

Advents in Management of Ameloblastoma – A Review of Literature

Dr. Nitesh Chhikara

MDS, Oral & Maxillofacial Surgery, Private Practitioner Haryana, India

ABSTRACT

Ameloblastoma is a rare, benign odontogenic tumor that accounts for 1-2 % of all jaw tumors, and is derived from the cell remnants of dental lamina with variant histological types. It is locally aggressive, highly recurrent, slowly growing tumor, mostly involving mandible and maxilla which when enlarged, invades and destroys the adjacent structures, leading to esthetic deformity and loss of function. The management of ameloblastoma depends on various factors and local excision remains the current mainstay of its treatment. Inadequate or any delay in the management results in high recurrence possibility and rare but possible malignant transformation. This literature review highlights the adverts, along with the changing patterns in management of ameloblastoma. None the less it provides us with a platform for further research.

Keywords: ameloblastoma, benign, mandible, odontogenic, tumor.

INTRODUCTION

According to Robinson, ameloblastoma is defined as “a unicentric, non functional, intermittent in growth, anatomically benign, and clinically persistent neoplasm”. The neoplasm was first described by Cusack in 1827.¹ Etymologically, the name derives from the old French word “amel,” which means enamel, and the Greek word “blastos,” meaning germ or bud. Over time, this tumor has been referred to by many different names including “cystosarcoma,” “adamantine epithelioma,” “adamantinoma,” and finally “ameloblastoma”^{2, 3}. Estimated global incidence is 0.5 cases per million person years, and mostly diagnosed in 3rd to 6th decade of life⁴. Though ameloblastoma has a locally aggressive growth pattern; according to Odukoya and Effiom, 2008; DeVilliers et al, 2011, about 70% of cases undergo malignant transformation, and up to 2% metastasize to other sites. Ameloblastoma has been categorized broadly into three biological variants: cystic (unicystic), solid, and peripheral⁵. The variables accepted for treatment are: age; infiltration potential; affected site; radiographic aspect; and prognosis⁶. Along with proper diagnosis, it is utmost important to establish a good and adequate treatment plan based on clinical and imaging examinations. Additionally, it is essential to perform complementary tests, such as computerized tomography and other radiographs⁷. Management of ameloblastoma is controversial regarding the choice of treatment. Various treatment options are available ranging from conservative to most radical such as curettage; enucleation; cryotherapy; marsupialization; electro cauterization; sclerotherapy; and radiotherapy. One of the most followed techniques is complete surgical removal of the lesion, with safe excision margins of at least 1- to 2-cm thickness to reduce the risk of recurrence^{8, 9}. Nowadays surgeons prefer for more conservative methods, because radical procedures results in major problems for the patients. The disadvantages of radical methods are mastication, mandibular dysfunction, and noticeable mutilation including facial deformity¹⁰. Here we review the literature of various research works with the prime focus of highlighting the best possible and effective approach of treating ameloblastoma, which will further elevate the standard of health care facilities in management of ameloblastoma.

METHOD OF SEARCH

Data was collected from scientific articles published and available in reliable database such as PUBMED, MEDLINE and SCIENCE DIRECT. MeSH terms utilized in the query were ameloblastoma and treatment method; management of ameloblastoma; recent protocol of ameloblastoma management; and surgical treatment of ameloblastomas. The articles containing required and reliable data are used for the review purpose.

MANAGEMENT OF AMELOBLASTOMA

Factors determining choice of treatment:

- Age of the patient
- Site of the lesion
- Size of the lesion
- Histological type
- Anatomical pattern of growth
- Malignant transformation

There are varieties of techniques available which can be grouped into conservative and radical.

The choice of most accurate and effective treatment modality is the most crucial step and must be anticipated to eliminate the lesion, as well as it should be focused on the influence it will have on the quality of life and also rehabilitation of the patients. The options are many, ranging from curettage to radical surgical resections, and the anatomic reconstruction of the surgical defects so created by using plates, pins, flaps and bone grafts.¹⁷ surgery is the cure of ameloblastoma undoubtedly, though, initially lot of controversies were there regarding the most appropriate surgical method to treat ameloblastoma, at present most acceptable method of treatment is surgical excision of lesion. Traditionally, curettage, enucleation as well as cryosurgery are followed; whereas the extreme methods include marginal, enbloc, and segmental as well as composite resections.

There's a lack of agreement regarding the best-suited procedure. Proponents of conventional procedures reckon that ameloblastomas, however, regionally invasive, tend to be basically benign by nature, as a result, they must be dealt with as such.^{21, 16} Ueno *et al.* recommended that "unnecessary resection" of the mandible constituted an extreme procedure,²¹ and according to Feinberg and Steinberg, this may be very crucial in younger individuals, in whom a disruption in development and growth might alter function and esthetic appearance¹³. Sammartino *et al.* additionally endorsed for conventional management of massive ameloblastomas because of "reduced morbidity" related to most of these methods. As per the experienced surgeons, radical and aggressive treatment methods are related to severe cosmetic, functional and reconstructive problems.^{11, 16}

The clinical and histological properties of the ameloblastoma are inter-related and determine its aggressiveness which in turn guides the treatment method, recurrence and outcome. However, the patient's physical and medical conditions, the patient's consent regarding potential facial deformity, compliance, and the psychological effect post-surgery, are the important factors determining the treatment. Some authors endorsed enucleation for the cure of ameloblastomas with the preservation of sound periosteum that is certainly essential for bone re-growth particularly in infants.[23] Many others have suggested enucleation instead of partial or complete jaw bone resection to deal with unicystic ameloblastoma, thought to arise primarily in the pediatric group.^{12, 13, 18}

Considering histological pattern, the authors suggest that in the management of solid/ multi-cystic ameloblastomas surgeons should firstly consider the assessment of anatomical barriers, such as cortical bone, periosteum, muscles, and mucous membranes that might have been involved or affected. In case these tissues have been affected, there will be a need of resection and these resections should have a bone margin of at least 1.5 centimeters between the lesion and healthy tissue³². Also according to Marx protocol, the surgical resection margins in case of malignant ameloblastoma should be approximately 1.5- 2 centimeters and neck surgery along with radiation therapy should be performed in ameloblastic carcinomas. Bianchi *et al.*⁶ supported the same treatment protocol. Though the treatment proposed for unicystic and peripheral ameloblastomas is similar to the treatment for dentigerous cysts by performing curettage therapy, these authors proposed a more radical intervention in cases of multicystic ameloblastomas and also indicated resection with safety margins associated with vascularized grafting for more extensive lesions⁴.

Advents and auxiliary techniques in management of ameloblastoma

In scope of reducing the extent of the surgery performed to remove the lesion, and decrease the risk of recurrence, various techniques incorporated along with the final resolute procedure⁶. Marsupialization is done in case of large and extensive ameloblastomas, in order to reduce the size of the lesion, protect the adjacent vital anatomical structures like neurovascular bundles and to allow a safe second surgical procedure with reduced morbidity.

Other procedures include peripheral osteotomy, chemical cauterization using carnoy's solution, cryotherapy, and 2.5% of gentian violet solution dye to determine the margins of bone resection. Also radiotherapy is used for the treatment of ameloblastomas and should be used in non resectable lesions and patients with severe medical conditions and co-morbidities, which cannot be taken up for surgery²⁰. Recurrence rate of the ameloblastoma is relative to the treatment method used. Highest recurrence occurs with curettage or enucleation ranging from 55-90% and least with resection of the lesion about 10-15%¹⁵. To overcome the drawbacks of these techniques and to reduce the risk of recurrence, frozen section of the soft tissues overlying cortical perforation and the bone marrow margins is strongly advocated. Frozen section of medullary bone from the mandibular stumps can aid in achieving wider margins and is essential if bone margins are 1 centimeter¹⁴. Intra-operative frozen sections reveals 95–98 % accuracy with a false negative rate of 3.8 % attributed to inadequate sampling versus misinterpretation by the pathologist.¹⁴

Also, targeted therapies have been developed to control the effect of SMO mutation associated with pathogenesis of ameloblastoma (Mishra et al, 2015). This includes arsenic trioxide and KAAD-cyclopamine which are known to be highly effective against these mutations and may be useful in the treatment of ameloblastoma associated with SHH signaling pathway (Sweeney et al, 2014)²². As SHH expression is high in ameloblastomas, several drugs already developed to antagonize SHH signaling offer other nonsurgical targeted therapeutic options for ameloblastoma patients (Mishra et al, 2015)²³. Among these, cyclopamine is the most widely used, but its main drawback is the inhibition of osteoblastic proliferation and differentiation that are important for bone healing (Stanton and Peng, 2010; Schaefer et al, 2013)¹⁹.

CONCLUSION

Ameloblastoma is one of the most troublesome lesions that maxillofacial surgeons may have to deal with in their clinical practice. Even though it is a rare lesion, it is utmost crucial to detect and diagnose these lesions as early as possible. As proved, ameloblastoma is potentially expansive, destructive, and aggressive, it is essential that the surgeons must learn to detect and treat it. They should also know the best treatment option for the patients as soon as the lesion is detected considering all the factors like limiting un-necessary resection, morbidity and improving function with reconstruction, rehabilitation and finally giving a balanced esthetic appearance to the patient for better psychological effect.

Ethical statement

This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of interest

The authors declare that they have no conflict of interest.

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