Cysts of the Nose and Paranasal Sinuses*

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SUMMARY

The pathology, diagnosis and treatment of cysts affecting the nose and paranasal sinuses are discussed. Nine cases with unusual features are described. These cysts may be treated by marsupialization into the nasal cavity, with minimal cosmetic deformity and restoration of nasal physiology.

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The diagnosis of benign cysts affecting the nose is made on the basis of clinical and radiological examination. They may present with nasal obstruction, sinusitis, proptosis or swellings of the middle third of the face. A variety of operative procedures have been employed in the management of these lesions. The purpose of this article is to demonstrate that marsupialization into the nasal cavity is a successful technique for restoring nasal physiology with minimal cosmetic disfigurement.

A classification of the benign cysts affecting the nose and paranasal sinuses is as follows:

1. Odontogenic cysts
   - (a) Developmental odontogenic cysts
     - (i) Dentigerous cysts
     - (ii) Primordial cysts
   - (b) Inflammatory odontogenic cysts
     - (i) Dental (periodontal or radicular) cysts
2. Developmental cysts (fissural cysts)
   - (a) Nasoalveolar cysts
   - (b) Globulomaxillary cysts
   - (c) Median palatine cysts
   - (d) Incisive canal cysts
   - (e) Midline cysts of the nasal dorsum
3. Cysts arising from the sinus mucosa
   - (a) Retention cysts
   - (b) Mucosal cysts
   - (c) Mucocoeles
4. Miscellaneous
   - (a) Haemorrhagic cysts
   - (b) Antrochoanal polypi

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DENTIGEROUS CYSTS

These cysts arise from an unerupted or undeveloped tooth, or from a normal tooth which is impacted or misplaced in the maxilla. Their development is due to breakdown of the stellate reticulum of the enamel organ after formation of the crown or from degenerative changes in the reduced enamel epithelium after the deposition of enamel. Occasionally there are multiple teeth in the cyst, but more frequently the cysts contains the crown of a tooth or a dental anomaly, and fluid. The wall consists of connective tissue with a lining of stratified squamous epithelium. The epithelium is attached to the neck of the tooth with the crown projecting into the fluid contents.

Small dentigerous cysts are best treated by enucleation or marsupialization into the oral cavity. Large cysts may distend the antrum, producing swelling of the cheek. They may be infected, presenting as empyemas of the antrum. In such cases enucleation is a disabling procedure, as the hard palate may have undergone pressure atrophy, and oro-antral fistulae or fractures may result. Such cases should be explored by a Caldwell-Luc approach, with construction of a large permanent intranasal antrostomy. This procedure allows for full examination of the cyst cavity and biopsy of the wall (the rare possibility of an ameloblastoma developing in the cyst wall is recalled). The lining of the cyst is not removed unless gross infection is present.

Case Report

Case 1. A 15-year-old Bantu female, presented with a hard swelling of the right cheek. The malar bone was displaced laterally. The medial wall of the antrum was soft and completely obstructed the right side of the nasal cavity, pushing

the septum over toward the left. X-Rays showed an opaque antrum with erosion of the anterior, medial and lateral walls. A tooth was observed in the roof of the antrum. A Caldwell-Luc operation was performed. The antrum was filled with mucopurulent fluid and lined by hyperplastic polypoid mucosa. The crown of a maxillary right cuspid was found embedded in the roof of the antrum. The tooth and lining of the antrum were removed, and a wide intranasal antrostomy was performed. Histological examination of the lining showed chronically inflamed granulation tissue (Fig. 1).

A diagnosis of dentigerous cyst with chronic infection and distension of the antrum was made.

Fig. 1. Water's view of sinuses in case 1, showing a tooth in the roof of an infected left maxillary antrum. Note opacity of the antrum, which was full of pus.

DENTAL (RADICULAR OR PERIODONTAL) CYSTS

These cysts develop in the periodontal membrane and adjacent structures at the apex of a tooth (periapical or radicular cyst) or on the side of the root (lateral or periodontal cyst). They arise from an erupted tooth which has become devitalized and infected with the formation of a granuloma at the root or a lateral abscess along the side of the root. The wall consists of a connective tissue capsule which may be lined by stratified squamous epithelium (possibly derived from epithelial rests from Hertwig's sheath). The cyst contains fluid which may be watery or viscid and cholesterol crystals may produce a shimmer in the light. They may contain pus.

Small radicular cysts are treated by extraction of the infected tooth and enucleation of the cyst. Large cysts often appear to involve several teeth, but only non-vital teeth should be removed or treated. In some cases the cyst is enucleated and an apicoectomy is performed, or the root canals are filled. Occasionally the cyst may be so large as to distend the antrum. These cases are treated by a Caldwell-Luc procedure and intranasal antrostomy, in addition to the dental treatment. In non-infected cysts, the lining is ideal material to line the antrum and should not be removed. If the lining is infected it is removed entirely as in the case of chronic hyperplastic maxillary sinusitis.

Fig. 2. Lateral view of a dentigerous cyst of the maxilla without infection. This case is not reported in detail as the patient refused surgery.

Case Reports

Case 2. A Bantu female aged 21 years, presented with a painless swelling of the right cheek of 2 years duration. Nearly all her teeth were carious. The maxillary swelling was soft and fluctuant and measured 5 cm in diameter. The palate was normal but the lateral wall of the nose was displaced medially against the septum. X-rays showed amputation of the roots of all the related teeth lateral to the right canine. The medial and lateral walls and roof of the antrum were displaced. A Caldwell-Luc procedure exposed a huge cyst of the antrum, filled with clear serous fluid containing cholesterol crystals. The protein content was 8·6 g/100 ml. A large intranasal antrostomy was created. The cyst was lined by stratified squamous epithelium overlying a connective tissue capsule. This lining was not removed. She was referred to a dentist for treatment of the teeth.

This was a case of a dental cyst occupying and distending the antrum (Fig. 3).

Case 3. A Bantu male aged 45 years presented with right proptosis, right nasal obstruction and a soft swelling of the right cheek. These symptoms had commenced 2 years previously. Two molars, one premolar and both incisors had been extracted from the right upper maxilla some years previously, and the remaining teeth were carious. A soft swelling was seen in the right nostril, filling the nasal cavity on that side. X-rays showed a huge swelling of the right antrum extending over the midline of the nasal cavity. A Caldwell-Luc procedure opened a large cyst containing yellowish serous fluid. The medial wall of the antrum was displaced against the septum and over the midline toward the opposite side. The middle turbinate was polypoid and the ethmoids were compressed. The lining of the antral cyst was polypoid in places and was removed entirely. A large intranasal antrostomy was created. Histological examination of the lining

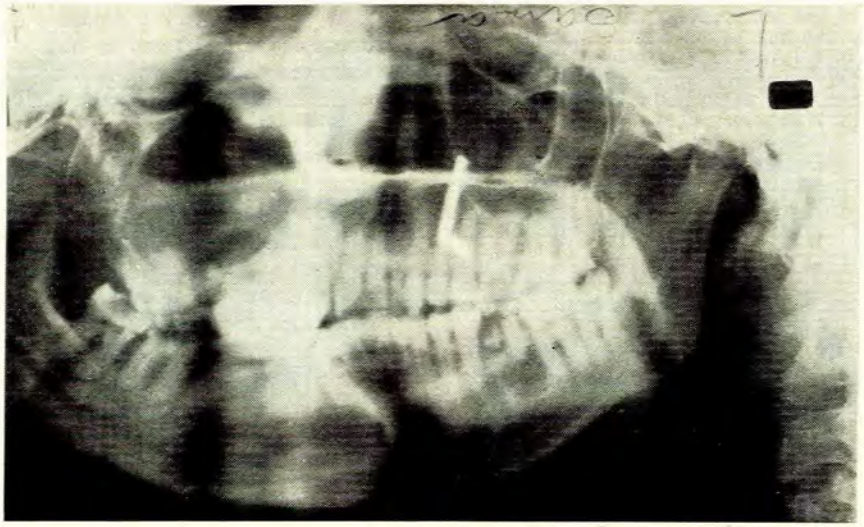

Fig. 3. Orthopantomograph of maxilla in case 2, showing a dental cyst distending the right antrum.

showed oedematous fibrous tissue covered by stratified squamous epithelium and infiltrated by eosinophils and mild chronic inflammation.

An infected dental cyst was diagnosed (Fig. 4).

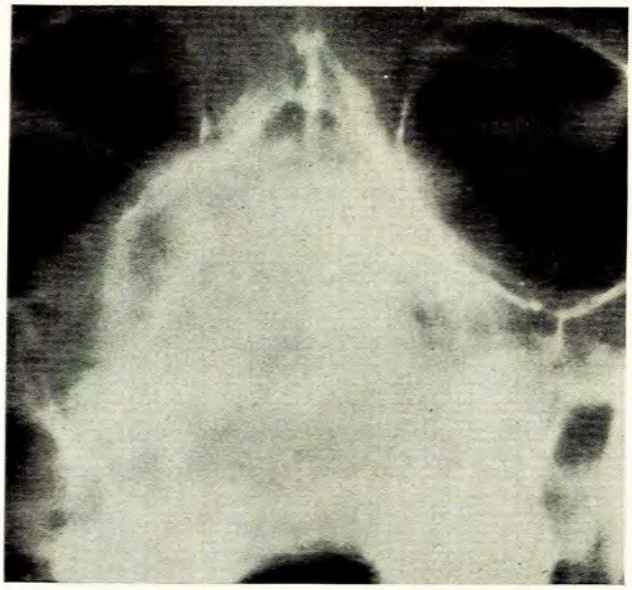

Fig. 4. A - P tomograph of the sinuses in case 3, showing a large dental cyst distending the right antrum, the nasal cavity and the right orbit.

PRIMORDIAL CYSTS

These are stratified squamous epithelium-lined cysts formed from retrogression of the stellate reticulum in enamel organs. This occurs before any calcified tooth structure has been deposited. Careful history and examination reveals that a tooth failed to erupt and is not detectable on X-ray.

DEVELOPMENTAL FISSURAL CYSTS

In 1937 New and Erich[1] reported a survey of dermoid cysts of the entire body. Of these 103 affected the head and neck, of which 13 were related to the nose.

Cysts may arise from epithelial remnants found along the lines of fusion where the median nasal (globular), lateral nasal and maxillary segments approach each other; these are *naso-alveolar cysts* and they occur in depressions in the base of the nasal alae. *Globulomaxillary cysts* are found between the maxillary second incisor and canine, often causing divergence of the roots of those teeth. More posteriorly, cysts may occur at the fusion of the primary palate with the maxillary segment on each side; they distend the hard palate, lying anteriorly and to one side of the midline of the palate. *Median palatine cysts* arise along the line of fusion of the two palatine shelves of the secondary palate. *Incisive canal cysts* (or nasopalatine duct cysts) occur in the midline of the upper jaw above the roots of the central incisors. *Midline cysts of the nasal dorsum* occur between the nasal bones. They may extend deeply in relation to the cribriform plate, the frontal sinus or the nasal septum.

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Case 4. A Bantu male aged 25 years, presented with a fluctuant cyst in the centre of the hard palate, 2 cm in diameter. It had been enlarging progressively for 2 years. X-rays showed a cyst in the midline of the hard palate. At operation the cyst was found to contain thick glairy fluid. The palate and floor of the nasal cavity were eroded, and the cyst extended up into the nasal septum between the layers of mucoperichondrium. It was marsupialized into the oral cavity. Histological examination of the lining showed the features of a

fissural cyst. The lining was partly stratified squamous epithelium and partly ciliated columnar epithelium. It was diagnosed as a median palatine cyst (Fig. 5).

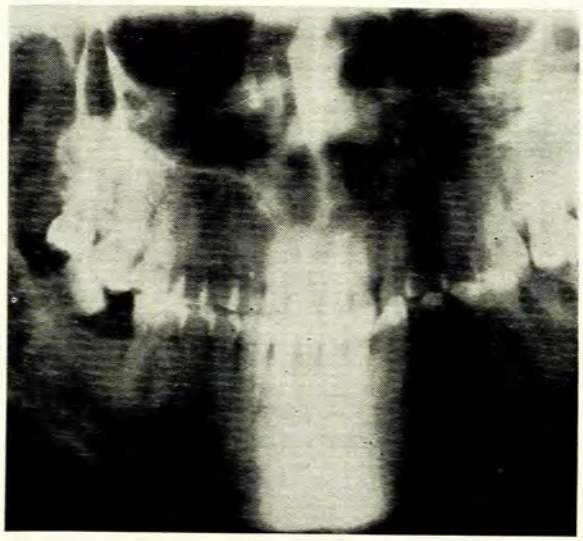

Fig. 5. Orthopantomograph of maxilla in case 4, showing a median palatine cyst.

Case 5. A Bantu male aged 34 years, presented with a firm swelling on the left side of the hard palate, 1 cm posterior to the alveolar margin and 3·5 cm in diameter. X-rays showed a defect in the bony palate underlying the swelling. The antrum on that side was cloudy, and its floor was displaced upward toward the roof. At operation a cyst was found to have eroded the bony palate. The antral cavity was distinct from that of the cyst, but was compressed. Histological examination of the cyst wall showed fibrous tissue lined by stratified squamous epithelium, with a non-specific chronic inflammatory infiltrate of lymphocytes and plasma cells. The cyst contained thick mucoid fluid. It was marsupialized into the oral cavity and a diagnosis of a median palatine cyst displacing the nasal cavity and maxillary sinus was made (Fig. 6).

Case 6. A 15-year-old Bantu male presented with a cystic swelling in the midline of the nose, of 6 months' duration. The mass was 2 cm in diameter, fluctuant, and tender to palpation. Anterior rhinoscopic examination showed gross swelling of the septum. At operation a midline incision exposed a cyst displacing the nasal bones laterally. The right nasal bone was eroded almost to its articulation with the frontal process of the maxilla, and the left nasal bone was partially eroded. The septum was deficient of bone and cartilage anteriorly. The lining of the cyst was removed inferiorly to marsupialize the cyst into the nasal cavity. The mucoperichondrial layers of the septum were approximated with chromic catgut sutures. The nasal bridge was reconstituted by raising the upper lateral cartilages, which were sutured together in the midline with atraumatic 000 silk. The nasal bones were trimmed symmetrically. The nasal bridge remained fairly flat, but in the Bantu this was a satisfactory cosmetic result. Histological examination of the lining showed the features of a simple dermoid cyst (Fig. 7).

RETENTION CYSTS

Small cysts containing thin fluid or thick mucus are occasionally seen within the inflamed hypertrophic mucosa removed during a Caldwell-Luc procedure for chronic sinusitis. Skillern[2] describes these as mucoid or retention cysts consequent upon obstruction of glandular ducts. Tunis[3] in 1910 found retention cysts in 13% of unselected cadaver heads. According to Schuknecht and Lindsay[4] the lining is a single layer of cuboidal epithelium. These cysts are not symptomatic and are discovered only at operations in which the sinus mucosa is exposed.

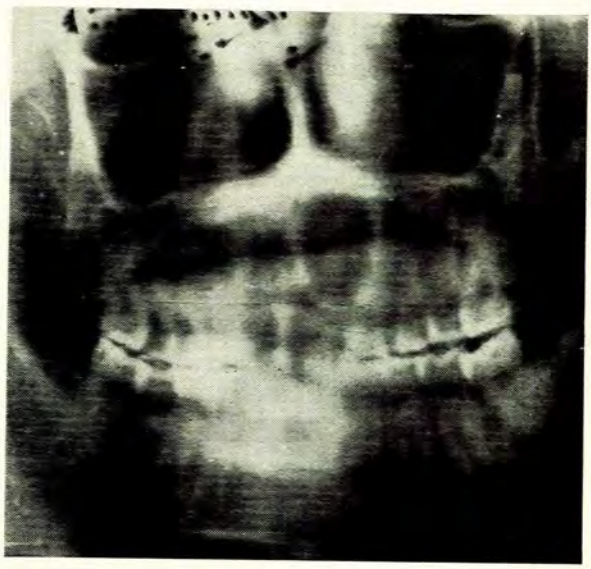

Fig. 6. Orthopantomograph of maxilla in case 5, showing a median palatine cyst.

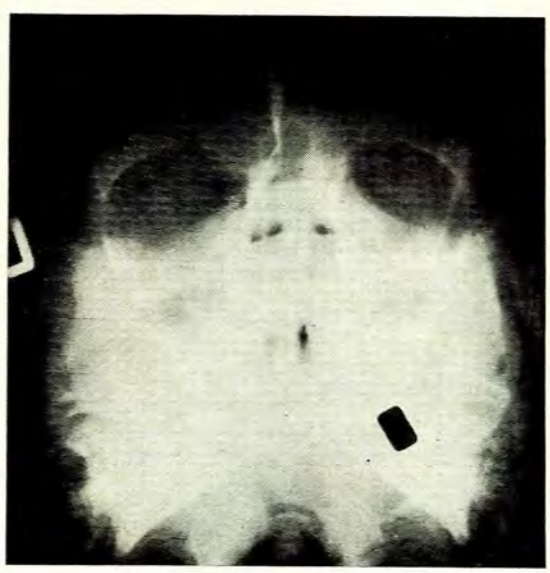

Fig. 7. Water's view of sinuses in case 6 showing a midline cyst of the nasal dorsum.

MUCOSAL CYSTS OF THE MAXILLARY SINUS

Proof puncture of the maxillary sinus occasionally yields uninfected straw-coloured fluid from rupture of a mucosal cyst. According to Paparella[5] this is both diagnostic and curative.

The nature of these cysts is uncertain. McGregor[6] refers to 'mesothelial cysts' arising from oedematous distension of the connective stroma of the mucosa. Mills[7] believes that all cysts of the antral mucosa are secretory, and those containing thin yellowish fluid result from extramucosal rupture of a blocked mucus gland. Lindsay[8] refers to 'non-secreting cysts' which lack an epithelial lining. He showed that the straw-coloured fluid is an exudate, and believes that the cysts arise from damage to capillary walls during infection.

X-rays show a round, lightly opaque shadow, or a diffuse opacity, in the floor of the antrum. A case is shown in Fig. 8.

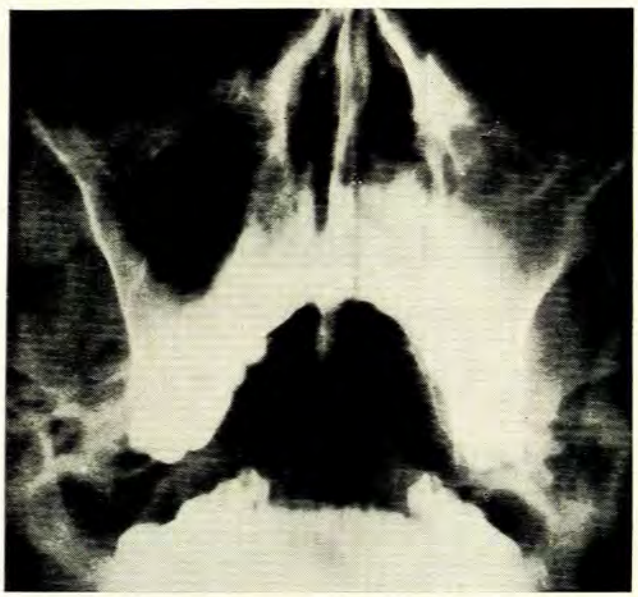

Fig. 8. Water's view of sinuses showing a mucosal cyst of the left antrum. Proof puncture yielded straw-coloured fluid containing cholesterol crystals.

MUCOCOELES

Mucocoeles are accumulations of mucoid secretion and desquamated epithelium within a paranasal sinus with distension of its walls. They may arise from obstruction of a goblet cell gland, or from obstruction of a sinus ostium.

Mucocoeles occur most frequently in the frontal and anterior ethmoid sinuses. I have reported the treatment of 14 such mucocoeles by drainage into the nasal cavity.[9] The frontonasal duct is widened by removing the anterior ethmoidal cells, and a Portex tube is left draining the frontal sinus for 3 months to prevent stenosis. An additional 2 cases are described below.

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Case 7. A 17-year-old Bantu female presented with a soft fluctuant swelling above the medial to the right eye, which had been enlarging progressively for 2 years. There was no history of trauma or sinusitis. The right eye was displaced forwards and laterally. Anterior rhinoscopy was normal. There was no diplopia.

X-rays showed erosion and displacement of the right superior orbital margin. The scalloping of the frontal sinus was almost obliterated. The left frontal sinus was absent.

A right frontal sinusotomy exposed a mucocoele of the right frontal and anterior ethmoid sinuses. An anterior ethmoidectomy was performed by the intranasal technique, and the frontonasal duct was widened from above and below. The lining of the mucocoele was preserved. A wide-bore Portex tube was left draining the frontal sinus for 3 months.

A diagnosis of fronto-ethmoidal mucocoele was made (Fig. 9).

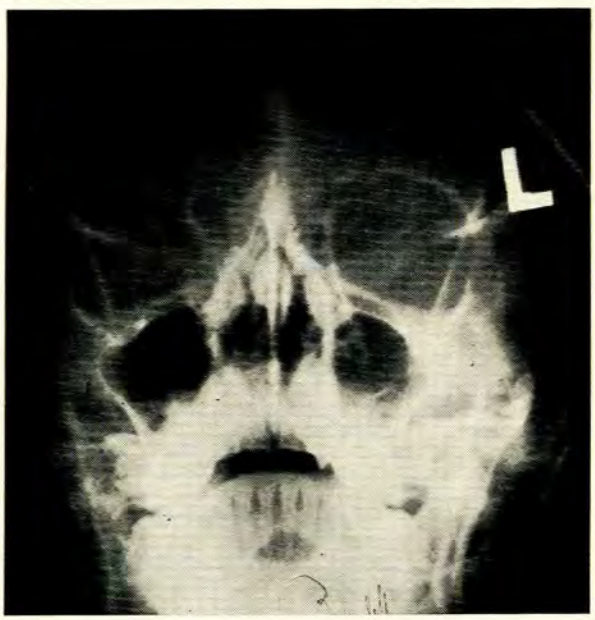

Fig. 9. Water's view of sinuses in case 7, showing right frontal mucocoele with erosion of the orbital roof. The left frontal sinus is absent.

Case 8. A 35-year-old Bantu male presented with right proptosis, diplopia, conjunctivitis and loss of visual acuity. Three years previously he had been assaulted, with resulting fractures of the right orbit. Healed scars were present on the forehead, and the roof of the right orbit was soft to palpation. X-rays showed fractures of the right orbit, displacement of the orbital roof by a cyst, and opacity of the right antrum and ethmoids.

A right frontal sinusotomy exposed a mucocoele of the right frontal sinus. This was multilocular and extended posteriorly as far as the posterior ethmoidal cells. Several of the loculi contained pus. The infected mucosa was removed, the anterior ethmoidal cells were exenterated, and a wide opening into the nasal cavity was established. This was intubated with a Portex tube for 3 months. A right proof puncture revealed thick pus and an intranasal antrostomy was performed.

This was a case of infected post-traumatic mucocoele of the frontal sinus, with right maxillary sinusitis (Fig. 10).

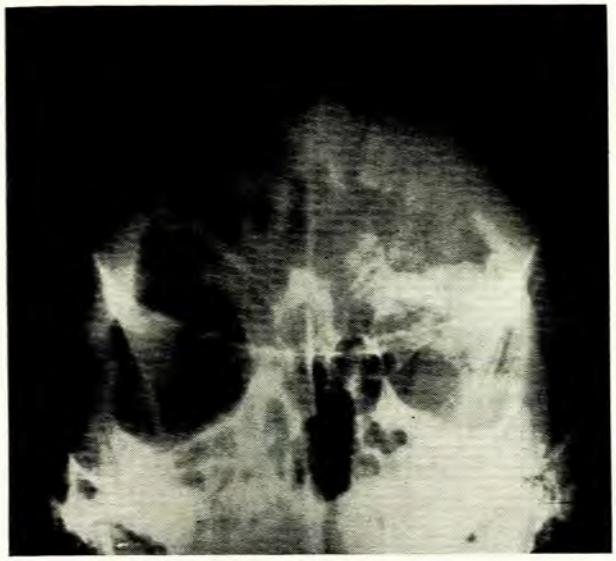

Fig. 10. Water's view of sinuses in case 8, showing right frontal mucocoele eroding the roof of the orbit. The right ethmoid sinus and right antrum are opaque.

Fig. 11. Water's view of antrum in case 9, showing a mucocoele of the right antrum, with multiple old fractures of the right orbit.

Mucocoeles of the antrum are extremely rare. Skillern[2] questioned whether they can occur. Differentiation of mucocoeles from other cysts of the antrum is problematical. Hardy[10] states that mucocoeles contain thick, gelatinous fluid, while 'antral cysts' contain thin, watery fluid. This may not be valid, as fluid specimens collected from mucosal cysts quickly become gelatinous. Mucocoeles are lined by columnar or cuboidal epithelium; dental cysts are lined by stratified squamous epithelium, and developmental cysts may be lined by either type. Dental and fissural cysts usually have a cavity which is separate from the maxillary sinus cavity.

Case 9. A 40-year-old Coloured male, was involved in a car accident in which he suffered multiple facial fractures. These were not treated and 13 years later he was referred to us from a nearby prison, with an appearance as villainous as his criminal record. A soft painful swelling 1 inch in diameter was present behind the right eye. The eye was normal, but was completely retracted behind closed eyelids. Rhinoscopy and dental examination were normal. X-rays demonstrated a depressed fracture of the frontal sinus with depression and sclerosis of the posterior wall. The superior and lateral walls and floor of the right orbit were fractured. The lateral wall of the antrum was opaque. A Caldwell-Luc operation opened a large cyst of the antrum which had eroded the anterior walls, lateral wall and roof of the sinus. Only the floor and medial walls remained intact. Thick glairy fluid was aspirated. The mucosal lining was not removed and a large intranasal antrostomy was created. A biopsy of the lining showed ciliated columnar epithelium covering a layer of connective tissue which was infiltrated by lymphocytes.

This was a post-traumatic antral mucocoele (Fig. 11).

Mucocoeles of the sphenoid or posterior ethmoid sinus are extremely rare. About 60 such cases are described.[11] They may present with proptosis, blindness, pain or paralysis of the eye muscles.

MISCELLANEOUS

Hiranandani and Melgiri[12] have reported a case of antrochoanal polyp which caused gross distension of the antrum. Mills[7] believes that antrochoanal polyps, which are frequently cystic in nature, are commonly due to extrusion of a simple mucosal cyst of the antrum through a normal sinus ostium.

Robinson[13] describes a haemorrhagic cyst of the maxilla—a very large cyst distending the palate and cheek– which developed over 15 years following trauma. It contained clear brownish-red fluid containing haemosiderin.

These cysts, and perhaps the mucosal cysts of the antrum described previously, could be termed pseudocysts, since they lack a definite histological lining.

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