Case report

CLINICAL MANAGEMENT OF ODONTOGENIC KERATOCYST: CASE REPORT AND INTEGRATIVE LITERATURE REVIEW

ABSTRACT

Introduction: The odontogenic keratocyst is a common odontogenic cyst which affects mainly the posterior region of the mandible.

Aims: The aim of this study was to discuss the clinical management of odontogenic keratocyst, based on a case report and an integrative literature review.

Case report: A 34-year-old woman has visited the Oral Surgery Division with a complaint of alignment discomfort of her teeth. Radiographic examination showed a well-defined multi-focus radiolucent area in the left posterior region of the mandible with involvement of cortical lingual bone. The incisional biopsy was performed and the diagnosis of Odontogenic Keratocyst was confirmed. Conservative treatment with decompression management was accomplished. 11 months follow-up reveled considerable reduction in lesion size, bone neoformation and mandibular cortical bone consolidation.

Conclusion: Conservative or radical management of odontogenic keratocyst depends on several factors such as location and size of the lesion, involvement of nerves and vessels and bone destruction area. The choice of treatment must be discussed and defined for each case, aiming at the patient's well-being and the case outcome.

Keywords: Odontogenic keratocyst. Decompression. Odontogenic cyst. Treatment.

1. INTRODUCTION

Odontogenic keratocyst (OKC) is a cystic pathological condition that originates from the dental lamina, representing approximately 11,7% of all cystic odontogenic lesions [1].

The OKC can affect maxilla and mandible [2], however it has highest prevalence in posterior region of the mandible [3].

The World Health Organization has classified the OKC as a neoplasm due to its aggressive clinical course, high potential for recurrences, mutations in the PTCH1 tumor suppressor gene, satellite cysts and association with Gorlin-Goltz syndrome [4]. However, in 2017, WHO published a new classification of head and neck tumors, in which keratocyst odontogenic tumor was moved back to cysts category and it was named odontogenic keratocyst given that there was not enough evidence to characterize it as a neoplastic lesion [5].

The most of keratocysts are identified based on routine imaging exams in the dentistry offices. In radiograph exam, OKC appear as a radiolucent image, with single or multi-focus and it can be associated or not for to impacted teeth [5]. It is often asymptomatic, however, when in large proportions, it can cause discomfort and facial asymmetry [6, 7].

Typically, histologic findings of OKC are a para-keratinized stratified squamous epithelium, usually 6–8-cell-layer thickness, which demarcates a cystic lumen filled with desquamated keratin. There is a well-defined, often palisaded, basal layer of columnar or cuboidal cells, whereas the parakeratotic cells in the upper layers often show a corrugated surface [8].

Various treatment modalities have been reported for OKC such as enucleation, enucleation with cryotherapy, marsupialization, decompression and resection [9]. The application of Carnoy's solution also was described as a complementary therapy after cist removal. Carnoy's solution promotes cauterization and superficial bone necrosis with epithelial remnants destruction of the dental lamina in bone margins [10].

Considering the characteristics and clinical heterogeneity of OKC, the aim of this study was to discuss the clinical management of the OKC based on a case report and an integrative literature review.

2. CASE REPORT

This study was accomplished at School of Dentistry of Faculdades Unidas do Norte Minas, MG, Brazil, and approved by the Research Ethics Committee under protocol no. 2.844.090.

A 34-year-old woman has visited Oral Surgery Division complaining discomfort on alignment of her teeth. Medical history was not contributory. In the extraoral examination, it was identified facial symmetry and no dermal lesions. The intraoral examination revealed satisfactory oral health, absence of carious lesions or periodontitis. Dental restorations and

dental crowding in the lower arch were observed. Computed tomographic examination showed a well-defined multi-focus hypodense area in the left posterior region of the mandible with involvement of cortical lingual bone (Figure 1).

After thorough analysis of the case, the patient was diagnosed with a mandibular cystic lesion. The diagnostic hypotheses were odontogenic keratocyst and multicystic ameloblastoma.

For content evaluation, aspiration puncture of the lesion was performed. A provisional diagnosis of OKC was considered due to presence of whitish liquid and thick appearance on aspiration, compatible with keratin (Figure 2A). Due to high size of the lesion, mandibular fragility and risk of inferior alveolar nerve injuries incisional biopsy and additional decompression of the lesion with a silicone ring were considered (Figure 2B).

The sample biopsied were included in paraffin and stained with hematoxylin and eosin (H&E). Histopathological examination revealed a fragment of cystic capsule of odontogenic origin, partially coated by few layers of parakeratinized epithelium. The basal layer of the epithelium consisted of columnar cells with palisade morphology and hyperchromatic nuclei (Figure 3). In the most superficial layer of the epithelium was observed the presence of keratin. The capsule was composed of loose connective tissue, blood vessels and moderate mononuclear inflammatory infiltrate. These findings leaded to the definitive diagnosis of odontogenic keratocyst.

Cone beam computed tomography with 3D reconstruction was performed 11 months after the decompression surgery procedure to evaluate lesion size reduction. Image findings revealed a considerable reduction in lesion size, bone neoformation and mandibular cortical bone consolidation (Figure 4).

3. DISCUSSION

Odontogenic keratocyst is a worldwide recognized pathological condition due to its aggressive behavior and propensity to recurrence. In this context, treatment ~~the~~ management of OKC has fundamental importance for the lesion repair outcome.

The origin of odontogenic keratocyst is based on the association between remaining cell remains of the dental lamina with genetic changes in PTCH1 genes, increased expression of the PCNA and Ki67 genes, and functional dysregulation of tumor suppressor genes [4, 11, 12]. Additionally, it could have elevated expression of B2 (BCL2) cell lymphoma ~~the~~ anti-apoptotic gene in OKC compared to other odontogenic lesions [11]. This set of changes provides epithelial remains proliferation and formation of the cystic cavity.

Etiological and pathogenic aspects of OKC reveal that lesion recurrence may be associated to epithelial remnants of primary lesion during enucleation, or to presence of satellite cysts and microcysts in the tissue underlying [13]. Unfortunately, the cystic coating of most of OKC is quite and friable, which makes the total enucleation of the lesion extremely difficult, especially in large and multilocular lesions [14, 15]. The use of Carnoy's solution (absolute alcohol, chloroform, acetic acid, and ferric chloride) in the surgical site, after removal of the lesion, may assist in epithelial remnants destruction and, consequently, it could reduce recurrence rates [14].

Decompression or marsupialization are considered a conservative technique in the management of OKC that aimed size decrease of extensive lesions, prior to enucleation or for complete resolution of the lesions [16]. This approach is interesting to preservation of important anatomical structures such as inferior alveolar nerve and prevention of a consequent possible deformity [17]. Marsupialization and decompression have been defined as different surgical techniques: In marsupialization technique, a part of the cyst is removed followed by suturing the lesion's exposed boundaries to the adjacent mucosa exposing the cyst to oral cavity. In decompression, a drain is placed inside the lesion, which it maintains communication with the cystic cavity [17].

The decompression or marsupialization leads to a decrease in the intracystic pressure and may result in bone neoformation with thickening of cystic epithelial lining. This event allows better surgical management in the total removal of the lesion and, consequently, in reduction of recurrence potential [13].

The last OKC 10-year-integrative review published in PubMed database showed 27 cases, the majority presented unilocular lesions (n=23), and, in 19 studies, the lesions were not associated with unerupted teeth. Considering treatment options, enucleation followed by curettage was the most frequent finding (n=22), decompression or marsupialization was utilized in the minority of cases (n=5), and use of Carnoy's solution was observed in 5 cases [6, 10, 18-27]. The articles data can be found in Table 1.

Treatment modalities for OKC result in different recurrence rates and include enucleation [28], enucleation with cryotherapy [29], enucleation with application of Carnoy's solution [30], marsupialization [16], decompression [31] and resection [32]. Interestingly, the minority of cases analyzed performed marsupialization or decompression techniques. The literature highlights the benefits of marsupialization or decompression procedure in extensive lesions, as well application of Carnoy 's solution in the sugery area after cyst removal [13, 14]. Such procedures when well indicated and well performed can reduce the potential for recurrence of the lesion. In the present case, and to minimize the risk of injuries of noble structures such as inferior alveolar nerve and fracture of the mandible, the decompression

was performed as a primary treatment. The main objective of decompression is gradually reducing the lesion size for subsequent enucleation of the cyst in a minor traumatic surgery [33]. This technique can promote epithelial differentiation and modification in cytokeratin 10 expression from positive to negative, transforming cystic epithelium in oral cavity-like epithelium and improve the cystectomy management forward step [24, 34].

The literature points out that, despite the lesion size, it must have a preference to surgical treatments such as enucleation or resection with or without Carnoy's solution application or cryotherapy in hospital environment under general anesthesia [23]. Meanwhile, on the other hand, it is known that there are some geographic places where access to high complexity dental assistance is restricted, placing decompression or marsupialization as a viable therapeutic management.

The OKC recurrence rates can reach 62,5%, what demonstrates aggressive growth pattern despite its benign characteristics [7]. It could justify why expert opt for radical treatments such as cystectomy with Carnoy's solution application as adjuvant therapy. This application can destroy the remaining cystic epithelial cells and can cause a superficial bone necrosis reducing the possibility of recurrence [6, 10, 20].

Therefore, it is possible to state the clinical management of odontogenic keratocyst based on several factors, among them: lesion size and its location, professional expertise, and available treatment modality. The option for radical or conservative techniques should be debated and well defined for each clinical case, always aiming for patient's well-being and case outcome.

4. CONCLUSION

Conservative or radical management of odontogenic keratocyst depends on several factors such as location and size of the lesion, involvement of nerves and vessels and bone destruction area. The choice of treatment must be discussed and defined for each case, aiming at the patient's well-being and the case outcome.

ETHICAL APPROVAL

This study was accomplished at School of Dentistry of Faculdades Unidas do Norte Minas, Brazil, and approved by the Research Ethics Committee under protocol no. 2.844.090.

REFERENCES

1. Johnson, N.R., et al., *Frequency of odontogenic cysts and tumors: a systematic review.* J Investig Clin Dent, 2014. **5**(1): p. 9-14.
2. Valdivia, A., et al., *What is Currently Known about Odontogenic Keratocysts?* Oral Health Prev Dent, 2022. **20**(1): p. 321-330.
3. Slusarenko da Silva, Y., P.J.W. Stoelinga, and M.D.G. Naclerio-Homem, *The presentation of odontogenic keratocysts in the jaws with an emphasis on the tooth-bearing area: a systematic review and meta-analysis.* Oral Maxillofac Surg, 2019. **23**(2): p. 133-147.
4. Gomes, C.C., et al., *Molecular alterations in odontogenic keratocysts as potential therapeutic targets.* J Oral Pathol Med, 2017. **46**(10): p. 877-882.
5. EI-Naggar, A.K., *WHO classification of head and neck tumours*. 2017: International Agency.
6. Arshad, F., *Syndromic odontogenic keratocyst: A case report and review of literature.* J Int Soc Prev Community Dent, 2016. **6**(1): p. 84-8.
7. Fidele, N.B., et al., *Recurrence of odontogenic keratocysts and possible prognostic factors: Review of 455 patients.* Med Oral Patol Oral Cir Bucal, 2019. **24**(4): p. e491-e501.
8. Wright, J.M. and M. Vered, *Update from the 4th edition of the World Health Organization classification of head and neck tumours: odontogenic and maxillofacial bone tumors.* Head and neck pathology, 2017. **11**: p. 68-77.
9. Vallejo-Rosero, K.A., et al., *Conservative management of odontogenic keratocyst with long-term 5-year follow-up: Case report and literature review.* Int J Surg Case Rep, 2020. **66**: p. 8-15.
10. Radia, S., A.C. Cash, and K. Moar, *An Unusual Case of an Odontogenic Keratocyst Associated With an Ungrafted Alveolar Cleft: A Case Report and Review of the Literature.* Cleft Palate Craniofac J, 2019. **56**(1): p. 110-115.
11. Diniz, M.G., et al., *miR-15a/16-1 influences BCL2 expression in keratocystic odontogenic tumors.* Cell Oncol (Dordr), 2012. **35**(4): p. 285-91.
12. Gomes, C.C. and R.S. Gomez, *PTCH1 gene inactivation is not a Keratocystic odontogenic tumour exclusive alteration.* Oral Oncol, 2011. **47**(3): p. 226-7.
13. Mohanty, S., et al., *Surgical management of the odontogenic keratocyst: A 20-year experience.* Int J Oral Maxillofac Surg, 2021. **50**(9): p. 1168-1176.
14. Stoelinga, P.J.W., *The odontogenic keratocyst revisited.* Int J Oral Maxillofac Surg, 2022. **51**(11): p. 1420-1423.

15. Stoelinga, P.J., *The treatment of odontogenic keratocysts by excision of the overlying, attached mucosa, enucleation, and treatment of the bony defect with carnoy solution.* J Oral Maxillofac Surg, 2005. **63**(11): p. 1662-6.

16. Pogrel, M.A. and R.C. Jordan, *Marsupialization as a definitive treatment for the odontogenic keratocyst.* J Oral Maxillofac Surg, 2004. **62**(6): p. 651-5; discussion 655-6.

17. Tabrizi, R., et al., *Decompression or Marsupialization; Which Conservative Treatment is Associated with Low Recurrence Rate in Keratocystic Odontogenic Tumors? A Systematic Review.* J Dent (Shiraz), 2019. **20**(3): p. 145-151.

18. Gopalkrishna, A.A., et al., *Trigeminal neuralgia induced by odontogenic keratocyst associated with impacted supernumerary teeth: A rare case report.* J Oral Maxillofac Pathol, 2018. **22**(Suppl 1): p. S135-S140.

19. Gupta, R.K., et al., *A Rare Simultaneous Occurrence of Odontogenic Keratocyst and Unicystic Ameloblastoma in Mandible: A Case Report.* J Clin Diagn Res, 2016. **10**(8): p. ZD01-4.

20. Matijevic, S., et al., *Peripheral ostectomy with the use of Carnoy's solution as a rational surgical approach to odontogenic keratocyst: a case report with a 5-year follow-up.* Vojnosanit Pregl, 2012. **69**(12): p. 1101-5.

21. Priya, K., P. Karthikeyan, and V. Nirmal Coumare, *Odontogenic Keratocyst: A Case Series of five Patients.* Indian J Otolaryngol Head Neck Surg, 2014. **66**(1): p. 17-21.

22. Rodrigues-Fernandes, C.I., et al., *Pigmented odontogenic keratocyst: Report of a rare case and review of the literature.* J Clin Exp Dent, 2018. **10**(12): p. e1230-e1234.

23. Shetty, P., et al., *Third molar in the orbital floor: A precarious presentation of odontogenic keratocyst-A case report and review of literature.* Clin Case Rep, 2018. **6**(9): p. 1854-1861.

24. Khan, A.A., et al., *Management of an extensive odontogenic keratocyst: A rare case report with 10-year follow-up.* Medicine (Baltimore), 2019. **98**(51): p. e17987.

25. Sheethal, H.S., et al., *Odontogenic keratocyst arising in the maxillary sinus: A rare case report.* J Oral Maxillofac Pathol, 2019. **23**(Suppl 1): p. 74-77.

26. Telagi, N. and B.M. Ahmed, *Odontogenic keratocyst with metaplastic epithelium: A case report.* J Family Med Prim Care, 2019. **8**(8): p. 2735-2737.

27. Vijayarangan, S. and V. Baskara Pandian, *Management of the Odontogenic Keratocyst - Six Cases with Conservative Management Supported by Chemical and Electrochemical Cauterization.* Cureus, 2019. **11**(11): p. e6260.

28. Singh, M. and K.C. Gupta, *Surgical treatment of odontogenic keratocyst by enucleation.* Contemp Clin Dent, 2010. **1**(4): p. 263-7.

29. Schmidt, B.L. and M.A. Pogrel, *The use of enucleation and liquid nitrogen cryotherapy in the management of odontogenic keratocysts.* J Oral Maxillofac Surg, 2001. **59**(7): p. 720-5; discussion 726-7.

30. Polak, K., et al., *Odontogenic keratocyst of the mandible: A case report and literature review.* Dent Med Probl, 2019. **56**(4): p. 433-436.

31. Marker, P., et al., *Treatment of large odontogenic keratocysts by decompression and later cystectomy: a long-term follow-up and a histologic study of 23 cases.* Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 1996. **82**(2): p. 122-31.

32. Williams, T.P. and F.A. Connor, *Surgical management of the odontogenic keratocyst: aggressive approach.* J Oral Maxillofac Surg, 1994. **52**(9): p. 964-6.

33. Goto, M., et al., *A rare case of odontogenic keratocyst extending into the sphenoid bone from the maxilla.* Int J Surg Case Rep, 2020. **71**: p. 132-138.

34. Ledderhof, N.J., et al., *Topical 5-Fluorouracil is a Novel Targeted Therapy for the Keratocystic Odontogenic Tumor.* J Oral Maxillofac Surg, 2017. **75**(3): p. 514-524.

LEGEND OF FIGURES

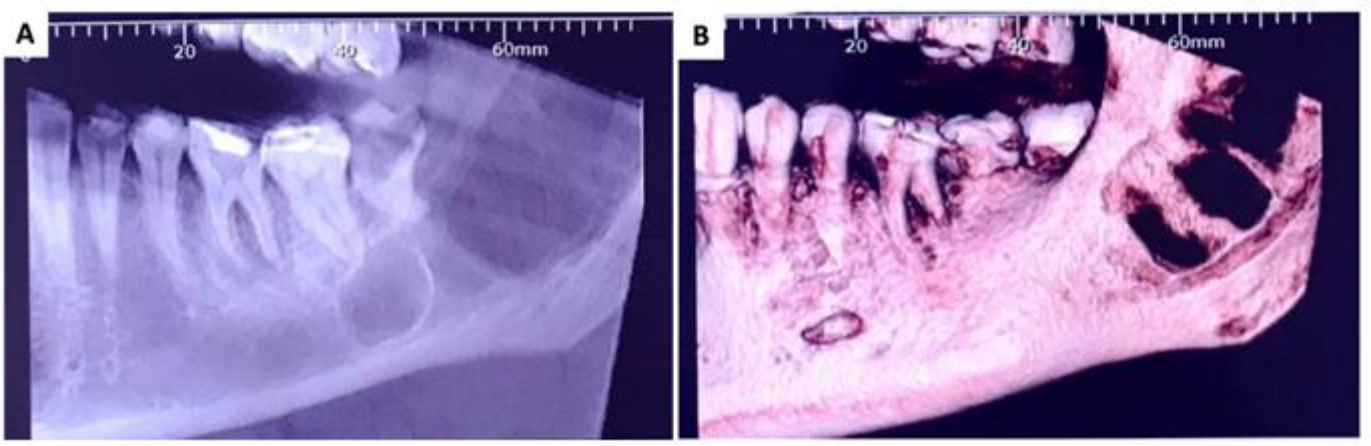

Figure 1: A) Computed tomographic examination showed a well-defined multi-focus hypodense area in the left posterior region of the mandible with involvement of cortical lingual bone. B) 3D reconstruction of left posterior region of mandible.

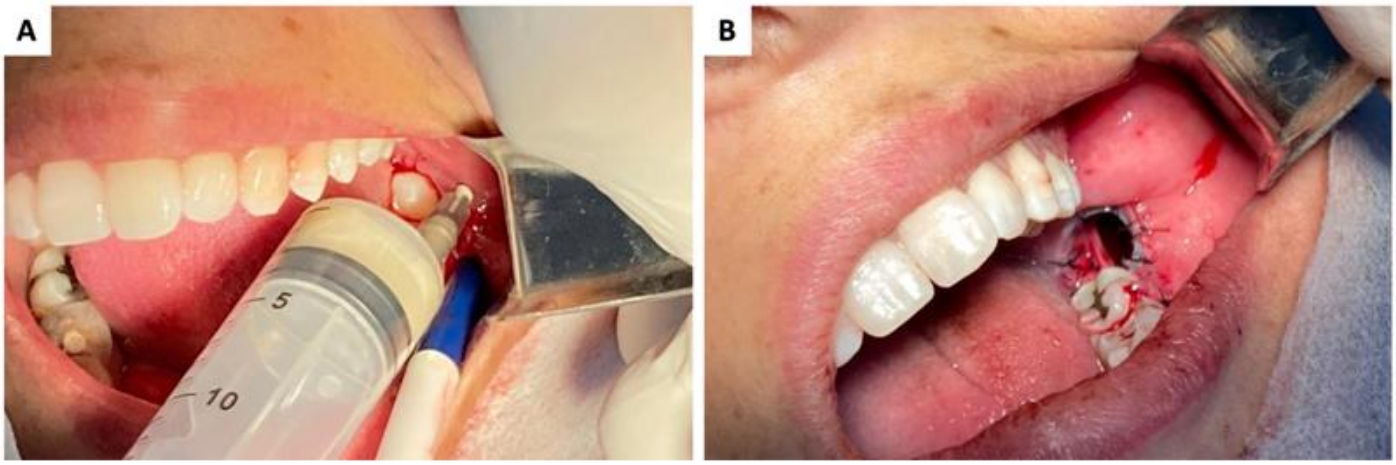

Figure 2: A) Aspiration puncture showed the presence of whitish liquid. B) Lesion decompression with a silicone ring.

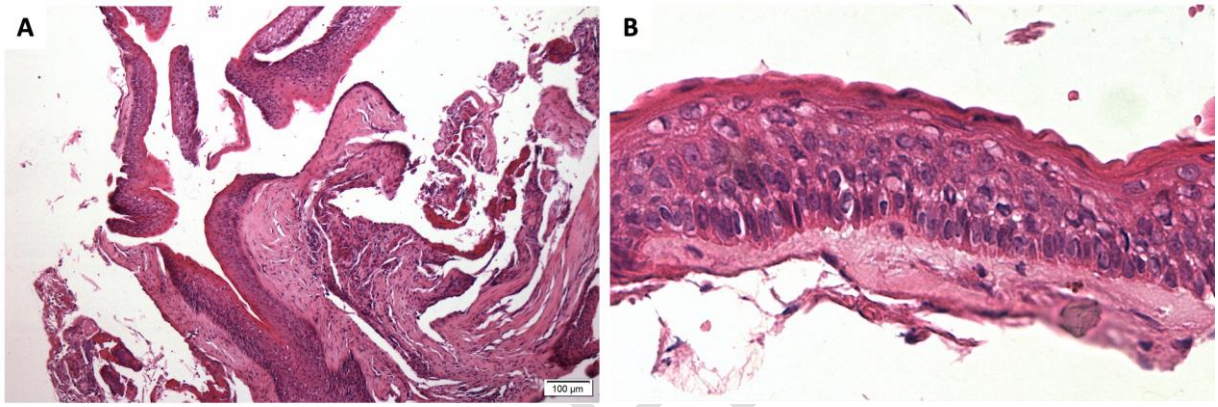

Figure 3: Histopathological examination stained with hematoxylin and eosin. A) 10x and B) 40x.

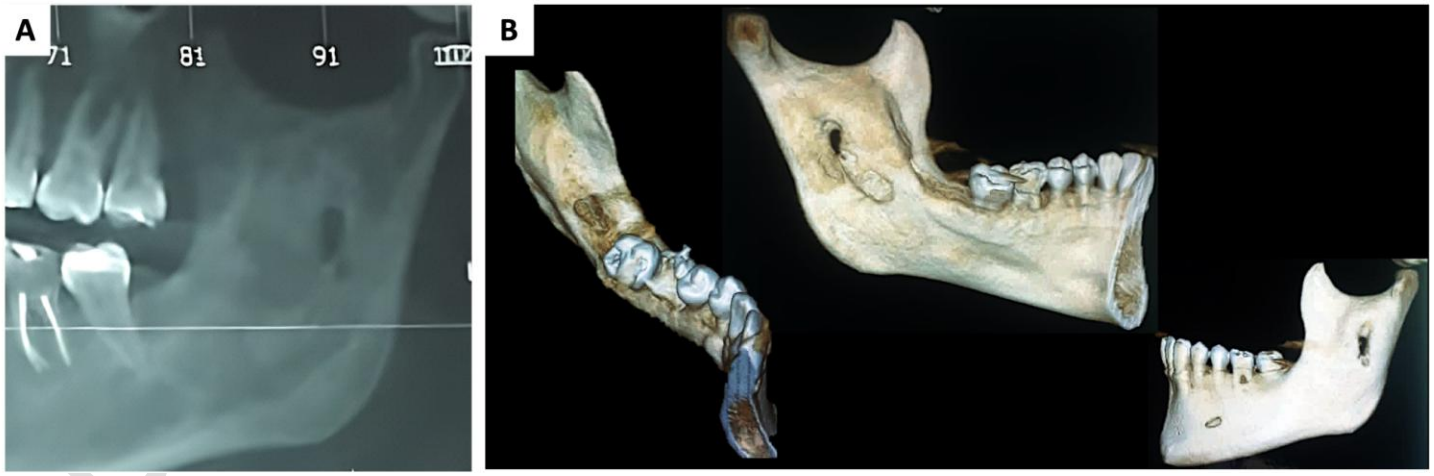

Figure 4: Computer tomography examination after decompression procedure showed a considerable reduction in lesion size. A) Left posterior region of the mandible. B) 3D reconstruction of mandible.

Table 1: Data from the articles included in the study.

Autor/Year	Gender	Age	Location	Included tooth	Aspect	Size	Marsupialization or Decompression	Enucleation	Carnoy's solution
Matijevic, S., et al. (2012)	Male	52	Mandibular body and branch	Yes	Single	4.0 cm	Yes	Yes	Yes
Priya, K., et al. (2014)	Male	18	Left side maxilla	No	Single	1,0 cm	No	Yes	No
	Female	20	Right side maxilla	No	Single	5 cm	No	Yes	No
	Female	16	Left side maxilla	No	Single	6 cm	No	Yes	No
	Male	20	Left maxilla	No	Single	5 cm	No	Yes	No
	Male	16	Right side maxilla	No	Single	1.5 cm	No	Yes	No
Gupta, R. K., et al. (2016)	Male	22	Body and mandibular branch on the left side.	Yes	Single	> 7 cm	Yes	Yes	No
Arshad F. 2016	Male	20	Mandible/region near the apexes of teeth 13 a nd 23	Yes	Multi-focus	2,0 cm	No	Yes	No
Gopalkrishna, A. A., et al. (2018)	Female	82	Mandibular body on the left side	Yes	Single	2.5 cm	No	Yes	No
Shetty, P., et al. (2018)	Female	22	Posterior maxilla on the left side	Yes	Single	> 7 cm	No	Yes	No
Rodrigues-Fernandes, C. I., et al. (2018)	Male	14	Anterior mandible	No	Single	< 7 cm	No	Yes	No
Khan, A. A., et al. (2019)	Female	35	Bilateral body and mandibular branch	No	Single	> 7 cm	Yes	Yes	No
Polak, K., et al. (2019)	Not reported	53	Anterior region of mandible	No	Single	> 7 cm	Yes	Yes	No
Radia, S., et al. (2019).	Male	10	Left side maxilla.	Yes	Single	> 7 cm	No	Yes	Yes
Sheethal, H. S., et al. (2019).	Female	15	Posterior maxilla the left side invading the sin us	Yes	Single	> 7 cm	No	Yes	No
Telagi, N. and B. M. Ahmed (2019).	Male	40	Mandibular body on the right side	No	Multi-focus	6 cm	No	Yes	No
Vijayarangan, S. (2019)	Female	19	Left side mandibular angle	No	Single	> 7 cm	Yes	Yes	Yes
	Male	39	Mandibular body	No	Multi-focus	> 7 cm	No	Yes	No
	Female	35	Element maxilla 14 to 24.	No	Single	> 7 cm	No	Yes	No
	Male	29	Mandibular body	No	Single	> 7 cm	No	Yes	No
	Female	35	Posterior mandible	Yes	Single	> 7 cm	No	Yes	Yes

Firth, N., et al. (2020)	Female	57	Between teeth 42 and 43	No	Single	1.5 cm	No	Yes	No
Goto, M., et al. (2020)	Male	21	Maxillary sinus and left side sphenoid bone	No	Single	> 7 cm	No	Yes	No
Vallejo-Rosero, K. A., et al. (2020)	Female	67	Anterior mandible	No	Single	> 7 cm	Yes	Yes	Yes
Prashanth, B. R., et al. (2020)	Male	29	Anterior region of mandible	No	Single	> 7 cm	No	Yes	No
Roman, C. R., et al. (2022)	Male	19	Posterior region of the left side jaw	No	Single	4 cm	No	Yes	No
Lohokare, A. U., et al. (2022)	Male	34	Right mandibular body	No	Multi-focus	3 cm	No	Yes	No