

Review

Evaluation, Treatment, Complication and Prognosis of Ameloblastoma

Ayman Bukhsh^{1*}, Rahaf Alnasser², Yahya AlNaser², Waleed AlRshaeed³, Samah Habtar², Gharam Al Anazi⁴, Maha Alshammari⁵, Hanan Alkadi⁶, Ibrahim Asiri², Zahra Alkhabbaz⁷, Noura Al-Ghamdi⁴

¹ Department of Oral and Maxillofacial Surgery, King Abdul Aziz Specialist Hospital, Taif, Saudi Arabia

² College of Dentistry, King Khalid University, Abha, Saudi Arabia

³ College of Medicine, Qassim University, Qassim, Saudi Arabia

⁴ Dental Department, Prince Sultan Military Medical City, Riyadh, Saudi Arabia

⁵ College of Dentistry, Vision Colleges, Riyadh, Saudi Arabia

⁶ Riyadh First Health Cluster, Riyadh, Saudi Arabia

⁷ College of Dentistry, Ajman University of Science and Technology, Ajman, United Arab Emirates

Correspondence should be addressed to **Ayman Bukhsh**, Department of Oral and Maxillofacial Surgery, King Abdul Aziz Specialist Hospital, Taif, Saudi Arabia. Email: dr.ayman_bukhsh@hotmail.com

Copyright © 2023 **Bukhsh**, this is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received: 11 December 2023, Accepted: 20 December 2023, Published: 24 December 2023.

Abstract

Ameloblastoma is a significant tumor originating from tissue known for its aggressive nature and tendency to come back after treatment. This review explores the aspects of factors that affect prognosis and strategies for managing a rare tumor that originates from tooth related tissues. Examining patients and utilizing imaging techniques to detect the tumor at an early stage is crucial for good survivability. Prognosis is influenced by recurrence rates, types of tissue characteristics observed under a microscope and how treatments affect surrounding structures, highlighting the necessity for management approaches. Surgical removal is considered the intervention in ameloblastoma management. Histopathological examination remains the gold standard for confirming the diagnosis. Incisional biopsies are often performed to confirm the diagnosis and determine the subtype based on characteristics. Furthermore, it discusses techniques for reconstructing affected areas. Explores the benefits of additional therapies to provide a comprehensive understanding of treatment options. Managing this tumor requires considering both the psychosocial implications and the need for lifelong follow-up. As research progresses, there is potential for markers and evolving treatment methods to enhance accuracy and improve the effectiveness of treatments.

Keyword: Ameloblastoma, Odontogenic Tumor, Surgical Excision, Recurrence, Psychosocial Impact

Introduction

Ameloblastoma is a significant tumor originating from tissue known for its aggressive nature and tendency to come back after treatment (1). This comprehensive review explores the research and clinical insights on the assessment, treatment options, complications and prognosis associated with ameloblastoma. It provides an understanding of our knowledge about this fascinating condition. Evaluating ameloblastoma begins with an examination, where the patient's medical history is carefully reviewed, and oral symptoms and signs are noted (2). Radiographic evaluation is a part of the process utilizing various techniques, like panoramic radiographs cone beam computed tomography and magnetic resonance imaging (MRI) (3, 4). These imaging modalities aid in determining the size, location and impact of the tumor on surrounding structures. Advanced imaging techniques like reconstructions from CBCT scans assist in planning by predicting how much tissue needs to be removed (5). For a diagnosis, histopathological examination remains the gold standard. Meanwhile, incisional biopsies are often performed to confirm the diagnosis and determine the subtype based on characteristics; these subtypes include conventional ameloblastomas as well, as unicystic or desmoplastic variants (6, 7). In times, advancements in techniques have shed light on the importance of molecular markers in understanding ameloblastomas. A noteworthy discovery has been made regarding ameloblastomas as it has been found that a segment of these tumors contains BRAF V600E mutations (8, 9). This discovery does not only offer diagnostic insights but also holds the potential to impact decisions related to treatment. Dealing with ameloblastoma can be quite challenging, due to its tendency for invasion and recurrence. There are treatment options, and the choice depends on factors like the histological subtype of the tumors, their size and location as well as the patient's age and overall health condition. For ameloblastomas and specific cases of ameloblastomas conservative approaches like enucleation and curettage are often considered (10, 11). These methods aim to remove the tumor while preserving tissue much as possible. However, they

carry a risk of recurrence for solid or multicystic ameloblastomas. In cases of aggressive or recurrent tumors, radical resections such as mandibulectomy or maxillectomy may be recommended. These extensive surgeries aim to achieve margins and minimize the chances of recurrence but often result in functional and cosmetic deficits that require complex reconstructive procedures. Adjuvant therapies, like cryotherapy and using Carnoy's solution, have been suggested to reduce recurrence rates when achieving margins is challenging. Radiation therapy is usually used in situations, but it is still a topic of debate because of worries about the development of radiation induced sarcomas. The complications that can arise from treating ameloblastoma can greatly affect a patient's quality of life and their long-term results. Complications that can arise from surgery include infections, after the operation damage to structures like nerves, teeth and blood vessels as well as impaired oral function (12). Following surgeries common problems include difficulties with speech and chewing. These issues emphasize the importance of multidisciplinary care involving speech therapists and prosthodontists. A significant number of cases experience recurrence as a complication particularly when conservative approaches are used. The risk of recurrence is influenced by factors such as the type of cells observed in the tumor (subtype) tumor size and how complete the surgical removal was. Recurrence can have consequences often requiring extensive surgeries and additional therapies for treatment. The prognosis for ameloblastoma is complex. Depends on factors like histological subtype and the effectiveness of initial treatment. Conventional ameloblastomas tend to have a risk of recurrence compared to desmoplastic variants. However, within the histological subtype outcomes can vary significantly. The choice of treatment significantly impacts prognosis; while radical resections reduce the risk of recurrence they can result in limitations and compromised aesthetics. Patients who undergo resections may need reconstructive surgeries using their own bone grafts or microvascular free flaps which contribute to overall morbidity associated with treatment. Regular long-term follow-up is crucial to monitor

for recurrence that may occur years after treatment. Regular imaging tests, clinical checkups and scheduled follow up visits are essential to identify any recurrences at a stage and start the appropriate treatments. So ameloblastoma poses a set of challenges when it comes to both diagnosing and treating it. Recent advancements in techniques, such as markers, have improved our ability to characterize ameloblastomas accurately. The decision on how to treat it remains complex as we must balance the necessity of margins with preserving function and aesthetics. Complications, such as the recurrence of conditions and complications arising from procedures can significantly affect the overall outcome of a patient's health. Term follow up and comprehensive care involving disciplines are crucial for effectively managing ameloblastoma. As research advances, we hope to gain an understanding of the mechanisms behind ameloblastoma, which may lead to targeted therapies and better outcomes for patients with this rare odontogenic tumor. This review will give an understanding of the assessment of available treatments, potential challenges and outlook related to Ameloblastoma.

Discussion

The conversation surrounding ameloblastoma highlights the complexities of how it presents its prognosis and how it is managed. Detecting it in a manner requires increased awareness from healthcare professionals due to its symptom-free early stages. Facial swelling symptoms and the effects on structures necessitate a comprehensive diagnostic approach that involves advanced imaging techniques and molecular markers to characterize the condition accurately (13). The multi-faceted nature of ameloblastoma prognosis is intertwined with recurrence rates, different histological subtypes, and the complexities of interventions. Despite treatment, the likelihood of recurrence emphasizes the importance of long-term follow-up care. Managing ameloblastoma involves removal while considering both aesthetic preservations. The choice of approach, reconstruction techniques, and considerations for therapies exemplify a personalized approach tailored to each individual

case. The discussion also extends to recognizing the aspects involved as it affects a patient's quality of life and underscores the need for support.

Clinical Manifestation

Ameloblastoma is a type of tumor that primarily impacts the jawbones and has the potential to exhibit aggressiveness (14, 15). It shows signs and symptoms that are important for early detection and proper treatment. In its stages, ameloblastoma is usually painless. May not cause any noticeable issues. It is often discovered incidentally during checkups or through imaging tests. However, the absence of pain can sometimes lead to delayed diagnosis. It's crucial for healthcare professionals to be vigilant. One key characteristic of ameloblastoma is the development of swelling. This swelling, which is usually painless and firm to the touch can gradually grow over time, resulting in asymmetry in the face and affecting a person's appearance (16). As the tumor progresses, it may cause symptoms such as teeth difficulty in eating or speaking and changes in dental alignment. The tumors' growth can also lead to malocclusion due to its impact on the jawbone. Ameloblastoma has a tendency to expand and weaken the surrounding jawbone, causing deformity and a noticeable bulge. To accurately assess the extent of bone involvement caused by ameloblastoma and determine treatment strategies, radiographic imaging techniques like radiographs or cone beam computed tomography (CBCT) are essential. In some cases, ameloblastoma may present as a lesion within the jaw known as odontogenic ameloblastoma. Untreated instances of this variation can lead to bone damage, although it may exhibit aggressive behavior. As the tumor grows and starts affecting the nerves, in the jawbone patients might experience a tingling sensation called paresthesia. This indicates that the nerves are being compressed or infiltrated. If ameloblastoma affects the jaw (maxillary), it can extend into the sinus or nasal cavity, leading to symptoms like nasal congestion, recurrent sinus infections or even fluid regurgitation through the nose (17). In some cases, the tumor's growth can cause ulcers in the surrounding tissue due to pressure, resulting in localized pain and

discharge from infections. However, rare ameloblastoma can weaken the jawbone to a point where it becomes susceptible to fractures either spontaneously or due to trauma. It should be noted that ameloblastoma tends to have a tendency to reoccur after treatment, over a period of time. Thus, long-term follow-up and surveillance are crucial for monitoring patients for recurrence (18). The clinical signs of ameloblastoma include swelling of the face symptoms, expansion and thinning of the jawbone cystic changes within paresthesia (tingling sensation) involvement of sinuses or nasal cavity, ulceration and infection risk as well as a possibility of pathological fractures. Recognizing these features is essential for diagnosis and implementing appropriate management strategies for this locally aggressive odontogenic tumor. Clinicians should maintain a level of suspicion while utilizing diagnostic approaches to ensure timely intervention and improved outcomes for their patients.

Prognosis

Ameloblastoma, a rare and locally aggressive odontogenic tumor primarily affecting the jawbones, poses unique challenges in terms of prognosis. The prognosis of ameloblastoma is characterized by its potential for recurrence, the impact on adjacent structures, and the variability in its clinical behavior. Understanding the factor's influencing prognosis is crucial for devising effective management strategies and providing patients with informed expectations. One of the defining features of ameloblastoma is its propensity for recurrence (19, 20). Despite seemingly successful treatment, the tumor has a notable tendency to return, making long-term follow-up and surveillance imperative. Recurrence rates vary depending on the type of ameloblastoma and the treatment modality employed. Unicystic ameloblastomas for instance, may exhibit a lower recurrence rate compared to solid or multicystic forms. Surgical excision, the primary treatment approach, aims to remove the tumor while preserving surrounding healthy tissue. However, due to the infiltrative nature of ameloblastoma and the challenges in achieving clear margins, recurrence remains a significant concern. The

histological subtype of ameloblastoma also influences its prognosis. Conventional or solid/multicystic ameloblastomas are associated with a higher recurrence rate compared to the unicystic variant. Histopathological features, such as the presence of luminal or intraluminal tumor proliferation, nuclear atypia, and stromal desmoplasia, play a crucial role in determining the tumor's behavior and consequently, the prognosis. The impact of ameloblastoma on adjacent structures contributes to its prognosis. The tumor's tendency to expand and thin the surrounding jawbone can result in facial deformity and functional impairment. This expansion may necessitate extensive surgical interventions, including resection of portions of the jawbone, reconstruction procedures, and potential facial cosmetic surgery. The extent of surgical intervention required can influence postoperative outcomes, recovery time, and overall quality of life for affected individuals. The site of occurrence also plays a role in determining the prognosis of ameloblastoma. Tumors occurring in the mandible (lower jaw) may pose challenges due to the proximity to vital structures such as nerves and blood vessels. In contrast, maxillary (upper jaw) tumors may extend into the sinus or nasal cavity, potentially complicating surgical management and affecting respiratory and sinus functions. The location of the tumor can impact the complexity of the surgical approach and subsequent reconstruction, influencing the overall prognosis. The age of the patient at the time of diagnosis is another factor influencing the prognosis of ameloblastoma. While this tumor can affect individuals of any age, there is a predilection for occurrence in the second and third decades of life. Pediatric cases, although rare, may exhibit different clinical behaviors and treatment responses. Younger patients may experience more aggressive growth patterns, necessitating careful consideration in treatment planning and long-term follow-up. Advancements in diagnostic imaging techniques, such as cone-beam computed tomography (CBCT) and magnetic resonance imaging (MRI), have enhanced the preoperative assessment of ameloblastoma. Accurate preoperative imaging is essential for evaluating the extent of bone

involvement, identifying potential invasion into adjacent structures, and planning appropriate surgical interventions. Imaging findings contribute to prognostic assessments, guiding clinicians in determining the optimal course of treatment and predicting the likelihood of recurrence.

Management

Ameloblastoma is a tumor that mainly affects the jawbones and requires an approach to clinical management. To effectively treat this condition, it's crucial to have an understanding of its characteristics, accurate diagnostic processes and careful selection of treatment methods. The primary focus in managing ameloblastoma is surgery aiming to remove the tumor while preserving functionality and minimizing any cosmetic implications. Before any therapeutic intervention takes place a thorough clinical evaluation is conducted as a prerequisite. This involves reviewing the patient's history, conducting clinical examinations and assessing radiographic images. Ameloblastoma can present in ways; patients often report swelling or lumps in their jaws. Sometimes these tumors are discovered incidentally during checkups or through radiographic imaging. The impact of the tumor can be seen through swelling changes in bite alignment and an expansion of the jawbones. Radiographic techniques such as radiographs and cone beam computed tomography (CBCT) play a role in visualizing the extent and characteristics of the tumor aiding in precise treatment planning. To confirm the presence of ameloblastoma and identify its subtype a definitive diagnosis relies on histopathological examination of a biopsy specimen (21, 22). The three main types of ameloblastoma which're unicystic and rare variants, have distinct clinical behaviors that greatly impact the treatment approach. Surgery is the method for managing ameloblastoma and the specific surgical approach depends on factors such as tumor size, location, histological subtype, as well as the patient's age and overall health. There are techniques available; enucleation and curettage are used for small lesions or cases where preserving surrounding structures is a priority. However, this conservative technique carries a risk of recurrence. Requires careful

postoperative monitoring. On the hand marginal or wide resection is employed for more aggressive tumors or when enucleation alone is not sufficient. This approach involves removing the affected part of the jawbone and a tissue margin surrounding it. While it reduces the risk of recurrence there may be cosmetic consequences associated with this method. After surgery reconstruction is often necessary to restore both form and function in cases where segmental resection was performed. Various reconstructive techniques, like bone grafts, free tissue transfer, and distraction ontogenesis can address concerns while aiming to restore function. In situations additional treatments, like radiotherapy might be considered, for aggressive or recurring ameloblastoma. However, the decision to use therapies is still a topic of discussion. Depends on a careful evaluation of each individual case weighing the potential advantages against the associated risks. The management of ameloblastoma goes beyond surgery as it involves anticipating and addressing complications associated with the tumor and treatment methods. It is essential to have follow-up care after an apparently successful treatment, due to the high likelihood of recurrence. Regular clinical examinations and radiographic assessments are crucial in preventing the tumor from reemerging. Surgical interventions, such as resection can result in issues like speech difficulties chewing problems and changes in facial appearance. To minimize these consequences reconstruction techniques are employed along with rehabilitation when necessary. Depending on the extent of resection and the need for reconstruction cosmetic changes may also occur. Skilled reconstructive procedures aim to restore an appearance and address any concerns while providing support alongside it is equally important. Dealing with a diagnosis and undergoing treatment has psychosocial implications that require a comprehensive approach. This includes offering support involving patients in decision making processes and facilitating support groups to ensure care. Having an understanding of the prognosis of ameloblastoma is crucial for setting expectations and planning long term follow up care. Regular and lifelong monitoring is necessary to detect any recurrence of ameloblastoma. Factors, like subtype,

treatment method and the effectiveness of removal contribute to the variation in the risk of recurrence. It is highly recommended for individuals who have been treated for ameloblastoma to undergo follow up. This includes examinations and radiographic assessments, which are important in detecting early signs of recurrence and maintaining oral health.

Conclusion

In dealing with ameloblastoma presents a situation that requires a careful and comprehensive approach. From detecting it to tailoring surgical treatments managing this condition involves navigating various challenges to achieve the best possible results. Ensuring long term monitoring, providing support and staying updated with research all contribute to an ever-evolving understanding and management of this uncommon tumor that originates from tooth related tissues.

Disclosure

Conflict of interest

There is no conflict of interest.

Funding

No funding

Ethical consideration

Non applicable

Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

References

1. Chae MP, Smoll NR, Hunter-Smith DJ, Rozen WM. Establishing the natural history and growth rate of ameloblastoma with implications for management: systematic review and meta-analysis. *PLoS One*. 2015;10(2):e0117241.

2. Evangelou Z, Zarachi A, Dumollard JM, Peoc'h M, Komnos I, Kastanioudakis I, et al. Maxillary Ameloblastoma: A Review With Clinical, Histological and Prognostic Data of a Rare Tumor. *In Vivo*. 2020;34(5):2249-58.

3. Neves FS, Souza TC, Almeida SM, Haiter-Neto F, Freitas DQ, Bóscolo FN. Correlation of panoramic radiography and cone beam CT findings in the assessment of the relationship between impacted mandibular third molars and the mandibular canal. *Dentomaxillofac Radiol*. 2012;41(7):553-7.

4. Shah N, Bansal N, Logani A. Recent advances in imaging technologies in dentistry. *World J Radiol*. 2014;6(10):794-807.

5. Beaton L, Bandula S, Gaze MN, Sharma RA. How rapid advances in imaging are defining the future of precision radiation oncology. *Br J Cancer*. 2019;120(8):779-90.

6. Ghai S. Ameloblastoma: An Updated Narrative Review of an Enigmatic Tumor. *Cureus*. 2022;14(8):e27734.

7. Figueiredo NR, Dinkar AD, Meena M, Satoskar S, Khorate M. Ameloblastoma: A clinicoradiographic and histopathologic correlation of 11 cases seen in Goa during 2008-2012. *Contemp Clin Dent*. 2014;5(2):160-5.

8. Fuchigami T, Ono Y, Kishida S, Nakamura N. Molecular biological findings of ameloblastoma. *Jpn Dent Sci Rev*. 2021;57:27-32.

9. Zhong Y, Guo W, Wang L, Chen X. Molecular markers of tumor invasiveness in ameloblastoma: An update. *Ann Maxillofac Surg*. 2011;1(2):145-9.

10. Dandriyal R, Lal V, Giri KY, Indra Bavanthabettu N, Chaurasia A, Pant S. Ameloblastoma: Retrospective Study and Analysis of 102 Cases Over 10 Years, Single Centre, Institutional Experience. *J Maxillofac Oral Surg*. 2022;21(2):730-8.

11. Cadavid AMH, Araujo JP, Coutinho-Camillo CM, Bologna S, Junior CAL, Lourenço SV. Ameloblastomas: current aspects of the new WHO

classification in an analysis of 136 cases. *Surgical and Experimental Pathology*. 2019;2(1):17.

12. Lawal HS, Adebola RA, Arotiba JT, Amole IO, Efunkoya AA, Omeje UK, et al. Quality of life of patients surgically treated for ameloblastoma. *Niger Med J*. 2016;57(2):91-8.

13. Medina A, Velasco Martinez I, McIntyre B, Chandran R. Ameloblastoma: clinical presentation, multidisciplinary management and outcome. *Case Reports Plast Surg Hand Surg*. 2021;8(1):27-36.

14. Bakkalci D, Jay A, Rezaei A, Howard CA, Haugen HJ, Pape J, et al. Bioengineering the ameloblastoma tumour to study its effect on bone nodule formation. *Sci Rep*. 2021;11(1):24088.

15. Masthan KM, Anitha N, Krupaa J, Manikkam S. Ameloblastoma. *J Pharm Bioallied Sci*. 2015;7(Suppl 1):S167-70.

16. Lovásová K, Borza B, Kizek P, Almaši M, Kachlík D, Hodorová I. A case of giant ameloblastoma: destructive effect on the facial skeleton and soft tissues of the head and neck. *J Int Med Res*. 2021;49(10):3000605211050185.

17. Kosmidou P, Angelis S, Papagianni E, Kokkevi I, Filippou D. Ameloblastoma on the Maxillary Sinus: Cause of Unilateral Nasal Obstruction. *Cureus*. 2020;12(1):e6563.

18. Hariram, Mohammad S, Malkunje LR, Singh N, Das S, Mehta G. Ameloblastoma of the anterior mandible. *Natl J Maxillofac Surg*. 2014;5(1):47-50.

19. Yang R, Liu Z, Gokavarapu S, Peng C, Ji T, Cao W. Recurrence and cancerization of ameloblastoma: multivariate analysis of 87 recurrent craniofacial ameloblastoma to assess risk factors associated with early recurrence and secondary ameloblastic carcinoma. *Chin J Cancer Res*. 2017;29(3):189-95.

20. Li Y, Han B, Li LJ. Prognostic and proliferative evaluation of ameloblastoma based on radiographic boundary. *Int J Oral Sci*. 2012;4(1):30-3.

21. Weiss R, 2nd, Read-Fuller A. Cone Beam Computed Tomography in Oral and Maxillofacial Surgery: An Evidence-Based Review. *Dent J (Basel)*. 2019;7(2).

22. Preto KA, Neto DB, Tjioe KC, Oliveira DT. Relevance of Cone-beam computed tomography on diagnosis and surgical planning of the cementoblastoma. *J Clin Exp Dent*. 2021;13(12):e1271-e4.