Archives of Orofacial Sciences (2008), **3**(2): 48-51

CASE REPORT

Removal of extensive maxillary dentigerous cyst via a Caldwell-Luc procedure

Z.A. Amin [a]*, M. Amran[b], A. Khairudin[b]

[a] Department of Otorhinolaryngology-Head & Neck Surgery, Kulliyyah of Medicine, International Islamic University Malaysia, 25100 Kuantan, Pahang, Malaysia.
[b] Department of Otorhinolaryngology-Head & Neck Surgery, Hospital Sultanah Nur Zahirah, Jalan Sultan Mahmud, 20400 Kuala Terengganu, Terengganu, Malaysia.

(Received 19 March 2008, revised manuscript accepted 22 September 2008)

Keywords

Caldwell-Luc procedure,
canine impaction,
dentigerous cyst,
ectopic tooth.

Abstract A case of a large dentigerous cyst associated with canine tooth in the maxillary antrum is presented. This case is of interest because of its extensiveness and the presence of an ectopic tooth in the roof of the maxillary sinus. Theoretical aspects of canine impaction and cyst formation are reviewed. The management of a jaw cyst, in particular, the still popular Caldwell-Luc procedure is discussed.

Introduction

Dentigerous cysts are the most frequent type of developmental odontogenic cysts (Hasbini *et al*., 2001; Kaya and Bocutoglu, 1994; Kusukawa *et al*., 1992), which is a cyst with epithelial lining derived from the epithelial remnants of the tooth-forming organ. Dentigerous cysts usually involve permanent teeth, although there has been cases reported in the past of dentigerous cysts associated with a deciduous tooth (Kusukawa *et al*., 1992), and with a supernumerary tooth (Most and Roy, 1982). Frequently, the affected teeth are those that erupt late such as the mandibular third molar or the maxillary canine (Odufuwa and Rose, 2001). The incidence of maxillary canine impaction ranges between one percent and three percent (Warford *et al*., 2003), and it is speculated that in an individual orthodontic practice, the incidence may be higher, with a report of 23.5% in one population (Ferguson, 1990). Lack of space is the most common cause of canine impaction (von der Heydt, 1975). Other contributing factors are that the cuspids of the permanent maxillary canines have the longest period of development, travel longer and take the most tortuous route to their final positions.

Case

A 16-year-old girl was referred to the Otorhinolaryngology clinic, Hospital Kuala Terengganu in 2004 with a recurrent history of painful swelling over her right cheek since past six months. She gave no history of chronic rhinosinusitis or recurrent dental infection or bleeding gum previously. Upon examination, she was noted to have an underdeveloped right maxillary canine as compared to the left one, besides the gross swelling of her right cheek. Apart from that she was generally well with no other problem. No neck nodes palpable and her cranial nerves were all intact. Nasal endoscopy showed no significant abnormalities. An occipito-mental (Water's) view X-ray showed a well-defined radio-opaque structure surrounded by a soft tissue mass in the right maxillary antrum. A coronal CT-scan film (Figure 1 and Figure 2) revealed a more precise ectopic canine surrounded by a large irregular bony structure and a soft tissue mass at the lateral aspect of the right maxillary antrum.

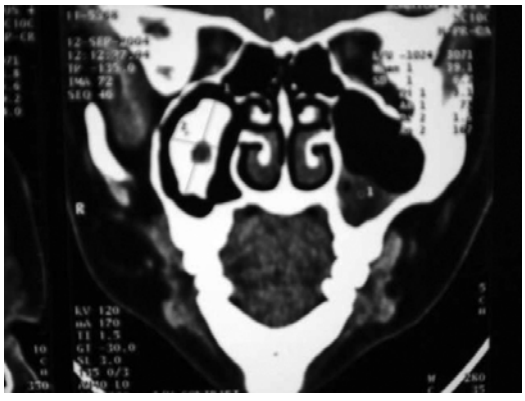

Figure 1 Bony setting of coronal computerised tomography (CT) view showing the location of the dentigerous cyst and the ectopic canine in the right maxillary sinus.

She was preoperatively diagnosed to have an ectopic tooth with possible dentigerous cyst. She then underwent a Caldwell-Luc procedure (Figure 3) under general anaesthesia, whereby the

* Corresponding author. Dr. Zamzil Amin Ashaari, Dept. of ORL-HNS, Kulliyyah of Medicine, International Islamic University Malaysia, 25100 Kuantan, Pahang, Malaysia.
Fax: +609-513 3615. *E-mail*: zamzilamin@yahoo.com

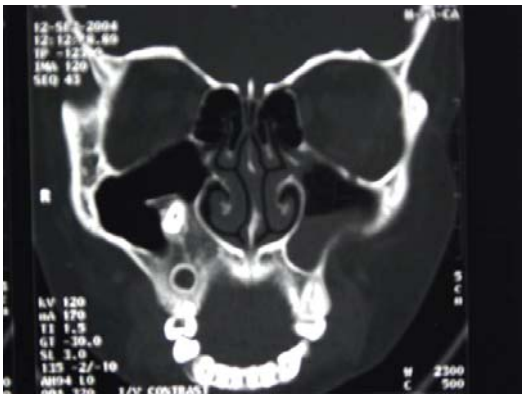

Figure 2 Soft tissue setting showing better demarcation of the right unerupted canine, surrounded by a thickened soft tissue covering. The left maxillary antrum was clear, with minimal soft tissue mucosal thickening.

Figure 3 The Caldwell-Luc procedure whereby the maxillary antrum is opened through the canine fossa.

Figure 4 The ectopic canine from the right maxillary sinus.

Figure 5 Cystic lining from right maxillary sinus that contained the ectopic canine.

tooth (Figure 4), together with the irregular covering bony like mass (Figure 5) was enucleated from the maxillary antrum. Some of the diseased mucosa of the maxillary antrum was also removed. The entire specimens were sent for histopathological examination. The histology report came back as a maxillary canine encased by a cyst lined by non-keratinized stratified squamous epithelium with dystrophic calcification and clusters of mucous cells found within the cysts. She had a week course of co-Amoxiclav (Augmentin) and her symptoms were completely resolved following the surgery. The swollen cheek subsided and now, 4 years after the surgery she never had any recurrence of the disease.

Discussion

Diagnosis of a dentigerous cyst can be made by careful clinical, radiological and histological investigations. Dentigerous cyst occurred more commonly in men, white population, and age group between third and fourth decades; with prevalence of mandibular cyst twice more common than maxillary cyst. It is often painless unless infected and mostly silent until they have enlarged sufficiently to produce expansion of the jaw. Therefore majorities are discovered accidentally on routine radiological examination. However, radiographically it is difficult to distinguish dentigerous cysts from other jaw cysts as most of them present as well-circumscribed, radiolucent lesions. Computerized Tomography (CT), and preferably with a dental CT software program, is highly valuable for the imaging and management of teeth in the maxillary sinus (Bodner *et al*., 1993). Routine CT imaging is debatable, however, and is better reserved for large lesions, in particular those involving the maxilla, in which case nasal cavity, orbital, or pterygomaxillary space extension may have occurred (Kerr *et al*., 2004).

Dentigerous cysts are frequently treated surgically, either by enucleation or marsupialisation. Following enucleation of the cyst and extraction of the unerupted tooth, the prognosis is excellent and recurrence is rarely

observed after a complete removal (Hasbini *et al.*, 2001). Having said that, the decision whether to enucleate or marsupialise the cyst depends on careful consideration of various patient factors. Enucleation will alter the normal tooth development and in certain circumstances especially in children the involved tooth should be given a chance to erupt. Marsupialisation has the advantage of reducing the cyst cavity and preserving the involved tooth in the cyst. Hyomoto *et al.* (2003) found that marsupialisation assisted natural eruption of the impacted tooth in the dentigerous cyst in 72.4% of their subject. Based on that, they concluded that marsupialisation promotes the natural eruption of a cyst-associated tooth and they suggest that in the paediatric population, marsupialisation should be considered as first line of treatment. In adult, the impacted teeth normally have a slim chance to erupt; therefore enucleation is a better treatment. Surgical enucleation combined with the Caldwell-Luc approach followed by primary closure is recommended in treatment of the large maxillary sinus cyst (Kaya and Bocutoglu, 1994), as marsupialisation of these cysts towards the oral cavity will consequently create an oroantral fistula. In our case we perform a surgical enucleation combined with the Caldwell-Luc procedure as the cyst was large and the ectopic tooth lies more laterally.

Since its introduction, the Caldwell-Luc procedure has become a standard approach for the management of antral disease as well as an operative route to reach such sites as the pterygomaxillary space, orbit, ethmoid labyrinth and medial skull base. The advancement of antibiotic therapy and the development of endoscopic sinus surgery however have changed many of the indications for this operation. There still remain, however, conditions where the wide anterior opening provided by the Caldwell-Luc procedure might prove to be beneficial.

In our case, the indication for a Caldwell-Luc procedure is obvious as it provides maximal exposure for the removal of the tooth with large dentigerous cyst that was located laterally in the sinus, making the endoscopic approach impossible. Similarly it can be employed to remove mucoceles, pyoceles, intrasinus odontogenic tumors, and large foreign bodies within maxillary sinus beyond the limit of endoscopy. Another instance where a Caldwell-Luc approach is preferred is in orbital decompression of significant malignant exopthalmos in patients with Grave's disease. Walsh and Ogura (1957) believed that this procedure was indicated in patients with Graves opthalmopathy in whom loss of visual acuity, changes in the corneal epithelium, progressive loss of extraocular function, conjunctival chemosis, orbital oedema or cosmetic disfigurement was found.

Caldwell-Luc procedure has been used for surgical access of the pterygomaxillary space, in case for internal maxillary artery ligation to treat epistaxis. It has also been used as an approach for sphenopalatine ganglion resection in cases of sphenopalatine or trigeminal neuralgia, and resection of vidian nerve for chronic vasomotor rhinitis. The use of newer instrument such as vascular clip appliers and small telescopes allow for smaller antrotomies with decreased risk of complications. In cases of facial trauma, sublabial incision with the Caldwell-Luc procedure allows access to fracture of maxillary bone, nasomaxillary complex and orbital floor and has been used frequently to reduce those types of fractures. In the Caldwell-Luc procedure, an opening at the inferior meatus is created surgically; the purpose of which to promote sinus drainage. Being in a more dependent position, the inferior meatal antrostomy (IMA) theoretically allows passive drainage of reaccumulated material. Its more accessible location also facilitates suction toilet post-operatively.

However, IMA has been criticized because of the need for an additional time, injury to the nasolacrimal duct, epistaxis from the sphenopalatine artery, and deviation from the normal sinus physiology. Moreover it has been reported to close within 3 months after the operation in 82% of 367 cases (Al-Belasy, 2004). We did not perform IMA in this patient for the above reasons, plus there was no need to provide extra drainage in our patient as she has a patent osteomeatal complex and no nasal anatomic abnormality. Also it is evidenced from the study (Al-Belasy, 2004) that it is not necessary to perform antrostomy at the inferior meatus for Caldwell-Luc procedure for odontogenic pathology such as in our case here. This is also evidenced in our case here that patient never had any recurrence of the disease after four years.

Conclusion

A Caldwell-Luc procedure has been the mainstay of maxillary sinus surgery over the past century though its role is decreasing with the advance of new antibiotics and technology. However, it still has a role in providing access for the performance of other procedures; for the removal of foreign bodies or benign tumours and for the management of refractory chronic disease. The use of inferior meatal antrostomy together with this procedure is associated with complications and time consuming, therefore it should not be done regularly in patients with patent natural drainage.

References

Al-Belasy FA (2004). Inferior meatal antrostomy: is it necessary after radical sinus surgery through the Caldwell-Luc approach? *J Oral Maxillofac Surg*, **62**(5): 559-562.

Bodner L, Bar-Ziv J and Kaffe I (1993). Computed tomography of cystic jaw lesions. *J Comput Assist Tomogr*, **18**: 22-26.

Ferguson JW (1990). Management of the unerupted maxillary canine. *Br Dent J*, **169**: 11–17.

Hasbini AS, Hadi U and Ghafari J (2001). Endoscopic removal of an ectopic third molar obstructing the osteomeatal complex. *Ear Nose Throat J*, **80**(9): 667-670.

Hyomoto M, Kawakami M, Inoue M and Kirita T (2003). Clinical conditions for eruption of maxillary canines and mandibular premolars associated with dentigerous cysts. *Am J Orthod Dentofacial Orthop*, **124**(5): 515-520.

Kaya O and Bocutoglu O (1994). A misdiagnosed giant dentigerous cyst involving the maxillary antrum and affecting the orbit. *Aust Dent J*, **39**(3): 165-167.

Kerr JT, Steger J and Sorensen D (2004). Midline maxillary odontogenic keratocyst. *Ann Otol Rhinol Laryngol*, **113**(9): 688-690.

Kusukawa J, Irie K, Morimatsu M, Koyanagi S and Kameyama T (1992). Dentigerous cyst associated with a deciduous tooth. *Oral Surg Oral Med Oral Pathol*, **73**(4): 415-418.

Most DS and Roy EP (1982). A large dentigerous cyst associated with a supernumerary tooth. *J Oral Maxillofac Surg*, **40**(2): 119-120.

Odufuwa B and Rose GE (2001). "Eye-tooth": a case of orbital dentigerous cyst after trauma. *Arch Ophthalmol*, **119**(10): 1560-1561.

von der Heydt K (1975). The surgical uncovering and orthodontic positioning of unerupted maxillary canines. *Am J Orthod*, **68**(3): 256-276.

Walsh TE and Ogura JH (1957). Transantral orbital decompression for malignant exopthalmos. *Laryngoscope*, **67**(6): 544-568.

Warford JH, Grandhi RK, and Tira DE (2003). Prediction of maxillary canine impaction using sectors and angular measurement. *Am J Orthod Dentofacial Orthop*, **124**(6): 651-655.