

have acquired this shape by any known pathological process. If it were not that no reference can be found to any such human variation of the appendix, in either disease or health, one would be inclined to class it among the multifarious forms in lower animals, where in a monkey, an anteater, and some birds, the appendix has this actual shape (Howard A. Kelly).

As regards the personal history of this patient, the only facts I could elicit were that he had been a large eater, and only slightly affected with constipation, if noticeably at all. From the first notice of disease to the day of operation only nine or ten days had elapsed, and he had never before been similarly affected. If this strange appendix had ever been highly charged with morbid products, there was no lack of room for their admission into the caecum by the fairly wide passage between the two; but the absence of mucous membrane over such an extent would seem to have permitted the absorption by imbibition of toxic products, accounting for the fever, pain, and inflammation.

My friend, Dr. O. T. Williams of Liverpool, has for some time past been engaged in a special study of the pathology and chemistry of appendicitis and mucous colitis, and finds the present case and specimen an apt illustration of some of his conclusions. For a detailed account of his studies I may refer to the BRITISH MEDICAL JOURNAL of July 27th and August 17th, 1907, and to the *Biochemical Journal*, vol. ii, No. 9; but I here add an epitome of the same, written for me by himself, with his description and criticism of my specimen:

The Etiology of Appendicitis.

The appendix, normally, as the result of age, undergoes involution, with which is a certain amount of fatty degeneration, especially in the submucosa. I have studied the nature of this change and found it to bear no comparable relation to the fat changes which the walls undergo in cases of appendicitis, where in cases even in young children the mucous membrane, and especially the submucosa, shows the formation of large quantities of calcium soaps. The latter often form a dense ring in the submucosa. They can in some sections be seen to be forming the concretion which I have shown to contain these same soaps. These soaps are again found in "intestinal sand"—in a malady which is closely allied clinically to appendicitis. The conclusion arrived at is that in these (and in certain other conditions) there is an abnormal production of these soaps. In appendicitis they so lower the vitality of the mucous membrane as to make the invasion of organisms an easy matter.

Mr. Parker's Specimen.

There is a large distended appendix consisting of two main divisions. The distal part is a large globular cavity which contained the material mentioned as having been emptied; some of it being still adherent to the sides. The proximal part shows the wall very much thickened by hypertrophied muscle, probably due to the attempts to empty the above material into the lumen of the bowel. The material examined is found to consist of calcium carbonate, fat, and calcium soaps. The probable explanation of the condition is that the calcium soaps formed in the submucosa and mucous membrane, were excreted into the lumen of the appendix, and so dilating it considerably; the large amount of hypertrophy of muscle even failing to discharge it. Later the calcium soaps still further decomposed, producing a certain amount of calcium carbonate.

The degeneration and distension has caused the disappearance of the whole of the mucous membrane.

A CASE OF COMPOUND FOLLICULAR ODONTOMA.

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(Exhibited in the Surgical Section at the Annual Meeting, 1907.)

In the following case more than 100 denticles were removed from the lower jaw by several operations, and the treatment extended over a long period.

History.

W. B. was a well-developed and healthy boy. When 11 years of age a swelling was discovered by his parents on the right side of the mandible, and it was then regarded as only an ordinary dental trouble. It caused no pain, only a feeling of stiffness and discomfort in the mouth, especially after eating. During the next four years the tumour increased in size and rendered mastication difficult. On several occasions he was

examined by medical men, and his parents were informed that the growth was probably of a dangerous character.

Condition on Admission to the Hospital.

The late Dr. Crouch of Gosport sent the patient to me in 1896. He then appeared in good health, and complained only of the increasing swelling of the jaw, which prevented him opening his mouth and greatly impeded mastication. There was considerable disfigurement of the right side of the face. The tumour involved the mandible behind the bicuspid region, and extended backwards to the angle and ramus. The mouth appeared to be half filled with a growth, and the teeth could not be separated more than $\frac{1}{2}$ in. The post-nasal space was free, and deglutition was not obstructed. (See Fig. 1.)

Treatment.

An exploratory operation was at once performed. An incision was made downwards and outwards about an inch from the angle of the mouth, the thickened and vascular structures were freely divided, and a hard nodular surface exposed. By the aid of the gouge, elevator, and mallet, the outer wall was broken away and the denticles removed (shown in Fig. 2). In a few days the patient was considerably relieved, the spasm of the muscles of mastication subsided, and soft food could be taken with greater ease.

At the end of eighteen months he was readmitted into the hospital. A second operation was performed, and more denticles and small and dense bony masses (Fig. 2) were dug out of the cavity in the direction of the angle. Free hæmorrhage followed, and the hole in the jaw required plugging for several days. In the course of a few weeks a superficial abscess formed, and fragments of necrosed bone came away spontaneously. The mouth was very carefully and constantly deodorized. Favourable changes again set in—the swelling of the face gradually diminished, the mouth could be more freely opened, and he was able to take food with comfort. Fig. 3 exhibits the appearance of the patient in 1899.

During the next three years gradual improvement took place, but marked disfigurement continued. The third operation was then undertaken for the purpose of improving the outline of the face by reducing the projecting and thickened surface of the maxilla. The swelling was freely exposed by an incision under the lower border of the jaw, and after elevating the periosteum several plates of bone (Fig. 2) with the prominent edges were removed with the saw.

The patient called to see me a few weeks since. He is now in sound health, and is doing a good business as a decorator. He is able to open his mouth with ease, and the teeth can be separated nearly an inch and a half. He can masticate on both sides; on the right side there is still a bony cavity, large enough to hold a small marble. The appearance of the patient in June, 1907, is shown in Fig. 4.

Structure of two of the Denticles.

I am indebted to Mr. S. G. Shattock for the following report:

The two denticles selected for microscopic examination were of flattened oval form and measured each 7 mm. in the longer diameter. The structure is alike in both. The material composing them consists of cement traversed by irregular channels, like Haversian canals. There is no trace of enamel at any part of the surface, and nowhere any dentine. The lacunæ and canaliculi are very coarse and conspicuous, and the lamination of the bone very evident.

Only two small denticles were examined, and it is very probable that in some of the larger denticles traces of enamel or dentine could be discovered.

ABNORMALITY OF THE TEETH.

The teeth of the patient present many irregularities, which are the results of the defective development of the maxillæ during embryonic life.

The alveolar arch of the upper jaw is both small and contracted (Fig. 5, c, d). The right molars, bicuspids, and canine are in their normal position. The lateral incisor, attended by a supernumerary tooth, is seen in the centre, causing the displacement of the central incisors to the left, together with the lateral incisor and canine. The left molars are altogether absent, and the bicuspids occupy their position in the jaw.

The original position of the tumour is indicated by the cavity on the right side of the lower jaw (Fig. 5, a, b); one molar and one bicuspid have been extracted on the left. The incisors and canines are badly-formed teeth, very irregular, and crowded together on the bone. On this side the only wisdom tooth in the mouth has duly appeared, and this fact clearly indicates that the follicles of all the absent molars were arrested at a very early period of their formation.

The permanent molars do not come forth in the place of the temporary teeth, but a position is gradually prepared for them by the growth and expansion of the jaws.

The rudiments of the first permanent molar issue from the second temporary molar follicle about the fourth month of fetal life, and as soon as the formation is complete and the papilla appears within it, another follicle is developed which contains, about seven or eight months after birth, the papilla of the second permanent molar.

tumours generally occur in the molar and bicuspid regions of either the upper or lower jaw. The development of any kind of odontoma in the incisor region is uncommon; but a case, however, appeared in the *British Dental Journal* of 1891, by Professor von Metnitz, which he regarded as a rare specimen of a compound follicular odontoma.

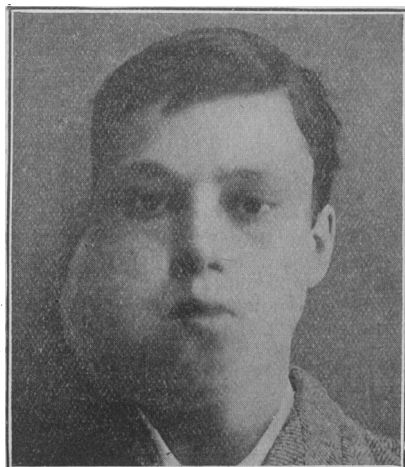


Fig. 1.—Patient in 1896.



Fig. 3.—Patient in 1899.

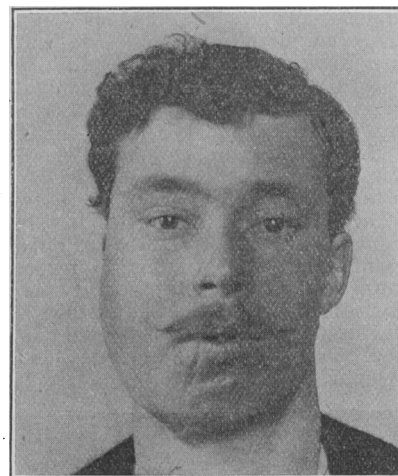


Fig. 4.—Patient in 1907.

After a long period, when the growth of the second molar is considerably advanced, similar changes occur which give rise to the follicle and papilla of the wisdom tooth. In the child the alveolar arch is small and shallow, but as development proceeds the jaw extends backwards, and in this fashion room is formed for the permanent molars. But these are very gradual changes, and during their slow advancement the follicles are securely lodged in the base of the coronoid process of the lower jaw and in the tuberosity of the upper maxilla; so that in due time, when the elongation of the bones is complete and the teeth are getting ready for eruption, their ultimate position is already prepared for their reception.

The marked abnormality of the teeth in this case is an indication of the severe distortion which occurred in the evolution of the maxillae, and this must be regarded as the essential cause in the production of the odontoma. In looking over the records of many similar cases I have been able to discover only very scanty reference to the general condition and development of the teeth.

I am indebted to Mr. H. A. E. Canning, of Southsea, for the models which exhibit the present condition of the patient's mouth, and also for the photomicrograph (Fig. 6).

STRUCTURE OF COMPOUND FOLLICULAR ODONTOMA.

The majority of odontomata are outgrowths from the dental germs, and their classification is based upon the part of the germ principally concerned in their formation; and this may be the papilla the enamel organ, the follicle, or the whole germ. A compound follicular odontoma is the result of a very early modification of the whole germ of a single molar tooth, or the germs of several teeth, as in the case now under consideration. These

Growths of this kind are seldom seen in the human subject, at the same time it is very probable that many cases formerly described as fibrous tumours and exostoses were unrecognized odontomata. Many interesting specimens have been removed from the jaws of the horse, the goat, and other animals, and these can be seen in the Museum of the Royal College of Surgeons, and also in the collections of other institutions.

A compound follicular odontoma really consists of a hard bony mass containing a number of little nodules composed of dental tissue and bone irregularly fused together. In some cases these denticles consist of all the dental elements—enamel, dentine, and cementum, which seldom bear any resemblance to normal teeth. On section they are found to be made up of dentine, with traces of its special tubular structure and particles of opaque and ill-defined enamel blended with osteodentine. In other cases these little nodules are composed wholly of dentine or cementum.

There is remarkable variation in the number of denticles found in compound follicular odontomata. In the specimens removed from the human subject that I have had an opportunity of examining the number has never been large, excepting in a few cases in which the denticles consisted wholly of cementum without any trace of either dentine or enamel.

In some specimens taken from the horse and goat, the number of denticles has amounted to three or four hundred; and although some of these irregular masses were compounds of the special tooth structures mingled with cementum, still the large majority were found to be composed wholly of the latter substance. A few years since Dr. de Roaldes, of New Orleans, removed from a lad a tumour of the upper

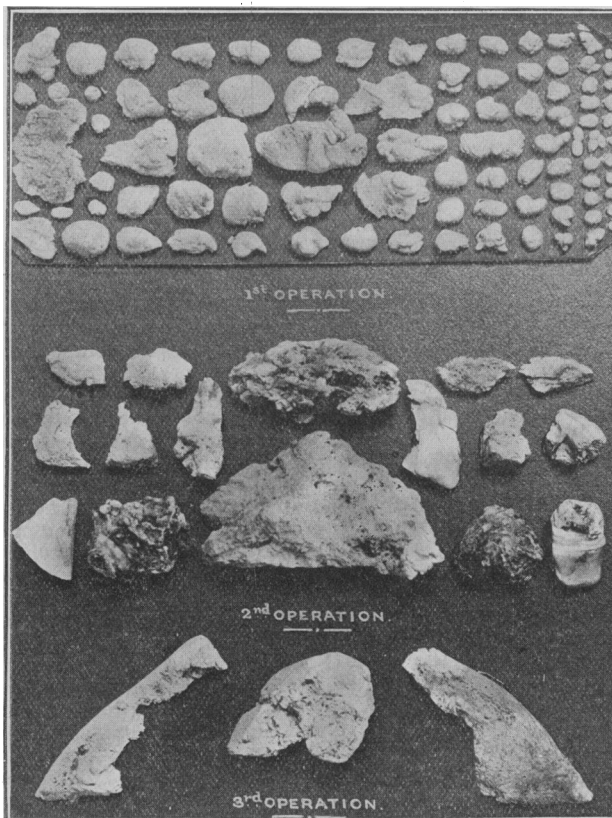


Fig. 2.—Denticles with portions of the dense and indurated bone.

maxilla which contained more than fifty denticles which were proved to be made up entirely of cementum. "The specimen consisted of hypertrophic tooth capsule which ossified sporadically in places, producing a number of denticles which had originally, in all probability, been bound together by perlosteum, and embedded in the fibro-vascular structure such as plums are in a pudding." Another specimen is to be seen in the museum of the Royal College of Surgeons containing five hundred irregular pieces of bony tissue which were removed by Mr. Bland-Sutton from a tumour of the antrum, which he regarded at the time of the operation to be a follicular odontoma. On microscopic examination these irregular masses were found to consist of true osseous structure.

The sacs of the permanent molars are formed before birth and their evolution within the bone slowly advances although their eruption may be delayed for many years. The process of development in all the teeth is similar, and the special structures which enter into their composition are identical in all respects—every tooth is a transformed papilla of the fetal gum, which by the swelling of the surrounding mucous tissue soon becomes enclosed in the dental sac with the cellular elements of the complete formation. The secret stages follow on in regular succession—the upper epithelial layers of the

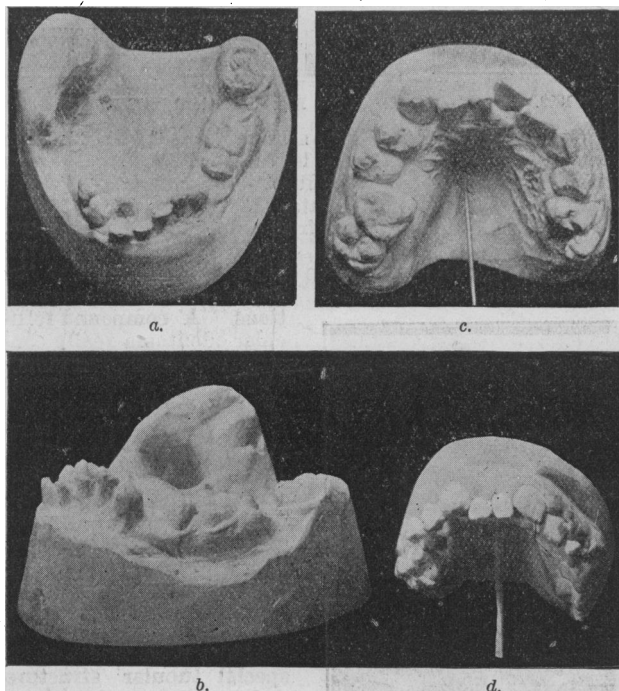


Fig. 5.—a, b, Models of lower jaw indicating the original position of the tumour; c, d, models of upper jaw exhibiting the displacement of the teeth.

papilla produce the enamel organ, the cells of the connective tissue, the odontoblasts, and from the cells on the walls of the follicle the cement comes forth just in the site of the future alveolus. Now, at any period these incipient changes may be distorted, and a hypertrophic activity of the odontoblasts and bony elements may result in a large formation of cementum sufficient to arrest the other essential structures. If, however, the process of calcification is well advanced, then the irregular outgrowth may consist of a combination of all the dental tissues. An odontoma when within the jaw and also after its eruption is in the position of the permanent teeth.

THE DIFFICULTIES OF DIAGNOSIS.

The diagnosis of a compound follicular odontoma is often surrounded with considerable difficulty. In the early stage there is nothing but the presence of a hard and painless expansion of the upper or lower jaw. When the process of eruption is advancing, a dense and irregular growth can be detected in the mouth, but it is often impossible to recognize the true character of the tumour without an exploratory operation. The age of the patient, and a careful examination into the history of the case, will bring to light important details. The fact, too, that the swelling commenced before the complete dental evolution, and the

presence in the mouth of badly-developed and crowded teeth, and also the absence of one or two altogether, will supply indications in the right direction.

SURGICAL TREATMENT OF ODONTOMATA.

A few words now about treatment. When the tumour is small the exploration and enucleation in either the upper or lower jaw can be done easily through the mouth without any external excision. In all operations of this sort the surgeon must take the greatest care to avoid permanent scars and deformity.

In excising an odontoma in the lower jaw the external incision should be made below its border, and then by the elevation of the cheek and the free division of the mucoperiosteum the tumour can be removed with the aid of the gouge and strong forceps.

In dealing with a large tumour of the upper maxilla involving the antrum the dissection and elevation of the cheek should be done in the way usually practised in excision of the bone. A free section must then be made parallel to the alveolar border and other sections for the displacement of the anterior surface just sufficient to secure complete separation of the hard growth from the bone. The instruments must be employed with great care to avoid any fracture of the alveolar border or palate. Large odontomata involving the whole antrum have been successfully removed by this method.



Fig. 6.—Section of a denticle showing the bony structure of the cementum. $\times 165$.

Some cases of compound follicular odontomata remain for a long period without causing much inconvenience, but sooner or later they are sure to give rise to serious trouble. The expansion of the jaw and the presence of the dense tumour slowly excite pressure and pain, and these symptoms are followed by tonic contraction of the muscles of mastication, inflammatory changes in the soft tissues, and prolonged suppuration. Sometimes the impeded circulation and nutrition of the bone, in combination with the depressed constitutional state of the patient, result in a peripheral necrosis, which greatly aggravates the distress and deformity of the patient. Under these conditions it is certainly not surprising that the distinctive indications of an odontoma are surrounded by great obscurity. A well known and very skillful surgeon once informed me that he nearly made a mistake in a case of this description, but fortunately the presence of a dental tumour became evident during the operation, and then, instead of performing excision of the mandible, he successfully removed the hard mass by enucleation, and the result was very satisfactory. Similar diagnostic difficulties have occurred to other surgeons, and I think there can be little doubt that other unrecorded cases of compound follicular odontomes have been unexpectedly discovered on the operating table.

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