Keratocystic Odontogenic Tumor: A Case Report And Review Of The Literature

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Citation

Abstract
Because of its aggressivity, its high recurrence and possible malignant transformation, odontogenic keratocyst is added to the benign odontogenic tumours category, the new term is keratocystic odontogenic tumor (KCOT). Its pathogenesis and its treatment were largely studied in the latest years in order to improve its prognosis. We present a case of 80 year old patient who presents KCOT occurring in chin area, the selected treatment was the enucleation of the lesion. We present also a literature review, while insisting especially on the pathogenesis and the treatment of the KCOT.

INTRODUCTION
In 1956, Philipsen separated seven jaw cysts from cholesteatomas occurring in other cranial areas. Because he thought that these were odontogenic cysts and not of inflammatory origin, he coined the term odontogenic keratocyst (OKC). This term has created some confusion, because other odontogenic cysts, such as radicular cysts, follicular cysts, and lateral periodontal cysts, are morphologically similar to OKCs. In the latest World Health Organization classification, the former odontogenic keratocyst is added to the benign odontogenic tumours category. The new term is “keratocystic odontogenic tumor” (KCOT). The change in terminology was based on the observation that the odontogenic keratocyst behaves as a neoplasm and not like a benign cystic lesion.

KCOT have particular interest because of its specific histopathologic features, high recurrence rate, and aggressive behavior. Multiple KCOTs are frequently associated with nevoid basal cell carcinoma syndrome, and the malignant transformation of KCOTs has also been reported.

CASE REPORT
A 80 years old healthy man presents itself in consultation for a swelling in the chin region. The patient is toothless the extractions have been mad since 10 years. At the time of palpation, a soft and fluctuating swelling, which is due to a perforation of the buccal cortical bone is found. The covering mucous membrane reveal a mild inflammation. This clinical aspect evoke a cystic or tumoral lesion.

The panoramic and occlusal radiography, show a well defined radiolucent lesion with a radiopaque corticated margin localized to the mandible in the anterior region (Fig.1).

Figure 1
Figure 1: panoramic radiography

In the other side the occlusal radiography shows an expansion of the buccal cortical bone (Fig.2).
These clinical and radiological signs evoke the diagnosis of a residual cyst, a keratocystic odontogenic tumor or an ameloblastoma.

The selected treatment was the enucleation of the lesion. The incision shows a cystic lesion of appearance with a bony perforation of the buccal cortical (Fig. 3-4).

A perforation of the cystic wall occurred during the intervention bringing back a yellowish liquid. A meticulous elimination of the remains joined with the bone is carried out at the end of the intervention and the wound was sutured (Fig. 5-6).

**Figure 2**
Figure 2: occlusal radiography

**Figure 3**
Figure 3: Reflection of the mucoperiosteal flap. destruction of the buccal cortical.

**Figure 4**
Figure 4: destruction of the buccal cortical by the cyst

**Figure 5**
Figure 5: enucleation of the tumour capsule
The biopsy specimen was subjected to a histological examination which posed the diagnosis of a parakeratinized odontogenic keratocyst (Fig. 7).

**DISCUSSION**

In the latest World Health Organization classification the former odontogenic keratocyst is added to the benign odontogenic tumors category. The new term is “keratocystic odontogenic tumor” (KCOT).

Approximately 65% of KCOTs occur in the mandible, with a predilection for the third molar-ramus region (73.2%).

The age at diagnosis and sex distributions of patients with KCOTs have been reported. KCOT was found to occur in patients of a wide age range, with an average patient age of 30.8 years, 10% of KCOT occur in edentulous patient in the study of Haring and Van Dis, several studies have reported a male predilection for KCOT, some have not. For Myoung et al., the ratio of men to women with KCOT was 1.42, showing a 50% male predilection.

Several theories of the development of the KCOT have been presented. According to one theory, KCOTs develop from the remains of the dental lamina. According to other theories, KCOTs emanate from the basal cell layer of the oral mucosal epithelium or from the stellate reticulum of the enamel organ.

The KCOT is one of the most aggressive odontogenic tumours due to its relatively high recurrence rate, its relatively fast growth, and its tendency to invade adjacent tissues. It has even been reported to penetrate the skull base. That suggests a true neoplastic potential and prompted the World Health Organization Working Group to classify the KCOT as a benign tumour with odontogenic epithelium and mature, fibrous stroma without odontogenic ectomesenchyme. Several authors have attempted to correlate the behavior of KCOT with the production of collagenase, prostaglandins, and highly active oxidative enzymes. Scharfetter et al. demonstrated both slowly and rapidly proliferating areas in different parts of the KCOT epithelium and of the connective tissue wall and suggested that the invasive growth of KCOT probably resulted from active growth of the connective tissue wall. Other possible explanations for its high recurrence are increased fibrinolytic activity in the cyst wall, increased mitotic activity epithelial proliferation in connective tissue, and residual dental lamina with subsequent new cyst formation. However, the most important evidence that KCOT is a neoplasm comes from genetic studies demonstrating loss of heterozygosity of the tumour suppressor genes in KCOT cases, e.g.: p53 and p16.

The signs and symptoms reported are pain, swelling, expansion, drainage and bony perforation, but KCOTs were sometimes symptom-free and were found incidentally during routine radiographic examination.

On the radiography KCOTs appear as well-defined radiolucencies, which can be either unilocular or multilocular. Unilocular lesions occurred with a greater frequency (73.7%) than the multilocular ones (26.6%). Unilocular lesions can be located periapically, simulating periapical cysts; surrounding the crown of unerupted teeth.
simulating dentigerous cysts (26.7% in the study of Haring and van Dis \textsuperscript{6} ); between the roots of teeth, simulating lateral periodontal cysts or lateral radicular cysts; or in the maxillary midline, simulating nasopalatine duct cysts. \textsuperscript{9} Large unilocular KCOTs can be indistinguishable from cystic ameloblastoma \textsuperscript{6}. The lesion's proximity to the tooth may cause displacement and/or root resorption, although displacement (28.3%) is more commonly seen than resorption (5%). \textsuperscript{6} Conventional radiographic imaging, such as panoramic views and intraoral periapical films, in most cases are adequate to determine the location and estimate the size of the KCOT. Advanced imaging techniques like computerized tomography and magnetic resonance imaging can be useful in large cases involving the maxillary sinus and the rare cases that extend to the skull base. \textsuperscript{6}

KCOT is characterized by a uniform epithelial layer that lacks rete ridges. In addition, it has a corrugated parakeratinized luminal layer and a prominent basal cell layer. \textsuperscript{6} Haring and Van Dis \textsuperscript{6} reported epithelial separation in 98% of cases they reviewed. Satellite cysts were evident in 33.3% of the KCOTs reviewed by them. No statistical significance existed between the radiographic appearance of the lesions and the presence of satellite cysts. \textsuperscript{6} Some histologic findings of KCOT, including the presence of 1 or more daughter cysts and the budding of the basal cell layer of the lining epithelium, have been reported to be related to high recurrence rates. \textsuperscript{4} Inflammation was present in 98% of the KCOTs reviewed by the same authors. \textsuperscript{6} The inflammation, predominantly a chronic inflammatory cell infiltrate, was most often in a generalized pattern of distribution. \textsuperscript{4} A statistically significant relationship was found to exist between the severity of the inflammation (mild, moderate, severe) and the radiographic appearance of the lesion (unilocular versus multilocular). The multilocular lesions were shown to have more severe inflammation than the unilocular ones. \textsuperscript{4} A lesion may be stimulated to grow in response to inflammation. \textsuperscript{4}

The treatment of the KCOT remains controversial. Treatments are generally classified as conservative or aggressive. Conservative treatment generally includes simple enucleation, with or without curettage, using spoon curettes or marsupialization. Aggressive treatment generally includes peripheral ostectomy, chemical curettage with Carnoy's solution, and resection. The goals of treatment should involve eliminating the potential for recurrence while also minimizing the surgical morbidity. There is no consensus on adequate or appropriate treatment of this lesion. \textsuperscript{10}

Recent studies have found certain changes after treatment with decompression, including thickening of the KCOT's wall, inhibition of IL-1α, epithelial dedifferentiation and loss of cytokeratin-10 production, changes from Forsell and Sainio group Ia (parakeratotic type) to groups II and III (orthokeratotic type), and bcl-2 negativity. These changes may be responsible for the less aggressive behavior with decreased recurrence seen after such treatment. These findings support the view that in a selected group of cooperative patients, treatment with decompression allows for a less invasive approach with excellent results, avoiding extensive disfiguring procedures. \textsuperscript{10} Pogrel and Jordan reported 10 cases of nonsyndromic KCOTs treated with marsupialisation that demonstrated complete resolution both clinically and radiographically after a mean follow-up of 2.8 years. \textsuperscript{11}

Maurette et al. \textsuperscript{11} recently report 30 cases of nonsyndromic KCOTs treated with decompression, the mean time for decompression was 9.27 months, that demonstrated a similar recurrence rates to those reported in the literature.

The benefit of the conservative treatment over more conventional approaches (enucleation, en bloc resection) lies in the minimal surgical morbidity. In addition, associated structures such as the inferior alveolar nerve and developing teeth are less vulnerable to damage. \textsuperscript{12}

Although complete resolution of the lesion while preserving anatomy and function can be achieved with conservative treatment, the need for long term follow-up of these patients cannot be overemphasized, because recurrence has been reported to occur up to 10 years after treatment. It appears that careful selection of cases, taking into account the lesion's clinical behavior, radiographic and histopathologic appearance, and association with nevoid basal cell carcinoma syndrome (NBCC, Gorlin's syndrome), as well as the presence of various molecular markers in the cystic epithelium, can help achieve better control of this entity. \textsuperscript{11}

Epithelial remnants or residual tissue are ostensibly prime potentiators of recurrence, as summarized by Brannon \textsuperscript{13}. For this reason, the use of chemical cautery after enucleation, aggressive curettage of bony walls, cryotherapy modalities, peripheral ostectomy with a bone bur, or even radical resection of the involved jaw have been advocated as means of lowering recurrence by removing remaining epithelium. \textsuperscript{4}

Recently, Morgan et al. \textsuperscript{10} evaluated different method of
surgical treatment, they find that treatment with peripheral
ostectomy with or without the use of carnoy's solution, had a
significantly lower rate of recurrence, treatment with
enucleation, with or without the use of Carnoy's solution was
associated with a significantly higher recurrence rate.

The KCOTs that were totally removed in one piece exhibited
a lower recurrence frequency than those removed in
fragments, a higher recurrence rate was found for the
KCOTs where the capsule had been dissected free from the
covering oral mucosa than for those where the cysts had
been removed together with the covering mucosa.

Cryosurgery in combination with enucleation exhibited a
higher frequency (37.5%) of recurrence when compared with
cases where only enucleation had been used (28.5%).

KCOT is often preliminarily diagnosed as less aggressive
cyst, which could receive more conservative surgical
treatment, which may led to an increased tendency to
recurrence, for this reason, Preoperative confirmation of
KCOT diagnosis by means of incisional biopsy or
confirmation during surgical procedures by means of frozen
section would help clinicians select more suitable treatment
modalities.

The follow-up should last at least until the complete
reossification of the cavity. It involves performing an
orthopantomogram every 6 months and a CT scan in case
of doubt. The follow-up should be even longer for
odontogenic keratocyst (notably parakeratinized). But even
regarding the specific diagnosis of keratocysts,
Chiraphathomsakul et al. reported a rate of 39% of patients
lost to follow-up after a short period of time (less than 1
year). concerning this kind of tumour, most recurrences
presented within 5 years, but late recurrences did occur even
after 25 years. A follow-up every two years seems
appropriate.

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