

# Section of Pathology.

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## The Pathology of Dental Cysts.

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DENTAL cysts are among the commonest cysts of bone. Their association with the teeth, the problem of the origin of the epithelial lining and the high cholesterol-crystal content are features of special interest. Whilst the direct connection of dental cysts with the roots of carious teeth has been well recognized clinically, histological study of the so-called chronic abscess-sacs, or dental granulomata, which occur on the roots of carious teeth, has shown that these contain epithelium and represent the precursors of dental cysts.

An account is given here of observations which support the hypothesis that the epithelium of dental granulomata and cysts is derived from the surface epithelium by ingrowth along a sinus resulting from peri-apical suppuration. Reference is also made to the phenomena which result in cyst formation.

The generally accepted view of the origin of the epithelium of dental granulomata and cysts is that of Malassez [4]. This worker described small islets of epithelium in the normal periodontal membrane, giving them the name "paradental epithelial debris," and showed that these were remains of epithelium associated with the enamel organ. Malassez advanced the hypothesis that these epithelial rests proliferated under the stimulus of infection and gave rise to dental granulomata and cysts. It is of interest that he also attributed the origin of adamantinomata to the epithelial rests—a hypothesis which is in line with Cohnheim's embryonal rest theory. Grawitz [2] formulated the hypothesis that the epithelium of dental granulomata and cysts was derived from the surface epithelium, which grew into a sinus track formed by discharge of a peri-apical abscess. Adloff [1] and Schuster [7] cited cases in support of Grawitz. Further confirmation was given by Adloff and Proell [6], who recorded dental cysts lined by ciliated columnar epithelium, which they considered to be derived from the maxillary antrum.

Three new cases described below confirm Grawitz' hypothesis. In each case continuity of epithelium occurs, extending from a sinus opening on the surface to the apex of a tooth.

In one case (fig. 1) a carious tooth was obtained with the surrounding tissues from the post-mortem room and cut serially. Caries had penetrated to the pulp, the pulp chamber was filled with salivary calculus and an area excavated in the peri-apical bone was occupied by a dental granuloma. A patent sinus completely lined by stratified squamous epithelium extended from an opening in the labio-gingival sulcus to the apical granuloma, where the epithelium formed a network which enclosed a minute residual abscess. The area surrounding the sinus and granuloma was fibrosed and infiltrated with plasma cells and lymphocytes, whilst the lumen of the sinus was occupied by degenerate leucocytes and desquamated epithelial cells.

In another case (fig. 2) serial sections were prepared of tissue obtained from a subject who had a chronic discharging sinus of the gum in connection with the root of a carious tooth. Sections of the tooth with the surrounding tissues showed an elongated abscess cavity lined by epithelium and extending from an epithelial network at the tooth apex to a sinus opening in the oral mucous membrane. The epithelium at the apical foramen formed an occluding plug, thus excluding the exposed tissue at this point from the open pulp cavity.

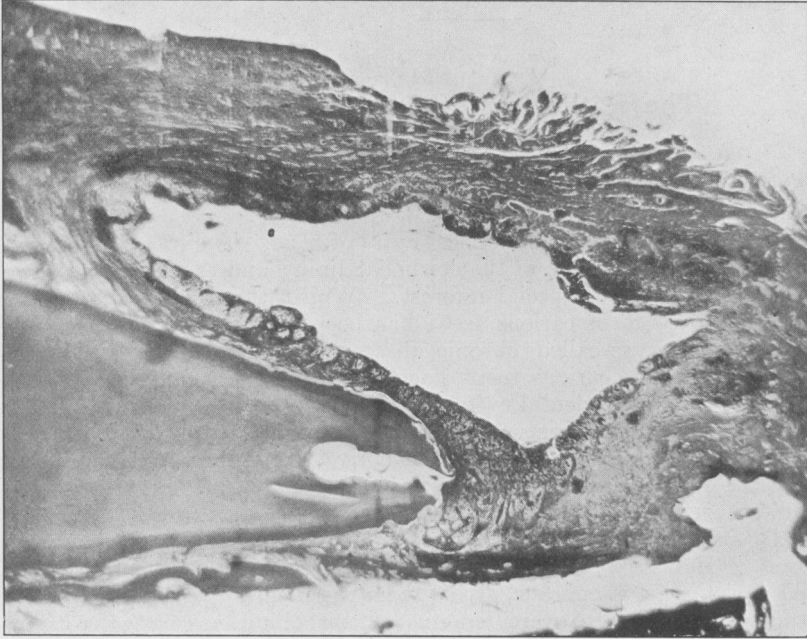


FIG. 2.—Epithelium-lined cavity in connection with the apex of a carious tooth. Here an abscess cavity has become lined by epithelium derived from the surface, where a sinus was present. (X 12).

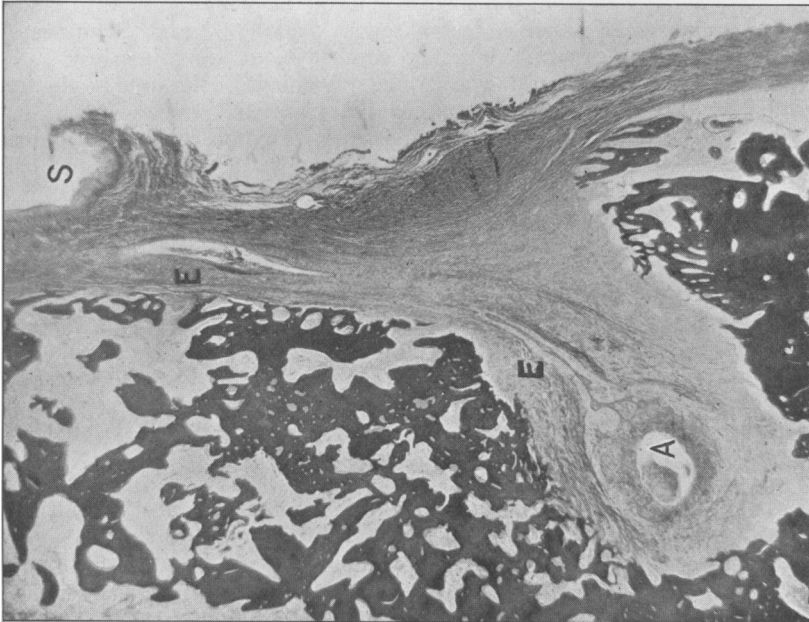


FIG. 1.—Section from serials of epithelium-lined sinus arising at the apex of a carious tooth. In the apical region (A) is a space lined by epithelium. The sinus opened at the labio-gingival sulcus (S). Portions of the sinus are seen at E, E. (X 12).



FIG. 4.—Small dental cyst. The cavity is occupied by necrotic material showing large numbers of cholesterol clefts, whilst epithelium has only partially lined the cyst. From the root of a carious tooth. ( $\times 12$ ).

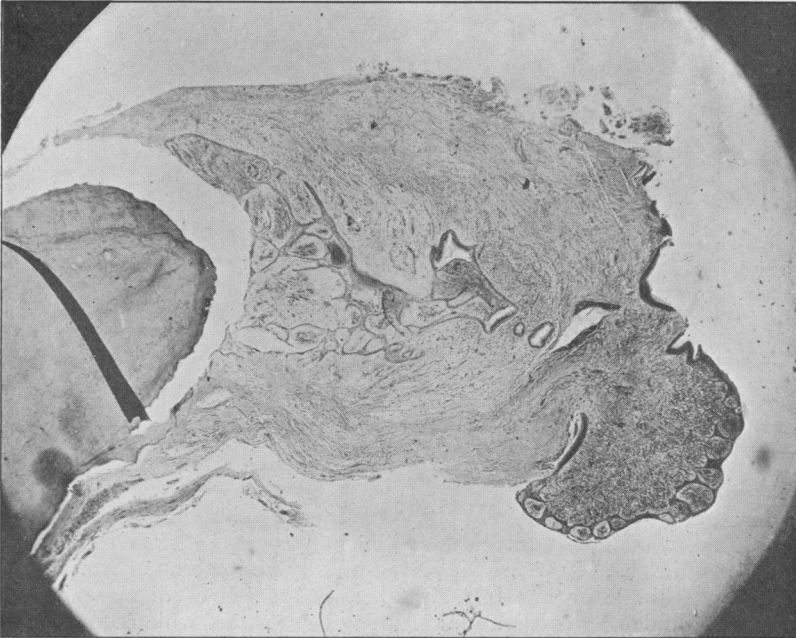


FIG. 8.—Dental granuloma from the apex of a maxillary tooth. Epithelium extends from the tooth apex to the maxillary sinus. Portions of the epithelium are of the ciliated columnar type. ( $\times 36$ ).

In the third case (fig. 3) continuity of epithelium existed between a root apex and the maxillary antrum. The epithelium shows areas of well-defined ciliated columnar epithelium but in parts this has undergone transformation into stratified squamous epithelium.

In the three cases described above epithelium has reached the peri-apical tissue of the tooth from the surface. Examination of a number of dental granulomata removed with extracted teeth shows that the epithelium has a characteristic arrangement. The epithelium forms a layer in contact with the tooth surface around the apical foramen, often with the intervention of a stratum of keratinization. From this layer of epithelium a slender network, which in some cases encloses



FIG. 5.—Small dental cyst incompletely lined by epithelium.

( $\times 40$ ).

a residual abscess, projects into the neighbouring chronically inflamed fibrous tissue. The whole is enclosed by a well-marked condensation of the peripheral tissue forming a capsule.

Whilst most granulomata remain at the stage in which inflammatory phenomena appear to be quiescent, a small number show signs of progress of the chronic infective process, by increase in size of the area involved and by indications of tissue necrosis. The latter occur as single or multiple circumscribed areas of disintegrated tissue which become surrounded by epithelium. Among the tissues which have been seen to undergo this process in dental granulomata are—chronic abscesses, areas of necrotic connective tissue densely infiltrated with cholesterol crystals, masses of

closely packed fat-granule cells and minute hæmorrhages; evidence of red-cell disintegration is seen in pigment-loaded phagocytes. These areas of necrosis may often be seen partially surrounded by epithelium which extends along the living tissue at its junction with necrosed tissue, just as epithelium grows over the granulations of a healing ulcer.

The phenomena would appear to be similar to those described by Powell-White [5] and Ledingham [3]. The former showed that the injection of pure oleic acid into the subcutaneous tissue of rabbits and mice produced abscesses which acquired a lining of epithelium derived as he said from chance contact with either epidermis, hair follicle, or sebaceous gland. Ledingham demonstrated that experimentally produced abscesses in rabbit dermis became lined with epithelium, and called



FIG. 6.—Portion of wall of large dental cyst, showing lining of stratified squamous epithelium. (× 120).

attention to the similarity of the phenomenon to that described by Powell-White. He states that: "It would appear that the epithelial covering of tardily absorbed abscess matter is a perfectly normal physiological process." A precisely analogous process takes place in the acquisition of an epithelial lining by necrotic tissue in the formation of dental cysts.

The constant presence of fat-granule cells and cholesterol crystals in the larger dental granulomata and cysts is apparently the result of tissue disintegration in a well-encapsulated focus with imperfect removal of the products. In the early stages fat granule cells appear singly amongst the chronic inflammatory cells and in crescentic masses at the periphery of necrotic areas. Later, cholesterol crystals

appear in the connective tissue in small groups and larger closely packed masses. Single crystals are sometimes enveloped by giant cells as has been described by Stewart [8]. Finally, cholesterol crystals are the sole recognizable contents of the cysts, and their constant presence in large numbers constitutes a striking and characteristic feature of dental cysts.

#### Summary.

(1) Three cases are cited supporting the view that the epithelium of dental granulomata and cysts is derived from the surface epithelium by ingrowth along a sinus track. In one case the sinus led into the maxillary antrum, and was partially lined by ciliated columnar epithelium.

(2) Dental cysts are formed by tissue necrosis resulting from chronic inflammation.

(3) The epithelial lining is derived from the ingrowth of surface epithelium along tissue surfaces which abut on necrotic areas. Similar phenomena have been described by Powell-White and Ledingham.

(4) The products of tissue disintegration constantly include large numbers of cholesterol crystals.

In conclusion I should like to express my thanks for the interest and help of Professor James McIntosh and Dr. S. L. Baker, of the Bland-Sutton Institute, where the work was carried out.

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### Three Avian Fibro-sarcomata.

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DURING these last two decades, widespread scientific attention has been frequently concentrated on the avian sarcoma originally described by Peyton Rous in 1910. This particular strain of laboratory tumour has been extensively investigated by numerous different methods, and as a result some authors hold that, owing to the ease with which it can be transmitted in fowls, either by the injection of Berkefeld filtrates or the inoculation of dried powders, it should be considered a "blastoid" or something in the nature of an infectious granuloma and not a blastoma or tumour. Others instead believe that it is a true sarcoma, in every way analogous to those occurring in mammals, but more particularly in man; it follows, according to the latter view, that all tumours of fowls are due to filterable agents and that as a logical conclusion any experimental fact observed on this strain of Rous No. 1 must also be applicable to sarcoma, or even carcinoma, in man.

There appears to be some justification for these several conflicting views, since some time after the publications of Rous and those of Fujinami, Pentimalli (1916) described a similar sarcoma which he succeeded in transplanting in the first attempt