

Section of Odontology

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President's Address

Cysts of the Jaw: A Long-term Survey of Types and Treatment

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Cysts of the jaws occur frequently, but familiarity should not breed contempt, for there are many pitfalls in diagnosis and treatment. The complicated development of the facial region leads to special problems and the classification of a cyst can be very difficult. There is lack of appreciation of the frequency of multiple cysts, while the problem of recurrence is not discussed in textbooks. To clarify these points an analysis was made of 320 patients, covering a period of fifteen years, consisting of all patients treated by me in private and at St George's Hospital together with all cases treated by me and by my colleagues at Mount Vernon Hospital. I am indebted to Mr A Thexton and Mr I Laws who assisted in the analysis. Table 1 shows the incidence of each type of cyst in the series.

Odontogenic Cysts

Dental cysts: Of the cysts considered to have developed from a dead tooth present at the time of operation, 40% were associated with the maxillary lateral incisor, 13% with the mandibular first molar and 9% with the maxillary central incisor. In comparison, only four dental cysts were found on the three upper molars, an incidence of about 1% for each tooth, a very significant difference for which there is no ready explanation. Ten more residual cysts occurred in the upper jaw than in the lower jaw, so the maxillary tooth may be extracted before the cyst is recognized, due to the greater difficulty of radiography in this area.

The high incidence of cysts of the lateral incisor is well appreciated, being related to the proximity of the coronal pulp to the surface, the irritant properties of synthetic fillings, the frequency of invagination and the liability to death of the pulp from trauma. It is also difficult to

Table 1

Incidence of each type of cyst in a series of 320 patients. Total number of cysts 336 ●

| | No. of cysts | % |
|-------------------------------|--------------|------|
| Odontogenic cysts: | | |
| Dental or residual | 214 | 63.7 |
| Dentigerous | 67 | 19.9 |
| Lateral periodontal | 9 | 2.7 |
| Primordial | 10 | 3.0 |
| Gingival | 1 | 0.3 |
| Total | 301 | |
| Non-odontogenic cysts: | | |
| Nasopalatine | 17 | 5.0 |
| Globulomaxillary | 11 | 3.3 |
| Median palatine | 0 | 0 |
| Nasolabial | 2 | 0.6 |
| Antral | 5 | 1.5 |
| Total | 35 | |

● Each tooth with multiple cysts is counted once only in this table

differentiate between dental cysts and the non-odontogenic cysts in this area. Hodson (1956) reported to this Section the presence of mucous cells in typical dental cysts so that the nature of the lining membrane is less helpful in classification.

Dentigerous cysts: The lower third molar is the commonest site for dentigerous cysts: in this study 13% of all cases and 59% of all dentigerous cysts. The condition was bilateral in only 2 cases. Some of these cysts are very large and the third molar may be grossly displaced and lie along the wall of the cyst, so that differential diagnosis from lateral periodontal and primordial cyst is more difficult. The upper third molar was associated with a cyst in 8 patients, being bilateral in one. In 2 cases the cyst became acutely infected following posterior superior dental injections. It is not easy to obtain good radiographs of this area: a well-rotated lateral oblique view can be made to project the tuberosity area free of superimposition, while a true lateral may show whether the area has a bony roof. The average age at operation for dentigerous cysts was 32, ranging from 5 patients aged 6-7 to a doctor aged 70 with bilateral cysts and another patient, aged 75, with a single cyst.

Lateral periodontal cysts: Dowsett (1932), in his Presidential Address to this Section, described what is clearly a lateral periodontal cyst. These are called by some authors 'lateral dentigerous cysts'; Standish & Shafer (1958) helped to establish the term 'lateral periodontal cyst'. This type of cyst does not develop as a result of increase of fluid in the normal follicular space around the crown of the tooth, but from a separate growth of epithelium arising from the 'rests' lateral to the tooth.

The average age of patients with these cysts was 20, ranging from 12 to 27, with one case aged 40. Three cases had swelling and 2 became infected. One patient also had an adamantinoma at the opposite angle, a further indication of abnormality of the dental formative tissues.

Six cases presented in the lower third molar region and 3 in the lower premolar region (Fig 1). This confirms recent reports that these cysts are more frequent at sites where supernumerary teeth are also common.

Primordial cysts: There is not full agreement that this term represents a separate entity, and much difficulty has been experienced in differentiating between lateral periodontal and primordial cysts: in one case the cyst was very like many described as primordial cysts but was at the site of a fourth molar (Fig 2). Histologically the lining can be classed as developmental or primordial. Another case (Fig 3), being very similar in type, is histologically not typical of a primordial cyst.

For a long time I have tried to cling to the simpler terminology which used the term 'dentigerous' for a cyst related to a vital tooth, whether pericoronal or lateral, and the term 'periodontal' for a cyst related to a dead tooth, whether apical or lateral. Stones (1962) employs a classification having many sub-groups. I have used the simpler classification with some mis-giving, being influenced by two points: (1) It would be necessary to determine the vitality of the pulp of the teeth in order to describe the cyst correctly. (2) The lateral cyst must reasonably develop from the epithelial 'rests' lateral to the tooth in the region of the periodontal attachment. The histopathologists now consider that they can differentiate between the dental cyst, related in some way to the stimulus of infection from a dead pulp, and the developmental cyst. This is of some importance clinically.

We are actively engaged in resolving this problem. It seems to be reasonable that infection should alter the nature of the cyst wall as well as the osmotic pressure of the contained fluid. Chronicity will give a fibrous reaction and therefore an adequate tissue plane to facilitate enucleation. Relatively rapid enlargement in size could reasonably be expected to lead to a more

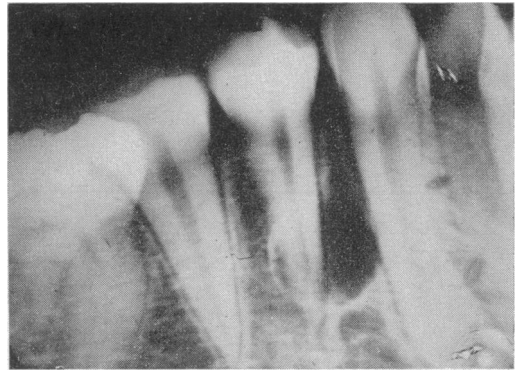


Fig 1 *Lateral periodontal cyst on $\bar{4}$ in a boy of 13. Removed and sectioned. Lining of primordial or developmental type*

tenuous lining closely adherent by osteoclastic action to the surrounding bone, thus making enucleation very difficult. These are my clinical findings and I trust that work will proceed on the nature of the contents and on the osmotic pressures developed as well as upon histological differentiation.

Very large cysts in relation to vital teeth occur in the maxilla but are not always called primordial. The cyst entirely replaces the maxillary antrum and forms one group of the old 'hydrops antri', a term which must disappear as diagnosis improves. It is entirely reasonable to suppose that a large cyst of dental origin so easily recognized in the mandible must also develop in the maxilla. The problems presented by cysts of this type have been previously reported (Fickling 1957).

Gingival cysts: Apart from those seen in infants, gingival cysts seem to be very rare. There was only one in this series, which developed in a year over the root of $\underline{2}$; it was of 5 mm radius, and limited lip movement. The dome was removed under local anaesthesia and the base left *in situ*. The root of the lateral incisor did not appear to be directly related to the wall of the cyst. It will be appreciated that there is little difference between this cyst and a lateral periodontal cyst. I have regarded this case as an example of a mucous cyst of the attached gingiva, but it could also arise from traumatic implantation of epithelium.

Non-odontogenic Cysts

The problem of diagnosis of globulomaxillary cysts has already been mentioned. Nasopalatine cysts (Fickling 1964) can be divided into cysts of the incisive canal and cysts of the palatine papilla, the treatment of each being slightly different, but for simplicity they are here grouped together. Contrary to what is often described they can be asymmetrical. I myself and several of

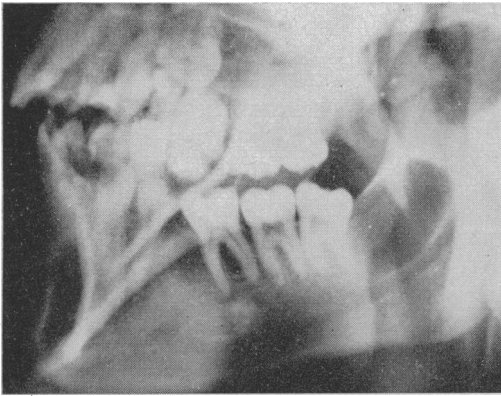


Fig 2 Cyst at site of fourth molar. Lining of developmental or primordial type

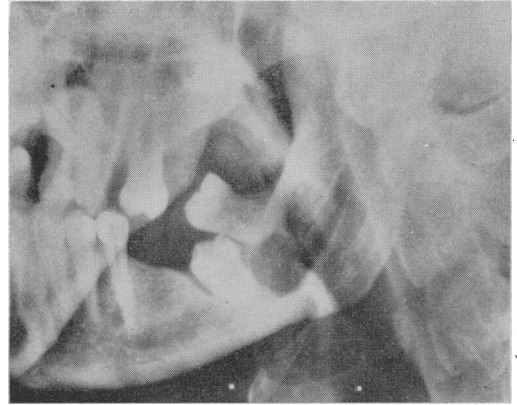


Fig 3 An infected cyst which might be placed in several categories; 78 had vital pulps on section

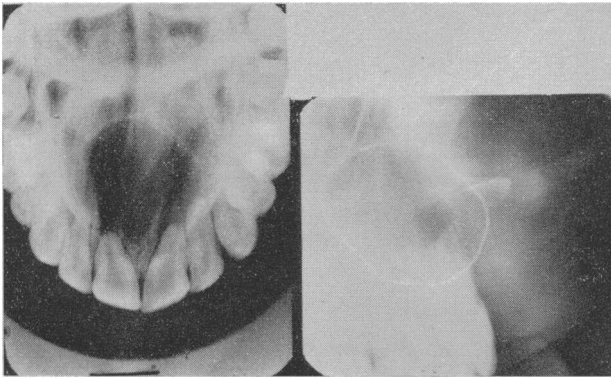


Fig 4 A very large nasopalatine cyst showing forward extension in the region of the nasal spine. Treated with a cyst plug from a palatal approach. Vitality of all teeth preserved

my colleagues have never seen a median palatine cyst. Although 2 cases approximated to the classical description, each appeared to be a large nasopalatine cyst. Expansion forward into the labial sulcus was well marked in one case (Fig 4) and complete regression of this aspect has been achieved by a cyst plug operation. The approach was made from the palate, a two-stage procedure being planned. It is hoped that this more anatomical approach will avoid the failure to regress in size which is a difficulty in the conservative treatment of these cysts.

Antral cysts: These occurred in the premolar and molar region in close association with the maxillary sinus and exhibited a respiratory type epithelium. Two cases were associated with previous antral surgery and could be classified as the surgical ciliated cyst of Gregory & Shafer (1958) which seems an appropriate name.

Multiple Cysts (Table 2)

Twenty-six patients in this series had more than one cyst present in the mouth. Recurrence leading to daughter cysts and a history of an earlier cyst were excluded. Fourteen cases were related to

poor oral hygiene in caries-prone mouths: 8 had two cysts, 4 had three cysts and 2 had four cysts; they were present in all quadrants of the mouth but occurred twice as commonly in the mandible. Double cysts occurred on three lower first molars; one second molar had four separate cysts. Of more interest are the multiple cysts of developmental origin which were found in 12 patients: 2 cases had bilateral globulomaxillary cysts; one case presented with symmetrical nasolabial cysts; in another there were two lateral periodontal cysts on the same tooth; and 7 cases had two dentigerous cysts, but not always symmetrical.

During the years under review there was only one example of the true multiple cyst syndrome (Cawson & Kerr 1964). This man had treatment at another hospital for three cysts, one of which

Table 2

Multiple cysts present in 26 patients (8% of patients with cysts)

| Type of cyst | No. of patients | No. of cysts | | Total |
|--------------------------|-----------------|--------------|------------|-------|
| | | Maxillary | Mandibular | |
| Dental or residual | 14 | 12 | 24 | 36 |
| Developmental, all types | 12 | 13 | 11 | 24 |

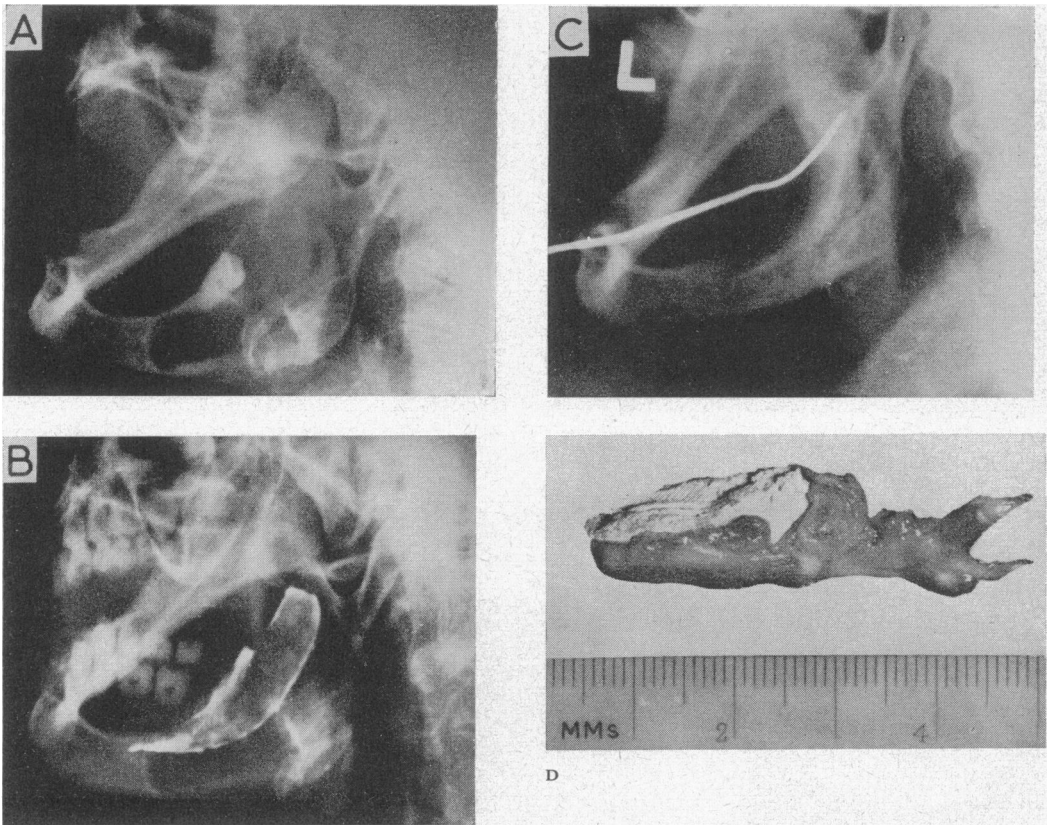


Fig 5 A, large dentigerous cyst treated in two stages. B, a large cyst plug was employed but regression left a narrow adherent lining, not seen in normal radiographs, but outlined by a probe in radiographs (C). D, the specimen removed at the second operation confirms the extent of tissue remaining (filling employed to improve photography). This case could have been considered healed at stage C, with the likelihood of recurrence

was complicated by a fractured jaw, and had three cysts treated by me. His skin shows some pigmented marks and he has had an osteotomy for mandibular prognathism. His mother was also operated upon for a cyst of the jaws.

The incidence of multiple cysts reported here would seem to justify routine radiographs of the various segments of the jaw prior to operation and particularly in cysts of developmental origin. A patient who has had a dentigerous cyst and who has a buried tooth for which operation is not advised should have radiographs at intervals to check for cyst development.

External Sinuses

Three cysts became infected and discharged on the face, giving the typical chronic sinus. One of these arose from the right upper lateral incisor presenting with a large area of infected granulation tissue in the infra-orbital region. The 2 other cases arose from lower incisors with the sinus on the chin. In each case the cyst was enucleated, the

surface sinus and track excised and the external wound carefully closed in accordance with normal practice. All healed by first intention.

Pathological Fracture Associated with Cysts

Although many fractures are referred to the Maxillo-Facial Unit, only 5 cases of pathological fracture were seen in fifteen years. It is not possible to lay down a plan of treatment for these cases in advance, for there are many variable factors. If there is little displacement union can be quite rapid, so that initially very little may be required, the cyst acting as a splint.

When there are no roots of teeth in the area of the cyst, and the fracture is not compound into the mouth, this does seem to be an indication for enucleation by an extra-oral incision, the cavity being filled by a chip bone graft from the iliac crest.

Of the fractures occurring after enucleation, only one required treatment and in this case union was much delayed due to displacement.

Treatment of Cysts of the Jaws

In oral surgical practice cysts are so commonplace that, like wisdom teeth, the principles of treatment may be overlooked. They can be enunciated as follows:

- (1) *Treatment of the patient*: To the patient the cyst is a growth and may be a cancer: every care must be taken to choose words which refute this and reassure the patient. In discussing with the patient a large cyst of the ramus, one must be wary lest the hint of recurrence be misconstrued and explain precisely how simple is the *physical* problem although the surgery may be complicated.
- (2) *Treatment of the cyst*, achieved so that the chance of recurrence is made minimal with the least discomfort in the shortest time.
- (3) *Preservation of adjacent structures*, including teeth, maxillary sinus, nasal floor or mandibular nerve, whenever this is possible.

Table 3

Methods used in treatment of 336 cysts

| Method | No. of cysts | % |
|---|--------------|------|
| Enucleated and closed by suture | 163 | 48.5 |
| Enucleated and packed open | 85 | 25.3 |
| Lining left, cavity saucerized | 16 | 4.8 |
| Lining left, small opening maintained by cyst plug | 53 | 15.8 |
| Opened into antrum or nose, mouth closed | 8 | 2.4 |
| Enucleated by extra-oral approach, wound sutured | 11 | 3.3 |
| Treated by apicectomy in addition to one of the above methods | 22 | 6.5 |

Some teachers simplify treatment to three techniques, but I have always taught that there are seven different methods – eight if a deliberate two-stage operation is added (Table 3):

- (1) Enucleate the cyst lining completely and close the intra-oral incision. This is the ideal, but closure should only be carried out when the operator is clinically certain that enucleation has been complete. In Europe this is called Partsch I (Partsch 1892).
- (2) Enucleate the cyst and open widely to the mouth. This is indicated when enucleation has proved so difficult that it might be incomplete or when the cyst is so large that, even with antibiotics or space-filling materials, breakdown might occur if the wound is closed. The resulting cavity fills quite rapidly.
- (3) Uncover the cyst by removing the oral bony wall over a *wide* area and leave the lining. This is the operation described by Dowsett (1932) who added the suture of the buccal wall to the remaining lining. Although less popular now this method goes some way to avoiding damage to the max-

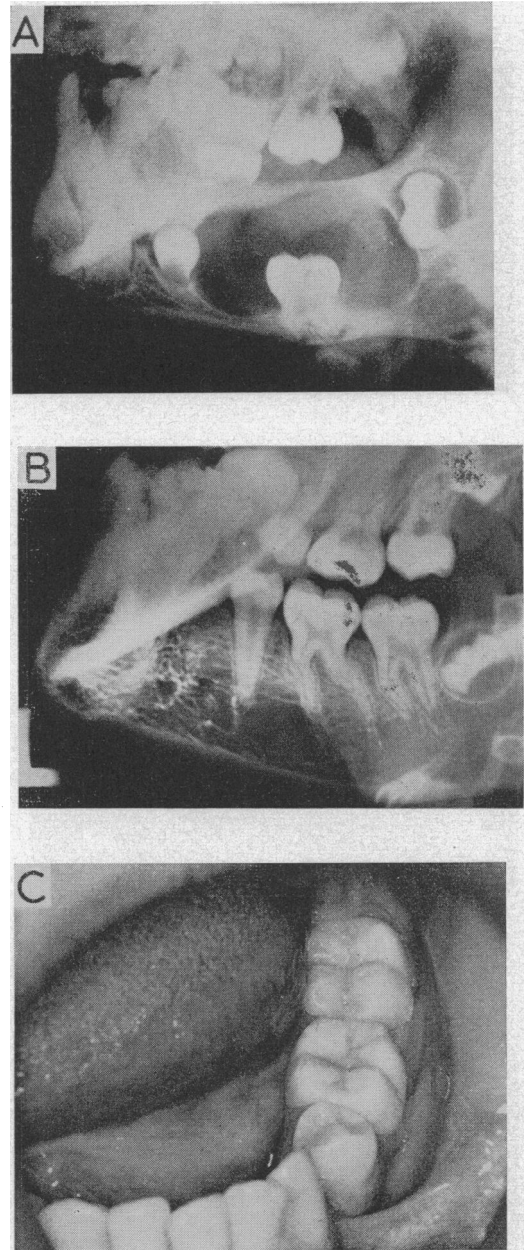
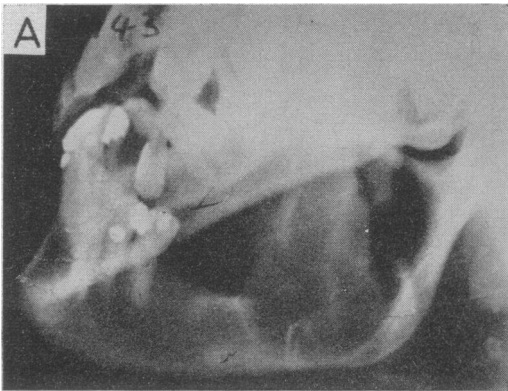


Fig 6 A, large dentigerous cyst at age 7 treated conservatively with a cyst plug. B, development of 678 six years later. C, the teeth are in correct occlusion without orthodontics

illary sinus, nasal floor or mandibular nerve and teeth, and causes very little constitutional disturbance in elderly patients or in those with intercurrent disease which might lead to poor healing. In Europe this is called Partsch II (Wassmund 1935).



(4) Make a relatively small opening, leave the lining and employ a cyst plug to maintain the opening until regression has occurred. This is specially suitable for large cysts in sites which cannot be saucerized or opened widely, such as the tuberosity and ramus. The reasons for employing this method in 16% of cases are shown in Table 4 and I consider it a valuable procedure, especially when combined with delayed enucleation as a two-stage operation.

(5) Open a maxillary cyst widely into the antrum and nose, perform a nasal antrostomy and close the oral incision. This is specially valuable for cysts which can be demonstrated to be leaking into the nose and for antral cysts. The resulting

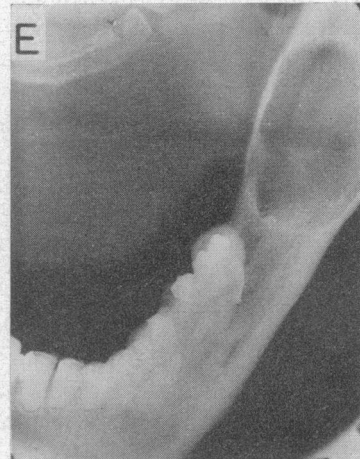
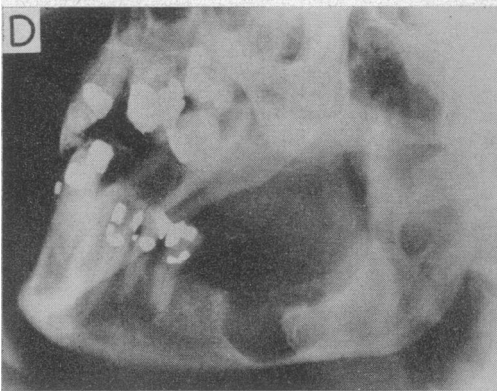
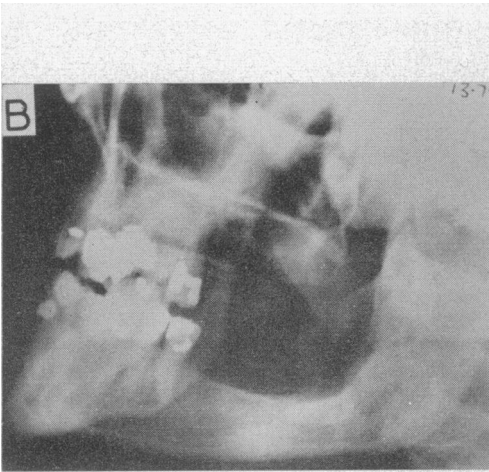


Fig 7 A, large cyst of ramus recurring after enucleation nine years previously; treated with a cyst plug; regression appeared to proceed satisfactorily. B and C, six years later radiographs in two planes appear normal. D and E, sixteen years after the second treatment a recurrence develops in the area previously free from evidence of cyst

Table 4

Indications for retention of cyst lining, and the use of a small opening maintained by a cyst plug in 53 cases

| Indication | No. of cases |
|--|--------------|
| Preservation of vitality of adjacent teeth | 6 |
| To permit eruption in a dentigerous cyst | 9 |
| Proximity of maxillary sinus | 18 |
| For large cysts of the ramus | 13 |
| Simplicity in the aged | 4 |
| Other reasons | 3 |

cavity tends to be dependent, but should regress in size; not all remain free from some antral symptoms.

(6) Make an extra-oral approach by a sub-mandibular incision, which implies enucleation and closure.

(7) Leave the cyst alone, a technique of non-intervention indicated, rarely, in the very aged or infirm, which should be remembered by every surgeon.

(8) *The Two-stage Operation* (Fig 5)

This is not original, but I do not think the need is sufficiently appreciated. I think it could be planned in more cases and the patient told in advance exactly why it is to be undertaken. A carefully-shaped cyst plug is not very uncomfortable and should be worn for at least one year. After that time enucleation is much simplified and the cavity can either be closed if suitable flaps can be prepared, or packed and allowed to granulate.

A two-stage operation is also indicated on a much smaller scale when an attempt is made to maintain the vitality of anterior teeth which would be endangered if a cyst were enucleated. Such a cyst plug must be worn day and night for about one year and the enucleation in the narrow space available is not easy. It is well known that the non-odontogenic cyst regresses very slowly and this method may not be successful.

The problem of teeth adjacent to the cyst can be solved by preserving the vitality of the pulps and avoiding enucleation in the apical area until the cyst has regressed naturally; by root filling and apicectomy; and by extraction.

In my view the type of operation may have to be modified according to the findings within the cyst. In all cases the original incision should be so planned that it is capable of accurate closure and this is specially important whenever the maxillary sinus might be involved.

In the treatment of cysts there are two procedures which give the greatest satisfaction to both operator and patient:

(1) The method described so well to this Section by Evelyn Sprawson (1927) by which a permanent tooth displaced by a dentigerous cyst can be allowed to erupt into the arch and become functional. Nine cases in the series were treated in this way (Fig 6). Unfortunately the tooth involved proved to be hypoplastic in 2 cases, suggesting that the abnormality occurred early in the development of the tooth.

(2) The preservation of involved teeth either by apicectomy or by achieving regression in size prior to enucleation. Every care must be taken to prevent cyst fluid entering the tooth during root filling, for in my experience these teeth become very grey in colour. Root filling should be performed before operation and carried not to the apex but into the area of the apicectomy only. Apicectomy was used in 22 patients in the series, involving 28 teeth. A very oblique radiculectomy may well be necessary and yet successful.

The extra-oral approach has been used for three main reasons: (1) As a means of access to cysts low on the lingual side or dentigerous cysts involving teeth very low in the mandible. (2) Lest the lesion be an adamantinoma, when material can be taken for histological examination and the wound closed, thus avoiding an intra-oral wound prior to excision. (3) For cysts complicated by pathological fracture. There was a high incidence of recurrence following an extra-oral approach and it would seem that it should be reserved for special cases. It is certainly not the most suitable method for large cysts of the ramus when it may lead to considerable loss of bone which does not seem to be replaced.

Cyst Epithelium and Neoplastic Change

Nothing that has occurred in twenty-nine years of operating has caused me to be frightened of the epithelial lining of cysts. When wiped clean of contents most cysts present a beautiful epithelial surface and can look equally perfect histologically. At the same time I have a healthy regard for its potentiality for friability, adhesion and recurrence. As large a portion as possible of every cyst lining should be sent for pathological examination, the whole cyst when enucleated or the whole area of the opening when only access is obtained; this access should be large enough to permit the removal of contents and search for hyperplastic areas, of which several may be present in the same cyst; they should always be removed for histological examination but frequently prove to be simple areas of overgrowth or heaping up of epithelium.

During the fifteen years covered by this series 3 cases showed an abnormality of the lining membrane. In one case a large cyst enucleated

from the mental region was reported as a dental cyst and yet recurred in eighteen months as an adamantinoma. The original sections have been rechecked and it must be assumed that the adamantinomatous area, if present, was not noticed and not sectioned.

The second case was an exceedingly large dentigerous cyst filling the mandibular ramus. A two-stage operation was planned and the entire lining enucleated as the first stage. There was a small hyperplastic area at the anterior end which was reported as adamantinoma. One year later, when bone had regenerated, the healing tissue was again enucleated with removal of the tooth. The patient was recently re-examined and there has been no recurrence at twelve years; it is, of course, appreciated that the cycle of adamantinoma can be longer than this.

The third case was an epithelioma of the mandible which was centred upon and involved a large dental cyst. Hankey & Pedler (1956) and Kay & Kramer (1962) have reported cases in which squamous carcinoma appears to have originated in a dental cyst. Nevertheless, the incidence of carcinoma being what it is, the number of cases reported in association with cysts is very small and does not justify a reassessment of methods of treatment.

The Problem of Recurrence (Table 5)

The causes of recurrence after operations upon cysts can be grouped as follows:

- (1) Ineffective original enucleation, some lining being left and the cavity sutured: (a) Adhesion of lining to periosteum, muscle insertions or mandibular nerve leading to incomplete enucleation. (b) Extremely tenuous lining making enucleation almost impossible.
- (2) Failure of a pack or cyst plug to ensure healing from the depth of the wound.
- (3) Natural closure of a cyst-antral communication made at operation (one case).
- (4) True budding or daughter cyst formation of the cyst wall which can be left behind after apparently effective enucleation.
- (5) Possible multi-centre potential: Can a second cyst of primordial type develop *de novo* after a competent and complete operation (Fig 7)?

It is possible that epithelium of developmental or primordial type has a true tendency to recur for one of these last two reasons. Speaking as a clinician, however, and after careful analysis of my own and other cases of recurrence I feel that more are related to a surgical failure: more than half the recurrences followed large cysts of the ramus. The thin cortical plate of the ramus is soon resorbed so that the cyst wall becomes

Table 5

Recurrence after cyst operations in 20 cases (6% of total cyst cases; 17% of 117 large cysts)

| | No. of cysts |
|---|--------------------------------|
| <i>Site or type of cyst</i> | |
| Angle and ramus | 11 |
| Originally a dentigerous cyst on a lower wisdom tooth | 8 |
| Lining of primordial type at second operation | 9 |
| Very tenuous lining at second operation | 4 |
| Maxillary non-odontogenic | 3 |
| Maxillary dentigerous cyst (8) | 1 |
| <i>Procedure at first operation</i> | |
| Intra-oral operation, details uncertain | 9 |
| Extra-oral approach with enucleation | 4 (33% of external operations) |
| Lining left, pack or cyst plug | 5 |
| Opened into nose and mouth closed | 1 |
| Enucleation, space-filling foreign body and closure | 1 |

adherent to the periosteum and to the fibrous muscle attachments. Adhesion to the mandibular nerve is not so common, but the nerve can be enveloped in a sort of mesentery and the cyst can herniate through the mandibular foramen along the nerve.

It is possible that a primordial cyst in the body of the mandible has a predilection for expansion on the lingual side of the mandible, giving a spherical break-through near the lower border in the molar region with adhesion to periosteum. While some linings lift away with the suction nozzle so that they cannot be left *in situ*, others are extremely tenuous or adherent so that there are cases in which true surgical enucleation is impracticable. Earlier I treated these with a cyst plug carried deep, but it failed in 2 cases. Clefts and deep pits are left which can be found with a probe; if they are ignored the mouth wound will heal but the adherent epithelium remains and a daughter cyst develops.

This is, in general, my view of recurrence. I think in every case the intra-oral approach should be made and the type of operation settled by the clinical findings. In all difficult cases the two-stage operation should be considered.

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