the mandibular base and new bone formation at the site of the removed lesion can be observed.

Discussion

Dentigerous cysts are frequently discovered during routine imaging exams and can present characteristics with other odontogenic lesions [11]. They are the most common developmental odontogenic cysts of the maxillary bones, accounting for 25.3% of all maxillary cysts in the Brazilian population [23]. Dentigerous cysts can be found across a wide age range, from 10 to 30 years, with reports extending from 19 to 89 years. Studies indicate a 1:1 gender ratio for this pathology, with a higher incidence in the second decade of life (42%) and a typical location in the posterior mandibular region (62%). In the case presented, the patient was female, 58 years old, and had a cystic lesion associated with an impacted tooth 48, aligning with the literature regarding gender and lesion location [2-9].

Radiographically, dentigerous cysts are typically characterized by a well-defined, unilocular radiolucent image with a sclerotic margin, associated with the crown of an impacted tooth. The patient presented with a computed tomography (CT) scan, which allowed for a more detailed examination of the lesion's dimensions, its proximity to vital structures, the involvement of the cortical bone, and the thickness of the buccal and lingual cortical plates (Figure 1) [20-24]. The lesion associated with the crown of the impacted tooth 48 appeared hypodense in the posterior mandibular region, with involvement of both buccal and lingual cortical plates. The buccal cortical plate showed expansion and fenestration, giving the lesion a multilocular appearance. Large dentigerous cysts can sometimes appear multilocular due to the persistence of trabecular bone. Although most dentigerous cysts are unilocular, those that appear multilocular should be further investigated. Consequently, despite the imaging being suggestive of a dentigerous cyst, the multilocular appearance noted in the CT report led to consideration of ameloblastoma as a differential diagnosis [24-27].

The diagnosis of a dentigerous cyst was confirmed through histopathological examination combined with cone-beam computed tomography (CBCT). The literature has documented cases of cystic lesions in close contact with the inferior alveolar nerve, causing nerve displacement, as observed in this case, where the mandibular canal was displaced towards the external lingual cortical plate, resulting in cortical layer disruption in some areas [12-16].

In terms of lower third molars associated with dentigerous cysts, impacted mandibular molars are the most frequently affected teeth. According to the Pell and Gregory classification, class III—where the crown is completely covered by bone and positioned mesially—is the most common type. In the case presented, the impacted tooth was class III mesio-angular (Figure 1), consistent with the literature. Regarding cyst-crown relationships, the present case fits the central variant, the most common type, where the cyst surrounds the crown of a tooth, as seen in Figures 1 and 2a. This helps explain how dentigerous cysts grow around teeth whose crowns are fully encased in bone. This occurs due to increased internal fluid pressure, which tends to be higher in hard tissues than in soft tissues, leading to a higher frequency of dentigerous cysts in the mandibular ramus region, where teeth are covered by bone [9-18].

When performing surgical removal of cystic lesions near the mandibular base, there is a risk of weakening the region due to the removal of supporting bone. The literature indicates that this bone fragility is heightened in patients around 60 years of age, a group that is also more susceptible to facial trauma. The 58-year-old patient in this case fits within this statistic. Pathological mandibular fractures associated with tooth removal can occur during surgery or in the immediate postoperative weeks, most commonly between the second and third weeks due to the weakened mandible. The removal of deeply impacted third molars along with the associated cyst increases the incidence of pathological mandibular fractures, as this procedure often requires substantial bone removal, leaving insufficient remaining bone and further weakening the mandible, thus predisposing it to fracture. The mandibular angle and body are the most frequently observed fracture sites associated with benign cysts, with literature reports of pathological fractures in the mandibular angle due to cystic lesions. Given this, treatment planning must account for the possibility of such fractures [10-22].

The most common treatment for dentigerous cysts is careful enucleation of the cyst, along with the removal of the unerupted tooth. This allows for histological examination of the lesion. For extensive lesions involving significant thinning of the bone walls, it is feasible to plan for open reduction and internal fixation with miniplates to reduce the risk of postoperative pathological fractures in areas weakened by the thin bone. This approach strengthens the site in combination with enucleation or marsupialization of the cystic lesion. The literature shows that for fractures of the mandibular angle, rigid fixation with 2.0 mm plates can be used. In this case, the patient was presented with risk factors for fractures, including age, a cystic lesion associated with a deeply impacted third molar in the mandibular angle region, and bone fragility due to the extent of the lesion. Therefore, the treatment plan involved enucleation of the cystic lesion and the immediate placement of a 2.0 mm miniplate to reinforce the remaining bone and prevent a late pathological fracture in the mandibular angle, along with complete removal of the lesion by enucleation [23-29].

The prognosis for most dentigerous cysts is excellent, with recurrences being rare after complete removal, particularly when the lesion is fully excised, as was the case here. Mandibular fractures are extremely painful, exacerbated by masticatory, phonatory, and respiratory movements, and can lead to dental occlusion alterations, temporomandibular joint (TMJ) dysfunction, and facial asymmetries.

Dentigerous cysts are often asymptomatic, which allows them to progress without proper and timely treatment, potentially leading to extensive lesions that pose greater challenges when removed. Proper planning and treatment in this case, including the choice of enucleation and intraoperative fixation with a miniplate, helped prevent these potential consequences, avoiding a late pathological fracture and preserving adjacent structures, resulting in a favorable postoperative outcome for the patient [24-29].

Conclusion

In conclusion, an accurate diagnosis of a dentigerous cyst is closely related to a thorough understanding of the pathological characteristics of oral cavity lesions, which facilitates the development of an appropriate treatment plan. It is essential to carefully remove both the lesion and the associated tooth due to the proximity to critical anatomical structures. Moreover, a meticulous assessment of the remaining bone in the affected region is crucial to guide preventive planning, employing strategies that can help avoid pathological fractures and potential future complications.

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