Peer-reviewed paper; submitted September 2018; accepted June 2019

Ameloblastoma: Demographic data and treatment outcomes from Waikato Hospital, New Zealand

Hung TC, Singh T

Abstract

Background and Objectives: Limited information is available on the demographics and treatment outcomes of patients with ameloblastoma treated in New Zealand. The aim of this study is to review the incidence, management and outcome of patients with ameloblastoma from Waikato Hospital over the last 11 years.

Methods: Twelve patients were diagnosed with ameloblastoma over an 11 year period (2007 - 2018) from Waikato Hospital, New Zealand. Data from each patient, including gender, ethnicity, age, tumour location, type of treatment, outcome and complications were collected and analysed retrospectively.

Results: Ten patients were diagnosed with conventional ameloblastoma (83%) and two patients with unicystic ameloblastoma (17%). The average age of diagnosis was 44 years for conventional and 15 years for unicystic ameloblastoma. Swelling was the most common presenting symptom (eight cases), with the majority of cases occurring in the mandible. A total of eight patients were treated with surgical resection (one recurrence) and four with conservative surgery (one recurrence). Two patients in total were lost to follow-up. One case of ameloblastic carcinoma was identified but not included in this study.

Conclusions: This is the first article describing ameloblastomas and their treatment in New Zealand. Most cases were diagnosed as conventional ameloblastomas, commonly in the posterior mandible. Resection was the most favoured treatment option, which is consistent with current literature. Those tumours managed conservatively had a higher recurrence rate. This study will form a good foundation for further research on this tumour in New Zealand.

Introduction

Ameloblastoma is classified as a benign epithelial odontogenic tumour of the jaw which can be locally invasive (Sham et al., 2009). It has a relatively low incidence, encompassing about 1% of all oral tumours and around 9 - 11% of odontogenic tumours. Its peak incidence is seen in the third to sixth decades of life but can vary between countries and shows equal sex predilection (Masthan et al., 2015; Effiom et al., 2017).

There is conflicting evidence on this tumour's incidence in different ethnicities, with a generally higher rate in Asian or African ethnicities when compared to Caucasians. A recent South African study showed the annual incidence rates of ameloblastoma for African males (1.96 per million) and females (1.20) was greater than Caucasian males (0.18) and females (0.44). This was supported by a Swedish study which demonstrated an incidence of 0.60 per million in their population (Oomens and Van Der Waal, 2014; Ruslin et al., 2017).

Early symptoms are infrequent as these tumours are often a painless, slow-growing swelling. However, they can result in severe facial disfigurement and functional impairment if left untreated. With time the lesion can infiltrate into the soft tissues via perforation of the lingual/palatal and/or buccal bone (Adeyemo et al., 2008). Other less common manifestations can include mobile teeth, malocclusion and nasal obstruction (Reichart et al., 1995; Buchner et al., 2006; Singh et al., 2015; Carvalho et al., 2017; Giraddi et al., 2017).

The current World Health Organisation (WHO) classification (Fourth edition, January 2017) classified ameloblastomas as conventional, unicystic and extraosseous/peripheral subtypes. The term solid/multicystic from the 2015 edition was removed, as most conventional ameloblastomas show cystic degeneration with no biologic differences from 'solid' tumours. Furthermore, the desmoplastic type is now a histopathological subtype rather than its own separate entity. Unicystic ameloblastoma has three histological variants. This is differentiated by whether only the cyst lining is affected (luminal); an intraluminal projection of solid tumour is present (intraluminal), or if the tumour infiltrates the cyst wall (mural) (Soluk-Tekkesin & Wright, 2017).

The main treatment goals of ameloblastoma are complete removal of the tumour and restoration of aesthetics and function (Feinberg & Steinberg, 1996). Literature describes two therapeutic strategies; conservative surgical approach with enucleation of tumour with or without adjunctive procedures, or a radical surgical resection with a clinical margin. It is important to accurately diagnose the subtype of the tumour with incisional biopsy, as surgical management and prognosis differs. Conventional ameloblastoma and unicystic ameloblastoma of mural type are known to be infiltrative, and both are associated with a higher recurrence rate if treated conservatively (Soluk-Tekkesin & Wright, 2017). In contrast, the non-aggressive behaviour of intraluminal, luminal variants of unicystic subtype and the extraosseous/peripheral subtype can be treated with a more conservative approach (Kamil, 2015; Garcia et al., 2016).

Malignant ameloblastomas have the same benign histology as ameloblastomas, however they can

have regional or distant metastases (Dandriyal et al., 2011). Ameloblastic carcinoma (AC) is considered a true malignancy, irrespective of any metastases. AC has a poor prognosis and is exceptionally rare. The clinical course of AC is aggressive with extensive local destruction and can metastasise to local lymph nodes and distant sites (Ram et al., 2010).

A review of the literature reveals limited information is available on the demographics and treatment outcomes of patients with ameloblastoma treated in New Zealand. The aim of this study is to review the incidence, management, and outcomes of patients with ameloblastoma from Waikato Hospital over the last 11 years. This will form a good foundation for further research on this tumour in New Zealand.

Materials and Methods

This retrospective study was conducted on patients with histologically confirmed ameloblastoma in the Department of Oral and Maxillofacial Surgery, Waikato Hospital (Hamilton, New Zealand) during the period from 1st of January, 2007, to 1st of January, 2018. In total, 12 cases were identified and files from each patient were reviewed. A database was constructed with the following variables: age, gender, preoperative signs and symptoms (this included swelling, pain, altered sensation, mobile teeth, draining sinus or none) and method of treatment either with conservative management or radical resection. Radical treatment involved either a mandibulectomy (marginal or segmental), or maxillectomy (subtotal or total), with a margin of uninvolved bone and soft tissue. Conservative treatment involved enucleation with or without adjunctive procedures (e.g. peripheral ostectomy or application of Carnoy's solution). Follow-up time periods and outcomes of patients were recorded, and outcomes were separated into no signs of recurrence, tumour recurrence, or death due to disease.

Results

Demographic data: Both males (n=6) and females (n=6) were affected equally, and the mean age of patients at the time of disease diagnosis was 44 years. Eight patients were NZ European and four identified themselves as Maori.

Tumour subtypes: All patients were diagnosed with ameloblastoma by means of histological examination based on the criteria defined by the World Health Organisation (WHO). The conventional ameloblastoma was the most common form (10 cases), whilst there were also two cases of unicystic ameloblastomas identified (one luminal subtype and one mural subtype). No cases of the peripheral subtype were reported. One case of ameloblastic carcinoma was identified and excluded from our analysis of benign ameloblastomas.

Initial presentation: Eight out of the 12 patients (75%) had initial symptoms of swelling. Three patients had pain due to acute infection, some with displacement of teeth. One of the tumours was an incidental finding during the removal of third molars. Eight tumours occurred in the posterior mandible, and two in the anterior. The remaining tumours were in the maxilla, one anterior and one posterior.

Methods of treatment: Seven of the 10 conventional ameloblastomas were treated with radical treatment (surgical resection), including six segmental mandibulectomies and one partial maxillectomy with a macroscopic margin of 1 cm of normal bone. The remaining three conventional ameloblastomas were treated conservatively with enucleation with peripheral ostectomy, and two of the cases also had Carnoy's solution applied.

There were two cases of unicystic ameloblastoma. The isolated case of mural subtype was treated with segmental mandibulectomy and the luminal subtype underwent enucleation only.

Outcomes

The average length of follow-up in our study was 28 months. Out of the seven patients that underwent radical surgery for conventional ameloblastoma, six patients remained tumour free with periodic reviews but one returned with recurrence (Figure 1). This particular patient underwent a segmental mandibulectomy of the left posterior mandible via intra-oral and cervical approaches. Unfortunately the reconstruction plate developed a localised infection and developed hardware failure and was subsequently replaced. However, six years later he developed a mass in the left midface and a biopsy confirmed a recurrence at 69 months post-surgery. He underwent a further resection including infratemporal fossa clearance, free flap reconstruction, followed by adjuvant radiotherapy (60 Gy in 30 fractions). The patient is still under review and is currently tumour free.

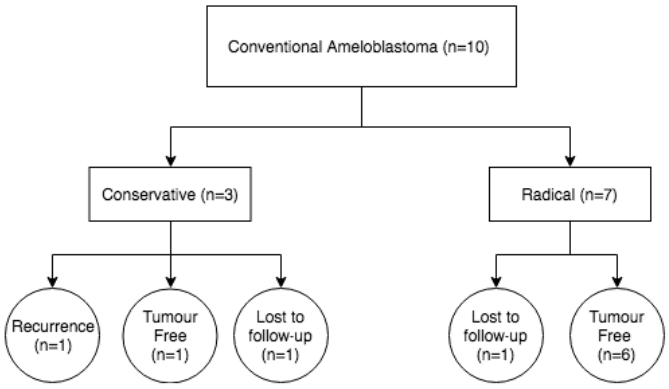

Figure 1. Outcomes and methods of treatment for the 10 conventional ameloblastomas.

The remaining three patients with conventional ameloblastoma were conservatively treated. One remained tumour free and is attending reviews regularly. Two other patients were lost to follow-up, and unfortunately one returned with recurrence in her mandible 10 years following her initial operation. She subsequently underwent a hemi-mandibulectomy and fibula free flap reconstruction with our service (Figure 2).

Two patients had unicystic ameloblastoma. The luminal subtype tumour underwent enucleation only; the patient

has been reviewed annually for the past four years and has remained tumour free. The patient with the mural subtype underwent segmental mandibulectomy, but regrettably he has been lost to follow-up.

Discussion

Studies showed an average age of conventional ameloblastoma presentation to be 33.2 years for Brazilian, 30.4 years for African and 42.3 years for European populations (Oomens and Van der Waal, 2014). In our New Zealand study, the average age of diagnosis was 44 years and a younger age group on average of 15 years for unicystic ameloblastoma. Also, there was an equal sex distribution seen in our study. These findings are all consistent with current literature (Gupta et al., 2011; Hsu et al., 2014).

The majority of the patients were found to have signs and/or symptoms present prior to their diagnosis. The most common presentations were swelling, pain and displacement of teeth. One patient was asymptomatic and the tumour was discovered incidentally on radiographs. It is advisable that patients attend for routine dental examinations, as these odontogenic tumours can be asymptomatic and occasionally they are picked up by general dental practitioner assessment and radiographs. Ameloblastomas (approximately 80%) are seen more commonly in the mandible (Giraddi et al., 2017) and this is reflected in our study as 10 out of the 12 patients (83%) presented with tumours in this location.

This tumour can be a major challenge for clinicians due to its biological invasive behaviour, available treatment approaches, reconstructive complexities, requirement for long term follow-up, and patient compliance (Effiom et al., 2017). It is generally accepted that the first operation affords the best chance of cure (Adeyemo et al., 2008). Both primary and recurrent ameloblastomas are treated by either conservative or radical surgery. Conservative procedures include enucleation, curettage, cryotherapy or marsupialisation (Dandriyal et al., 2011). They are utilised in luminal and intraluminal unicystic ameloblastomas and in children or medically compromised patients, as it preserves patient's normal tissues, minimises facial disfiguration and supports adequate quality of life after surgery. However, the disadvantage of conservative procedures is a higher recurrence rate, especially in conventional ameloblastomas and the mural unicystic type (Dandriyal et al., 2011; Effiom et al., 2017).

Conventional ameloblastomas have the highest rate of recurrence when treated conservatively (55-90%), along with a higher risk of metastasis (Effiom et al., 2017). Thus the radical approach is often the primary treatment of choice for most conventional, mural variant of the unicystic subtype, and recurrent ameloblastomas. It involves a resection with a 1-1.5 cm margin of apparently uninvolved bone followed by either immediate or delayed reconstruction of the surgical defect (Dandriyal et al., 2011; Singh et al., 2015; Effiom et al., 2017; Giraddi et al., 2017). Conventional ameloblastoma of the maxilla should be treated by either a partial or a total maxillectomy, depending on size and extension of the lesion, and an infratemporal fossa clearance should be considered in those lesions that have eroded the posterior maxillary sinus wall (Giraddi et al., 2017). One patient in our study returned with mandibular recurrence requiring an infratemporal fossa clearance and is tumour free thus far (4-years post surgery). The high rate of recurrence from conservative management of conventional ameloblastoma was unfortunately seen in our study involving one patient as shown in Figure 3. The eight patients that received a radical surgical approach are still free of recurrence.

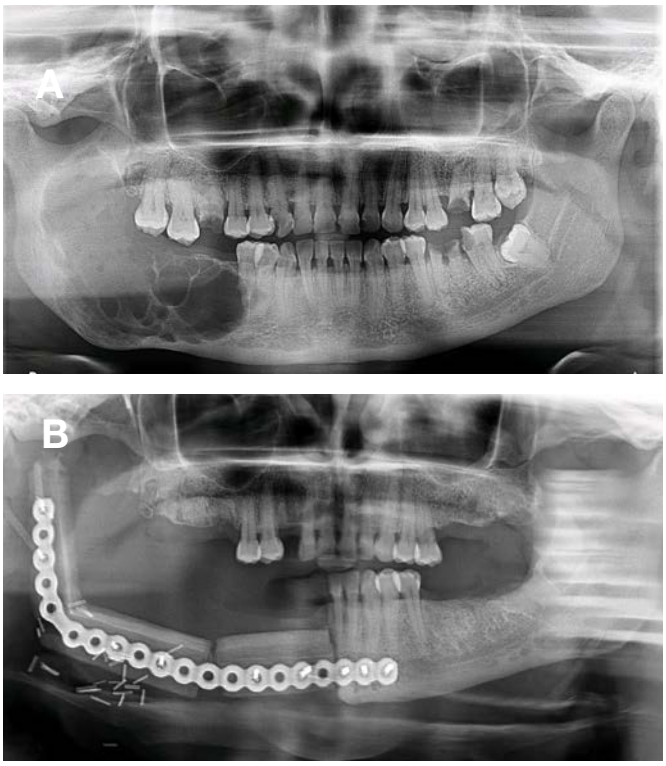

Figure 2. Panoramic radiographs showing (A) Conventional ameloblastoma affecting the right posterior mandible and (B) Hemi-mandibulectomy and fibula free flap with titanium reconstruction plate used to reconstruct the mandible.

Unicystic ameloblastoma is often present in younger populations, typically as an asymptomatic unilocular radiolucency. They usually appear very similar to a non-neoplastic odontogenic cyst and can easily be clinically misdiagnosed as a dentigerous cyst or odontogenic keratocyst. Therefore, biopsy with confirmation histology is obligatory (Lau and Samman, 2006), and there are various treatment modalities for unicystic ameloblastoma.

Unicystic ameloblastoma has been classified into three histologic groups and was first described in 1977. Ameloblastoma epithelium can occur within the lining epithelium of the cyst, occupy lumen of the cyst or within the cyst wall. (Robinson and Martinez., 1977).

However, more conservative treatments have been advocated due to its lower recurrence rates compared to conventional ameloblastoma (Effiom et al., 2017), except for the more invasive mural variant as it involves the surrounding bone. Therefore, mural variants should be treated by resection in a similar manner to the conventional ameloblastomas (Ackermann et al., 1988; Giraddi et al., 2017).

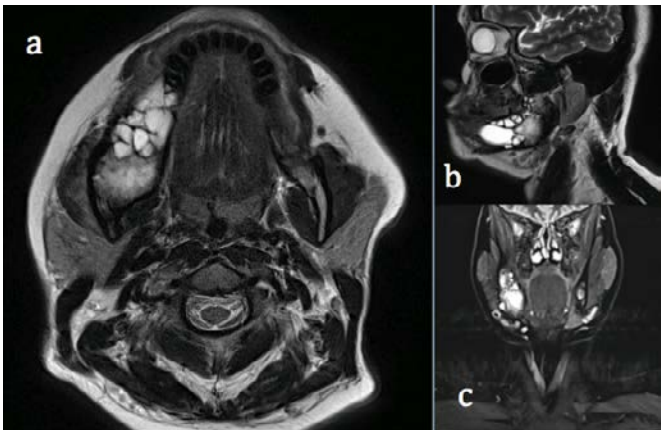

Figure 3. Magnetic Resonance Imaging (MRI) of a conventional ameloblastoma that recurred in the right posterior mandible following conservative management 10 years prior; (a) Axial view, (b) Sagittal view and (c) Coronal view.

All ameloblastomas require long-term clinical and radiological follow-up, which can be difficult when patients live in rural or geographically isolated locations. Our Maxillofacial Surgery Department at Waikato Hospital provides tertiary services to a large area of New Zealand's North Island, and hence travel to outpatient appointments can take several hours by car or require airline transport. This is a common situation for our patients, and therefore patient compliance can be difficult as demonstrated with two being lost to follow-up.

During our data collection there was one case of ameloblastic carcinoma (AC) that was not included in the above analysis. This rare malignant odontogenic neoplasm has characteristic histologic features and behaviour. AC occurs in a wide range of age groups and has no sex predilection, but the most commonly involved area is the posterior portion of the mandible. Patients often present with a rapidly growing painful swelling. AC can perforate the cortical plate, extend into soft tissue and metastasise to the lungs, bones and the brain. Due to its aggressive clinical behaviour and local recurrences, wide surgical excision including regional lymph node dissection is the treatment of choice, as it drops the local recurrence rate to less than 15%. If treated conservatively, it has a high (92.3%) recurrence rate (Ram et al., 2010; Kallianpur et al., 2014; Gawande et al., 2017). Our single patient with AC presented to her GP with a rapidly growing swelling of her mandible, and was diagnosed with an advanced AC (T4a N2b M0). This patient underwent a radical segmental mandibulectomy with an ipsilateral selective neck dissection, followed by adjuvant radiotherapy.

Conclusion

This is the only clinicopathological study regarding ameloblastoma demographics, management and treatment outcomes from New Zealand that we have found during our literature search. The findings correlate with current literature and will hopefully form a foundation for further research on this unique tumour in New Zealand. Importantly it reinforces the need for long term follow-up as tumours can recur even a decade after their initial treatment.

Acknowledgements

We wish to thank the pathologists who have been involved in the management of these cases over many years, particularly Dr. Michael Arendse, Dr. Duncan Lamont, Dr. Michael Dray and the staff of the Oral Pathology Unit at the University of Otago. The following laboratories have also assisted; Diagnostic Medlab Auckland, Pathlab and Medlab Central.

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Authors details

Tzu Chiao (Tiffany) Hung BDS (corresponding author)
Oral and Maxillofacial Surgery Department, Waikato Hospital, Hamilton, NZ
Tzu.hung25@gmail.com

Thasvir Singh BDS (Otago) MBChB (Auckland) M Phil (Melbourne) FRACDS (OMS)
Consultant at Oral and Maxillofacial Surgery Department, Waikato Hospital, Hamilton, NZ

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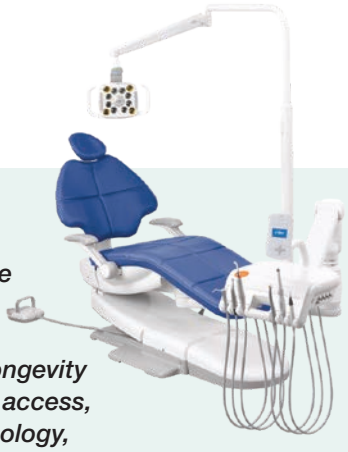

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