Odontogenic Cysts Expanding to the Maxillary Sinus: A Retrospective Study

Maksiller Sinüse Ekspanse Olan Odontojenik Kistler: Retrospektif Çalışma

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ABSTRACT Objective: Odontogenic cysts develop during or after the formation of teeth. When they originate from maxillary teeth, most of them remain periapical in position and are confined to the maxillary alveolus. A small but significant percentage of odontogenic cysts enlarge substantially and produce bone erosion with extension into the maxillary sinus. The aim of this retrospective investigation was to present data on a series of odontogenic cysts of the maxillary sinus in 31 patients and to briefly review the relevant literature. **Material and Methods:** Thirty-one patients with odontogenic cyst in the maxillary sinus treated in our clinic were included the study. All clinical information with respect to age, sex, symptoms, and the type of cyst was recorded. Radiological evaluation was made using computed tomography and plain sinus X-rays. All cysts were treated surgically. **Results:** The study group consisted of 14 males and 17 females with a mean age of 35 years. Of the 31 cases, 11 had radicular cyst, 17 dentigerous cyst, 2 calcifying odontogenic cyst and 1 odontogenic keratocyst. All of the presenting cases were large enough to involve the maxillary sinus. Swelling and facial asymmetry were the most common symptoms. There were also uncommon symptoms such as epiphora and nasal obstruction. The cysts were surgically removed by enucleation. **Conclusion:** The value of early diagnosis and removal of odontogenic cysts should be emphasized in order to prevent serious complications.

Key Words: Maxillary sinus; dentigerous cyst; odontogenic cyst, calcifying; odontogenic cysts; radicular cyst

ÖZET Amaç: Odontojenik kistler dişlerin formasyonu esnasında veya formasyon sonrasında gelişirler. Bu kistler maksiller dişlerden köken aldıklarında, çoğunlukla periapikal pozisyonda konumlanır ve maksiller alveoler proçeste sınırlı kalırlar. Bu kistlerin küçük fakat önemli bir kısmı ise büyüyüp genişler ve kemik rezorpsiyonu yaparak maksiller sinüse ekspanse olurlar. Bu çalışmada, maksiller sinüsle ilişkili olan 31 hastada tespit edilmiş odontojenik kistlerin bir seri olarak retrospektif incelenmesi ve ilgili literatürün özetlenmesi amaçlanmıştır. **Gereç ve Yöntemler:** Maksiller sinüsle ilişkili odontojenik kisti olan 31 hasta çalışmaya dahil edildi. Tüm olgularda klinik bulgular, yaş, cinsiyet, mevcut semptomlar ve tanılanan kist türü kaydedildi. Radyolojik değerlendirme bilgisayarlı tomografi ve doğrudan sinüs grafisi kullanılarak yapıldı. Bütün olgularda cerrahi tedavi uygulandı. **Bulgular:** Çalışmamızdaki 14 erkek, 17 kadın toplam 31 bireyden oluşan hastaların ortalama yaşı 35 idi. Otuz bir olgunun 11'i radiküler kist, 17'si dentijeröz kist, 2'si kalsifiye odontojenik kist ve 1'i odontojenik kerato kist idi. Bu çalışmada sunulan tüm odontojenik kistler maksiller sinüsü işgal edecek kadar büyüktü. Şişlik ve fasiyal asimetri en çok görülen semptomlardı. Epifora ve nazal obstrüksiyon nadir görülen semptomlardandı. Bu kistlerin tedavisi enükleasyonla cerrahi olarak yapıldı. **Sonuç:** Odontojenik kistlerin erken tanısı ve uzaklaştırılması önemli komplikasyonların önlenmesi için gereklidir.

Anahtar Kelimeler: Maksiller sinüs; dentigerous kist; kalsifiye odontojenik kist; odontojenik kist; radiküler kist

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Odontogenic cysts develop during or after the formation of teeth.[1] They occur both in the upper and the lower jaws.[2,3] When they originate from maxillary teeth, most of them remain periapical in position and are confined to the maxillary alveolus. A small but significant percentage of odontogenic cysts such as radicular cyst, dentigerous cyst, calcifying odontogenic cyst (COC) and odontogenic keratocyst enlarge substantially and produce bone erosion with extension into the maxillary sinus because the floor of the maxillary sinus is intimately related to the premolar, molar and canine teeth of the upper jaw. They may partially or almost entirely obliterate the sinus.[4,5] On the other hand; some cysts, which originate from ectopic odontogenic tissue, are not similar to other cysts, which involve the maxillary sinus by eroding the inferior wall of the sinus. In contrast, they develop primarily in the maxillary antrum.[6]

Odontogenic cysts of the maxillary sinus (OCMS) initially manifest with malocclusion, cosmetic deformity or both. They may also lead to functional disturbances.[7] Pain may occur in relation to these cysts, particularly if they become infected.[3,8]

Although there are numerous case presentations of odontogenic cysts involving the maxillary sinus, most of them are isolated case reports. Large studies of these cysts are few. The purpose of this retrospective investigation was to present data on a series of radicular cysts, dentigerous cysts, COC and odontogenic keratocyst of the maxillary sinus in 31 patients and to briefly review the relevant literature.

MATERIAL AND METHODS

Thirty-one patients with odontogenic cyst in the maxillary sinus were treated in our clinic between September 1992 and May 2001. All clinical information with respect to age, sex, symptoms, and the type of cyst was recorded. Each subject consented to a protocol that was reviewed and approved by the Medical Ethics Committee of Ataturk University. Plain sinus X-rays (Water's view) and high-resolution computed tomography (HRCT) without contrast (Figures 1, 2) were used to evaluate cyst margins and the surrounding tissue. Panoramic radiography was performed to determine the dental structures and their relation to the maxillary sinus. All patients were treated surgically with enucleation (Figure 3). Histological specimens were evaluated at the Ataturk University, Faculty of Medicine Department of Pathology.

FIGURE 1: Coronal view CT showing a dentigerous cyst obliterated maxillary sinus, which originated from impacted maxillary canine tooth. Arrows show margins of cyst.

FIGURE 2: A large dentigerous cyst invading the maxillary sinus is seen in the direct X-ray (Water's).

The minimum length of follow-up was seven years. The recurrence rate was evaluated at follow-up. Outcome criteria were determined by analyzing the recurrence rates after the treatment.

RESULTS

The study group consisted of 14 (45.1%) males and 17 (54.9%) females with a mean age of 35 years (Table 1).

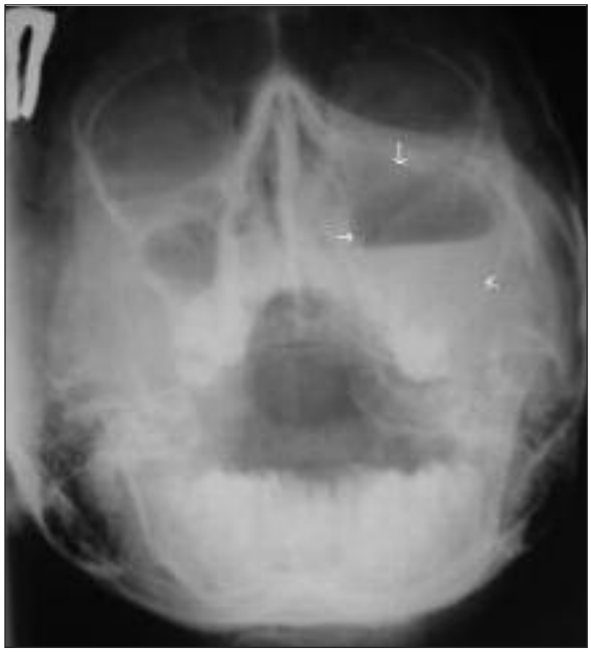

FIGURE 3: Intraoperative view of the removal of the cyst.
(* shows cyst capsule, arrows show eroded maxillary sinus lateral wall).

TABLE 1: Age distribution of the patients with odontogenic cyst expanding to the maxillary sinus.

Age	No. of patients	%
10-19	3	9.7
20-29	8	25.8
30-39	11	35.5
40-49	5	16.1
50-59	3	9.7
60-69	1	3.2

Of the 31 cases, 17 (54.8%) had dentigerous cysts, 11 (35.5%) radicular cysts, 2 (6.5%) Calcifying Odontogenic cysts and 1 (3.2%) odontogenic keratocyst (Table 2).

Swelling, discomfort and facial asymmetry were the most common symptoms, experienced by 16 (51.6%) out of 31 patients. Two patients were asymptomatic (Table 3).

Eighteen (58%) patients had impacted teeth and the most common impacted tooth was maxillary canine in 13 (72.2) out of 18 cases, followed by maxillary premolar (3 cases), maxillary molar (1 case) and a supernumerary tooth.

The patients were followed-up for a mean of 12.4 years (range, 7.1-12.2 years). Of the 31 cases, recurrence developed in only one COC, which was treated with curettage by the Caldwell-luck approach. Epiphora, nasal obstruction, and other symptoms spontaneously dissipated over the 6-12 months after the operation.

Five patients were followed-up for 7 to 8 years, 9 patients for 8 to 9 years; 7 patients for 9 to 10 years and 8 patients for 10 to 12 years. Two patients were followed-up for more than 12 years.

DISCUSSION

It is generally estimated that from 10% to 15% of pathologies involving the maxillary sinus is of dental origin or relationship.[9] This may be either a simple problem like accidental openings in the floor of the antrum during the extraction of teeth or an important problem that may require a complex surgical intervention like an odontogenic cyst entirely obliterating the maxillary sinus.[9]

If odontogenic cysts enlarge substantially, they show a close relationship to the maxillary sinus and involve it, leading to several symptoms. These symptoms usually develop by transmitting pressure to the walls of the maxillary sinus and eroding them.[10,11] The lateral-inferior wall is first influenced by the OCMS because it is very closely related to odontogenic tissue.[5] Swelling which causes facial asymmetry is the most common symptom due to

TABLE 2: Distribution of odontogenic cyst types.

Type of odontogenic cyst	No. of patients	%
Radicular cyst	11	35.5
Dentigerous cyst	17	54.8
Calcifying odontogenic cyst	2	6.5
Odontogenic keratocyst	1	3.2

TABLE 3: Chief complaints and symptoms of patients with odontogenic cyst expanding to the maxillary sinus.

Symptom	No. of patients	%
Swelling and discomfort	16	51.6
Asymptomatic	2	6.5
Swelling and purulent discharge	2	6.5
Swelling and nasal obstruction	6	19.3
Swelling, nasal obstruction and epiphora	2	6.5
Only pain	3	9.7

the erosion of the lateral-inferior wall verified by being experienced by 16 of the 31 patients. Pain may occur in relation to pressure of the cysts to the surrounding tissue and if they become infected.

When OCMS continue to enlarge, they may entirely obliterate the maxillary sinus. They cause erosion of the orbital, nasal and posterior walls of the sinus. Symptoms that may develop due to these erosions include nasal obstruction, epiphora due to pressure that is transmitted to the nasolacrimal duct, swelling due to erosion of the palatine bone, and ophthalmological symptoms such as proptosis, enophtalmus, diplopia, ptosis and rarely decreased visual acuity caused by erosion of the orbital floor.[10,12] Although these symptoms are not commonly mentioned in the literature, six of the patients in our study experienced nasal obstruction and 2 patients had epiphora and nasal obstruction.

We believe that these symptoms arise primarily for the following reasons

- Patients who are from the rural area and have a low socioeconomic level are referred to the clinics very late when the cysts enlarge to very large size.

- Some OCMS develop and enlarge very fast such as COC.

- Some OCMS, particularly dentigerous cysts that primarily originate from ectopic teeth in the maxillary sinus may not be similar to other cysts, which pressurize the inferior-lateral wall at the early stage. In contrast, they may pressurize the nasal, orbital and posterior wall at the early stage.

The diagnosis of these cysts is based not only on clinical, but also on radiological findings. Diagnosis can be made radiologically with plain sinus X-rays.[13-15] However, CT is a more precise method to diagnose OCMS and to monitor their healing processes over time.[16-18] CT can show the exact extent of the lesion and offer excellent morphologic detail of both the bony and the soft tissue structures.[16] Magnetic resonance imaging (MRI) may also be used for such pathologies and it shows excellent tissue contrast. However, CT is usually more informative than MRI, especially in regions involving thin bony structures (e.g. the paranasal sinuses and orbita).[16]

A cyst of dental origin that encroaches upon the maxillary sinus manifests in the x-ray as a rounded area of uniform radiolucency, bordered by a thin, well-defined radiopaque margin, which displaced the cavity of the maxillary sinus upward or posteriorly.[19] Dentigerous cysts contain the crown of a displaced tooth.[2,5,8,20,21] They may occupy a central position with the crown, symmetrically enveloped by the cyst or a lateral location with the cyst expanded to one side.[2,5] All of our dentigerous cyst cases were of the central type. A review of the medical literature indicates that only a few cases of ectopic molars displaced by progressively growing dentigerous cysts have been reported.[13] However, there was one case similar to those cysts found in our study. In addition, even though cysts associated with a supernumerary tooth are uncommon, we encountered such a case in our study.[22] In radicular cysts, the dead tooth from which they originate can be seen and may show an obvious cavity.[5,19,23] Adjacent teeth usually remain vital but may be tilted, a little displaced or occasionally may become slightly mobile. Most COC appear as well-circumscribed and unilocular cyst-like areas, but are occasionally multilocular or less sharply circumscribed. Some contain scattered radiopacities that range from small flecks to large masses. Related teeth may sometimes be displaced or show root resorption.[2,24] Two such cases were found in our sample.

Pathologic examination of the radicular cyst shows an irregular epithelial lining and underlying inflammatory infiltrate. Histology of dentigerous cyst indicates that the lining consists of a relatively flat layer of stratified epithelium, usually without inflammatory cells in the underlying connective tissue. The lining of dentigerous cysts were reported to undergo neoplastic transformation into aggressive lesions such as ameloblastomas and squamous cell carcinoma.[25] However, the frequency of such neoplastic transformation is low.[25] In about 25% of reported odontogenic carcinoma cases, the carcinoma appears to have arisen from a dentige-

rous cyst.[2,25] The COC was first recognized and described by Gorlin et al. in 1962.[6,26] The COC is believed to be derived from odontogenic epithelial remnants. "Ghost cell keratinization" is the characteristic microscopic feature of the COC, and is also a defining feature of the cutaneous lesion known as the calcifying epithelioma of malherbe or pilomatrixoma.[3,26] In some sections, this may resemble forms of ameloblastoma. The COC is now properly classified with other epithelial cysts of the jaws.[26] The propensity for odontogenic keratocysts to undergo malignant alteration is no greater than that of other types of odontogenic cysts.[25]

Although there are a few cases treated by marsupialization[3,13] which may be useful when all permanent teeth which are related to the cysts, are to be saved and erupted in young patients and the cyst is very large, treatment is usually surgical removal by enucleation.[22,27] With some very large cysts, surgical enucleation is performed following marsupialization of the lesion to promote its involution and stimulate osteogenesis.[28]

Because of the unpredictable biologic behavior of COC, treatment is usually more aggressive than simple curettage. Unlike the radicular and dentigerous cysts, recurrences are not uncommon for these lesions. It is also mandatory to completely remove all diseased antral tissues and thoroughly assess all resected soft tissues histologically.[14]

The value of early diagnosis and removal of dentigerous cysts should be emphasized in order to ensure elimination of the cystic lining, which might allow for the formation of aggressive lesions such as ameloblastomas and squamous cell carcinoma.[2] Epiphora, nasal obstruction and other symptoms spontaneously disappeared within 6-12 months after the operation.

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