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Case Report: Three-Dimensional Insights into an Odontogenic Tumor: CBCT Evaluation of a Right Mandibular Ameloblastoma

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ABSTRACT

Background: Ameloblastoma is a benign odontogenic tumor characterized by slow growth, local aggressiveness, and a tendency for recurrence. Orthopantomography (OPG) is commonly used for initial assessment; however, Cone Beam Computed Tomography (CBCT) is essential for comprehensive evaluation, providing three-dimensional assessment of lesion margins, cortical involvement, and relationships with adjacent anatomical structures for accurate diagnosis and treatment planning.

Case Description: A 41-year-old female presented with a gradually enlarging swelling on the right side of the lower jaw, first noticed approximately 5–6 months earlier. The swelling had remained largely asymptomatic until the onset of mild, intermittent pain over the preceding 2–3 days. CBCT examination revealed a large multilocular radiolucent lesion involving the right mandibular body, angle, and ramus. The lesion exhibited marked cortical expansion with areas of thinning and focal discontinuity, along with well-defined internal septations. In view of these characteristic radiographic features, a provisional diagnosis of ameloblastoma was made. The patient was subsequently advised surgical intervention, followed by postoperative prosthetic rehabilitation and long-term follow-up.

Conclusion: Ameloblastoma remains a diagnostically challenging odontogenic tumor due to its overlapping radiographic features with other multilocular jaw lesions. In this context, CBCT offers comprehensive three-dimensional evaluation, allowing precise delineation of lesion extent, cortical plate integrity, internal architecture, and proximity to adjacent structures.

Clinical Significance: This case highlights the pivotal role of CBCT in early radiologic identification and characterization of ameloblastoma. Advanced imaging not only reduces diagnostic ambiguity but also provides critical anatomical insights that optimize clinical decision-making and preoperative assessment when intervention is indicated.

Keywords: Ameloblastoma; Mandible; CBCT; Odontogenic Tumor; Diagnostic Imaging

1. INTRODUCTION

Ameloblastoma is a benign but locally aggressive odontogenic tumor arising from the epithelial componen

ts of the tooth-forming apparatus[1]. It is the most prevalent odontogenic tumor in developing countries and is commonly observed between 30 and 60 years of age[2]. It accounts for approximately 1% of all jaw tumors and 10–15% of odontogenic tumors, with a marked predilection for the posterior mandible[3]. Clinically, ameloblastoma typically presents as a painless swelling; progressive growth may result in dysfunction and facial asymmetry[4]. Mandibular involvement often leads to cortical expansion, thinning, and mobility or loss of adjacent teeth[5]. Recent identification of BRAFV600E and SMO gene mutations has enhanced understanding of its molecular pathogenesis[6,7]. According to the 2022 WHO Classification of Head and Neck Tumours, ameloblastoma is categorized under benign epithelial odontogenic tumors and includes conventional, unicystic, extraosseous/peripheral, adenoid, and metastasising variants[8]. Radiographically, ameloblastoma commonly appears as a multilocular radiolucency with a "soap-bubble" or "honeycomb" pattern, although unilocular variants may mimic odontogenic cysts[9]. While panoramic radiography and CT demonstrate corticated margins and septations[10], CBCT provides superior three-dimensional visualization of lesion extent, cortical integrity, and relation to vital structures such as the inferior alveolar nerve, aiding in differential diagnosis and surgical planning[11,12]. The present report describes CBCT characteristics of an extensive ameloblastoma involving the right mandible. Emphasis is placed on the radiologic hallmarks of the lesion, including its internal architecture, locularity, cortical expansion, and adjacent anatomical structures. Particular attention is given to the value of three-dimensional, multiplanar CBCT assessment in delineating lesion extent and identifying features that aid in differentiating ameloblastoma from other radiolucent jaw pathologies. This case underscores the pivotal role of advanced imaging in establishing an accurate diagnosis and facilitating appropriate treatment planning through precise three-plane evaluation.

2. CASE REPORT

- Age/Sex: 41-year-old female
- Chief complaint: Swelling on the right side of lower jaw for 5–6 months and mild intermittent pain since 2-3 days.
- Medical history: operated case of uterine cyst 1½ years ago and is not taking medications for the same.
- Dental history: Extraction of right upper posterior teeth 8 years ago as she was having pain in that tooth.
- Family history: Non-contributory
- Personal history: Vegetarian, brushes once daily with toothbrush and paste, no deleterious habits

2.1 HISTORY AND CLINICAL EXAMINATION

A 41-year-old female patient reported to the department of oral medicine and radiology with a chief complaint of swelling on the right side of the lower jaw for the past 5–6 months, accompanied by mild intermittent pain for the last 2–3 days. The swelling was insidious in onset and gradually progressive in nature. Her medical history revealed that she had undergone surgical management for a uterine cyst approximately 1½ years ago and is currently not on any medication for the same. The dental history disclosed extraction of the right maxillary posterior teeth eight years prior due to pain. The family history was non-contributory. The patient follows a vegetarian diet and maintains oral hygiene by brushing once daily with a toothbrush and toothpaste. She denied any deleterious oral habits.

Extraoral examination revealed a solitary swelling over the right middle and lower third of the face measuring approximately 5×5 cm, extending super inferiorly from the pre-tragal region to the inferior border of the mandible.

The swelling was firm, bony hard, non-fluctuant, slightly tender, and non-compressible. The overlying skin was normal, with no secondary changes.

Intraoral examination revealed a localized expansion in the right lower posterior buccal vestibule extending from the distolingual cusp of 47 to the retromolar region. The mucosa over the swelling appeared intact and of normal color. No ulceration or discharge was observed.

2.2 DIAGNOSTIC ASSESSMENT

Orthopantomogram (OPG) revealed a large multilocular radiolucent lesion giving a "soap bubble" and "honeycomb" appearance, extending from the distal root apex of 47 to involve the right body, angle, and ramus of the mandible and root resorption of 47 were evident further Cone Beam Computed Tomography (CBCT) was performed for detailed three-dimensional assessment.

The lesion appeared as a large multilocular radiolucency with well-defined yet scalloped borders, extending from the distal root of 47 to the right ramus and coronoid region. Axial sections revealed bicortical expansion and areas of cortical discontinuity. The internal structure showed multiple fine septations giving a characteristic “soap bubble” and “honeycomb” appearance.

Buccolingual expansion was significant, with thinning and partial perforation of both cortical plates in some areas. Coronal and sagittal sections showed the lesion measuring approximately 35–38 mm superoinferiorly and buccolingually, extending to involve the inferior border of the mandible. The mandibular canal was displaced inferiorly and partially obliterated in its course. The lesion also exhibited fine internal radiopaque lines suggestive of bony septa. Adjacent teeth (47) showed root resorption, a common finding in ameloblastoma. Hence a Provisional Diagnosis of Conventional Type of Ameloblastoma was made.

2.3 DIFFERENTIAL DIAGNOSIS

The radiographic differential diagnosis of a multilocular radiolucent mandibular lesion includes odontogenic keratocyst (OKC), central giant cell granuloma (CGCG), odontogenic myxoma, and aneurysmal bone cyst (ABC). Odontogenic keratocyst typically presents as a unilocular or multilocular radiolucency with smooth, well-corticated margins, minimal buccolingual expansion, and infrequent root resorption. Central giant cell granuloma often demonstrates a multilocular radiolucent pattern with thin internal trabeculae, a tendency to cross the midline, and relatively uniform expansion rather than scalloped borders. Odontogenic myxoma may exhibit a “honeycomb” or “tennis-racket” appearance; however, its margins are generally less well defined, and root resorption is uncommon. Aneurysmal bone cyst is characterized by a rapidly expansile multilocular radiolucency with marked cortical thinning and a “blow-out” appearance, frequently associated with fluid–fluid levels on CT or MRI—features typically absent in ameloblastoma[14]. In the present case, the presence of pronounced multilocularity with coarse internal septations and significant buccolingual expansion on CBCT favored a diagnosis of ameloblastoma.

2.4 THERAPEUTIC INTERVENTION

The patient was advised for surgical excision of the lesion involving the right body and ramus followed by multidisciplinary treatment planning.

2.5 OUTCOMES AND FOLLOW-UP

The patient was advised to undergo regular follow-up visits with imaging at each appointment, which is essential for monitoring bone healing and detecting any recurrence.

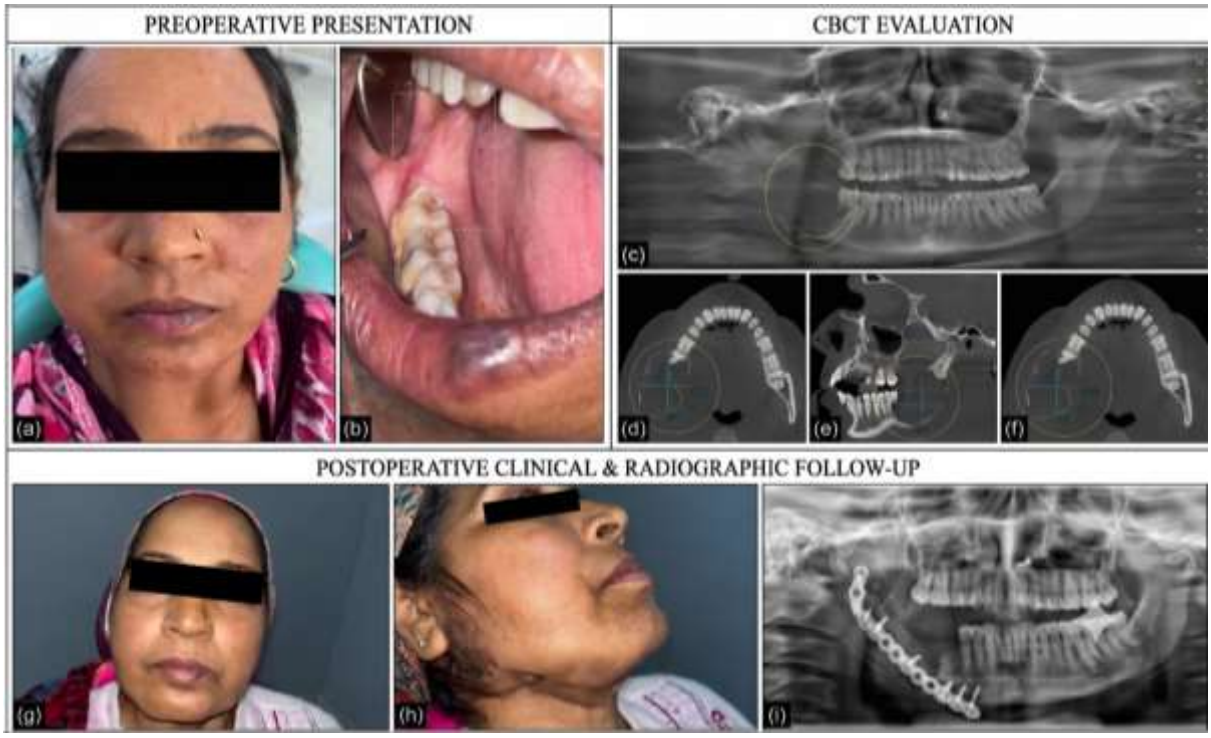

Figure 1: Comprehensive Pre-operative and Post-operative Clinical and Radiographic Presentation.

Pre-operative Presentation: (a, b) Extraoral facial view showing right mandibular swelling and intraoral examination revealing buccal vestibular cortical expansion with intact mucosa. (c) Pre-operative panoramic radiograph (OPG) outlining the multilocular radiolucent lesion involving the right mandibular body, angle, and ramus with root resorption of tooth 47. (d, e, f) CBCT scans (axial, sagittal, and coronal multiplanar reconstructions) demonstrating lesion dimensions (35–38 mm), bicortical expansion, cortical thinning, focal perforation, and inferior alveolar canal displacement. Post-operative Outcome & Follow-up: (g, h) post-operative clinical follow-up demonstrating restored facial symmetry, healed surgical approach, and mature submandibular scar. (i) Post-operative panoramic radiograph (OPG) demonstrating the segmental mandibulectomy defect stabilized with a titanium mandibular reconstruction plate and rigid fixation screws.

3. DISCUSSION

Orthopantomography (OPG) remains the primary imaging modality for the initial evaluation of odontogenic tumors, providing a panoramic overview of lesion location, size, and gross radiographic pattern. However, its inherent two-dimensional limitations restrict accurate assessment of lesion extent, internal architecture, and cortical involvement. In this context, Cone Beam Computed Tomography (CBCT) plays an in dispensable role in the comprehensive evaluation of jaw pathologies by offering isotropic voxel resolution and high-contrast visualization of osseous structures. Unlike conventional radiographs, CBCT allows multiplanar reconstruction, enabling detailed assessment of the lesion's internal structure, cortical plate integrity, and spatial relationship with critical anatomical landmarks such as the mandibular canal and inferior mandibular border[13]. These advantages make CBCT particularly valuable in the evaluation of ameloblastoma, which characteristically presents as a multilocular radiolucent lesion associated with cortical expansion and thinning[14].

In the present case, CBCT demonstrated a large multilocular radiolucency with multiple fine internal septations and bicortical expansion, findings consistent with conventional ameloblastoma. Three-dimensional imaging enabled precise delineation of lesion extent (35–38 mm), cortical thinning, focal discontinuity, and displacement of the mandibular canal—features that are frequently underestimated or obscured on two-dimensional imaging. Such detailed characterization is critical for assessing biological behavior and potential aggressiveness of the lesion, thereby influencing future management planning.

The radiographic differential diagnosis of multilocular jaw lesions includes odontogenic keratocyst (OKC), odontogenic myxoma, and central giant cell granuloma (CGCG). However, distinct imaging features assist in differentiation: ameloblastoma typically exhibits coarse septa producing a "honeycomb" or "soap-bubble" appearance with marked cortical expansion, whereas OKC often presents with scalloped margins and minimal buccolingual expansion. Odontogenic myxomas characteristically show thin, straight septa with a "tennis-racket" pattern, while CGCGs may demonstrate multilocularity with wispy internal septations but usually lack the cortical perforation commonly associated with ameloblastoma.

The diagnostic superiority of CBCT lies in its ability to accurately evaluate three-dimensional relationships, detect cortical perforations, and assess variations in internal density[15,16]. Volume-rendered images and multiplanar views further enhance visualization of subtle cortical defects, aiding in differentiation between aggressive and non-aggressive lesions. Several studies have emphasized the role of CBCT in improving diagnostic confidence, morphological assessment, and preoperative planning in cases of ameloblastoma[17].

Beyond initial diagnosis, CBCT also serves as a valuable baseline tool for longitudinal assessment, allowing monitoring of lesion progression or recurrence, particularly in conservatively managed or post-treatment cases. Quantification of lesion volume and surface area enables objective follow-up evaluation, while the relatively low radiation dose and high diagnostic yield support its routine use in maxillofacial imaging[18,19,20].

Thus, CBCT effectively bridges the gap between conventional radiography and computed tomography, offering detailed diagnostic information for odontogenic tumors such as ameloblastoma while maintaining accessibility and patient safety. Its role extends beyond diagnosis to prognosis assessment and multidisciplinary treatment planning.

4. CONCLUSION

CBCT imaging provides detailed three-dimensional visualization of ameloblastoma, offering critical insights into lesion morphology, boundaries, and cortical involvement. It enables differentiation from other multilocular radiolucent lesions of the jaw and serves as a cornerstone for diagnosis and management planning. Early CBCT-based evaluation can help prevent complications through timely and appropriate multidisciplinary intervention.

5. CLINICAL SIGNIFICANCE

CBCT enables precise localization and characterization of odontogenic lesions such as ameloblastoma, minimizing diagnostic uncertainty. Its ability to depict cortical perforations, internal septations, and mandibular canal displacement enhances diagnostic confidence and guides clinicians toward appropriate case management decisions.

6. INFORMED CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying diagnostic information.

REFERENCES

1. Neville BW, Damm DD, Allen CM, Chi AC. *Oral and maxillofacial pathology.* 4th ed. St. Louis (MO): Elsevier; 2016.
2. Reichart PA, Philipsen HP, Sonner S. Ameloblastoma: biological profile of 3677 cases. *Eur J Cancer B Oral Oncol.* 1995;31B(2):86-99.
3. Adebayo ET, Ajike SO, Adekeye EO. A review of 318 cases of ameloblastoma in Kaduna, Nigeria. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2005;99(2):191-195.
4. McClary AC, West RB, McClary AC, Pollack JR, Fischbein NJ, Holsinger FC, et al. Ameloblastoma: a clinical review and trends in management. *Eur Arch Otorhinolaryngol.* 2016;273(7):1649-1661.
5. Effiom OA, Ogundana OM, Akinshipo AO, Akintoye SO. Ameloblastoma: current etiopathological concepts and management. *Oral Dis.* 2018;24(3):307-316. doi:10.1111/odi.12646.
6. Ghai S. Ameloblastoma: an updated narrative review of an enigmatic tumor. *Cureus.* 2022;14(8):e27734. doi:10.7759/cureus.27734.
7. Duarte-Andrade FF, Silva AMB, Vitório JG, Canuto GAB, Costa SFS, Diniz MG, et al. The importance of BRAF-V600E mutation to ameloblastoma metabolism. *J Oral Pathol Med.* 2019;48(4):307-314. doi:10.1111/jop.12839.
8. WHO Classification of Tumours Editorial Board. *Head and neck tumours.* 5th ed. Lyon (France): International Agency for Research on Cancer; 2022. (WHO classification of tumours series; vol. 9).
9. White SC, Pharoah MJ. Oral Radiology: Principles and Interpretation. 9th ed. Elsevier; 2025.
10. Scarfe WC, Farman AG. What is cone-beam CT and how does it work? *Dent Clin North Am.* 2008;52(4):707-730.
11. Kim JE, Cho JB, Yi WJ, Heo MS, Lee SS. Classification and prognostic evaluation of ameloblastoma using multiplanar CT imaging: a retrospective analysis. *BMC Oral Health.* 2025;25(1):115. doi:10.1186/s12903-025-05485-6.
12. Shah N, Bansal N, Logani A. Recent advances in imaging technologies in dentistry. *World J Radiol.* 2014;6(10):794-807.
13. Pagare J, Kale G. Radiographic features of histopathologically confirmed ameloblastoma: a retrospective study using cone-beam computed tomography. *Int J Res Rep Dent.* 2025;8(2):357-364. doi:10.9734/ijrrd/2025/v8i2240.
14. Kositbowornchai S, et al. Diagnostic performance of CBCT in differentiating odontogenic cysts and tumors. Dentomaxillofac Radiol. 2017;46(2):20160254.
15. Kim J, Nam E, Yoon S, et al. Radiographic and clinical features of ameloblastoma: A comparison between conventional and unicystic types. Imaging Sci Dent. 2020;50(4):303–10.
16. Chai ZK, Mao Y, Chen Y, et al. Improved diagnostic accuracy of ameloblastoma and odontogenic keratocyst on cone-beam CT by artificial intelligence. *Front Oncol*. 2022;11:793417. doi:10.3389/fonc.2021.793417.
17. Deepa D, Lele S. Role of Cone Beam Computed Tomography in the evaluation of ameloblastoma. *J Clin Diagn Res*. 2014;8(10):ZC01–ZC04

18. Ariji Y, Ariji E, Kimura Y, et al. Imaging features contributing to the assessment of ameloblastomas using cone beam computed tomography. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2014;118(4):534–543.
19. Choi JW, Lee SS, Oh SH, You JS, Huh KH, Heo MS. Evaluation of mandibular cortical bone perforation caused by ameloblastoma using cone-beam CT. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010;109(3):e38–e46
20. Mandlik R, Patil P, Wanjari SP, et al. Unveiling Radiographic Features and Radiopathological Correlation of Ameloblastoma: A Retrospective Study. *Ann Rom Med Health Sci*. 2024;11(2):74–81.