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LECTURES

ON

CYSTIC TUMOURS OF THE JAWS, AND ON THE ETIOLOGY OF TUMOURS.

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By F. S. EVE, F.R.C.S.,

Erasmus Wilson Lecturer and Pathological Curator of the Museum of the College, and Surgical Registrar to St. Bartholomew's Hospital.

LECTURE I.—CYSTIC TUMOURS OF THE JAWS.

I HAVE chosen for the subject of this lecture the various forms of cystic tumour of the jaws, chiefly because this splendid museum has afforded me exceptional advantages for the study of a variety of morbid growth, which has been described as multilocular cystic tumour, cystic sarcoma, and adeno-sarcoma of the jaw. This disease much more commonly affects the lower than the upper jaw. It first makes its appearance as a small swelling near the socket of a tooth, and slowly increases, attaining sometimes large dimensions. When affecting the lower jaw, the tumour grows within the substance of the bone, expanding the compact wall, which forms a more or less complete capsule around it. A section displays an agglomeration of cysts separated by septa of dense fibrous tissue. The septa are, as a rule partially, and sometimes completely, ossified, as shown by a beautiful specimen in the museum of St. Bartholomew's Hospital (No. 537).*

The size of the cysts varies in different specimens. The more common form of tumour is composed chiefly of large cysts from half an inch to an inch or more in diameter, the other, almost entirely of small cysts, so that a section presents the appearance of a honey-comb with irregular cells. The septa between the cysts are, in the latter, usually ossified. The contents of the cysts differ even in the same tumour; they may be filled with a white glutinous colloid material, with a brownish serous fluid, or with a reddish friable substance, which is more commonly met with in the smaller tumours, or in the more recently formed portions.

In a specimen (R. C. S. Museum, No. 2203) described in Mr. Heath's exhaustive work,† a large cyst is almost filled with solid lobulated proliferous growths, projecting from its walls; in the other portion of the tumour, the cysts were filled with serous fluid.

When occurring in the upper jaw, the growth projects into and distends the antrum; it then usually possesses the ordinary clinical appearances of a solid tumour in that cavity. The general characters of such a growth are shown in a specimen (No. 2202) from the College Museum. It may be observed that the cysts are smaller, and the proportion of solid matter is much greater than in the majority of the tumours of the lower jaw.

Of the twelve specimens of multilocular cystic tumour which I have had the opportunity of examining microscopically, and in four other recorded cases in which microscopic examinations were made, all presented the same general structure. I think it, therefore, very improbable that a form of multilocular cystic tumour of the jaw exists, such as has been described as *simple* multilocular cystic disease. Again, the unilocular cysts—occasionally met with in the jaws—must be considered as distinct in their nature from the multilocular tumours; for I have been unable to find recorded in literature, or preserved in our museums, a single example of an unilocular tumour presenting similar peculiarities in its minute structure.

The general clinical and pathological characters of multilocular cystic tumours of the lower jaw are well illustrated by a specimen presented by Mr. Keetley to the Museum of St. Bartholomew's Hospital

(No. 536). The tumour was removed, with one half of the lower jaw, from a lady, aged 45 years, who had noticed a swelling on the left side of the jaw ten years before coming under observation. It increased in size at first very slowly, and during the last year more rapidly, but neither caused pain nor affected the general health. The submaxillary glands were not enlarged. Ten years before the tumour was observed, she had for a long period a discharge from the socket of an imperfectly extracted tooth, and was told by a surgeon that the jaw was necrosed. Near this part, the tumour appeared. It involved the left half of the lower jaw, extending from the angle to the symphysis; its outer and lower surfaces were covered by the thin expanded external lamina of the bone. The left incisor, canine and bicuspid teeth, were crowded together at the upper and anterior edge of the tumour; the molar teeth had disappeared. A section of the growth presented the usual characters of multilocular cystic tumour, the cysts being, for the most part, of large size. They contained either brown serous fluid, colloid material, and, many of them, a reddish friable substance, especially near the symphysis, where the tumour was still encroaching on the bone.

Under the microscope, the solid portions of the tumour showed branching and irregularly arranged columns, composed of small round epithelial cells, which resembled those in the deeper layers of the epithelium of the gum. The columns, in longitudinal section, showed bulgings with intervening constrictions on their sides. In transverse section they appeared as alveoli inclosed by well formed fibrous tissue. A lining of elongated cells (see Figs. II and III) formed, in places, the peripheral layer of the cell-columns or masses. The cells occupying the centres of the columns were much enlarged from commencing colloid degeneration; and portions of the tumour, containing small cysts, showed that the central cells, or the whole contents of the alveolar spaces, had undergone colloid degeneration (see Fig. I). The tumour, apparently, grew by the formation

Fig. 1, from specimen No. 536, St. Bartholomew's Hospital Museum.—Alveolus in state of transformation into a Cyst. (a) Epithelial Cells which have undergone Colloid Degeneration; (b) Nuclei of Young Cells.

of sprouts from the columns of cells, which formed its primary constituent; and, probably, by the subsequent cutting off of the sprouts, the alveolar spaces were formed. The cyst-formation evidently resulted from the expansion of these spaces by colloid de-

* Described by Mr. Coote, *Lancet*, October 10th, 1857.

† *Diseases and Injuries of the Jaw*, second edition, p. 304.

generation of their epithelial contents, and the accumulation of fluid within them as in cyst-formation elsewhere.

The other tumours I have examined correspond to the description just given in the essentials of their minute structure; they presented, however, minor points of difference, such as are observed in any variety of morbid growth. In some tumours, the tendency to degeneration of the cells was slight, and the cyst formation was in consequence scanty; these were composed largely of irregular masses of small epithelial cells, with numerous round patches of degeneration scattered throughout them. In many instances, the outer layer of cells composing the columns or masses were elongated, or imperfectly columnar. This arrangement of the cells, when associated with colloid degeneration of the central cells, gave the columns a close resemblance to gland-tubes (see Fig. II), and led to the sup-

Fig. II, from a drawing in College Case-books.—(a) An Alveolus and portions of Alveoli filled with Epithelial Cells; (b) Central Space, probably formed from breaking down of Cells; (c) Elongated or Semi-columnar Peripheral Cells, not well marked in this specimen. No. 2,203.

position, in some cases, that the tumour was an adenoma.* The appearance of gland-tissue was, in the specimen (Fig. II), very closely imitated by the approximation of columns placed parallel to each other. It is, however, most improbable that these tumours have any connection with gland-tissue, for both Waldeyer and Klein assert that there are no mucous glands in the gum itself, an observation which I have verified.

Two cases of multilocular cystic tumour have been described in Germany by Drs. Falkson and Bryk, in which the columns and alveoli composing the tumour nearly resembled, in their minute structure, the rudimentary enamel organ. In Falkson's case,† the tumour grew within the symphysis; it occurred in a woman aged forty years, and had been growing ten years. It consisted microscopically of cylinders and alveoli, lined by a single layer of regularly arranged columnar cells inclosing a delicate network, formed by the anastomosing processes of stellate cells. In Bryk's case,‡ subsequently published, the microscopic appearances of sections of mucous membrane covering the tumour presented precisely similar appearances. Round cells were, however, observed within some of the columns, and small rods, or masses of nuclei, were scattered throughout the tumour.

Both of these specimens possessed the usual clinical and naked eye characters of multilocular cystic tumour, and resembled the specimen first described, both in the manner of their growth, and in the mode of the cyst-formation. The resemblance which, in their microscopic structure, they bore to the rudimentary enamel organ, led to the supposition that they were connected with the enamel organ of the tooth-follicles. This opinion Bryk thought to be supported by the clinical history in his case. The tumour, which was the size of a fist, was removed from a

peasant, aged 32. When six years old, he sustained a fracture of the lower jaw near the symphysis from the kick of a horse. The fracture remained for some time imperfectly united, and, during the year following the accident, he pulled out ten loose teeth; no others formed to replace them. At fifteen years of age, he first noticed a swelling of the chin; and three years later many small knobs, of the size of hazel-nuts, had formed on one side of the symphysis at the site of the injury. The tumour subsequently grew rapidly. The inflammation of the bone following the fracture, according to Bryk, originated the disease by acting as a disturbing agent upon the forming or already formed tooth-pulps. The teeth extracted by the patient were, he thought, all milk-teeth, no permanent teeth being subsequently formed to replace them.

An obvious objection to this explanation is, that at the age of six years, all the teeth, except the third and perhaps the second molars, would have become calcified, and the eruption of the permanent set would, probably, have commenced. Therefore, the disease could not have originated in the already perfectly developed follicles near the symphysis.

In order to point out more clearly the relation of these tumours to the enamel organ, I will glance briefly at the development of that structure. About the seventh week of embryonic life an ingrowth of the epithelial lining of the gum takes place along the whole length of the jaws. The portions of this ingrowth about to form the teeth become enlarged into downward projecting papillæ consisting* of small round epithelial cells surrounded by a layer of elongated cells, which are continuous with those forming the deep stratum of the epithelium. These ingrowths of epithelium constitute the primary enamel organ. Into their apices or lowest portions, a papilla of gelatinous connective tissue projects, by which the enamel-organ is invaginated, so as to become converted into the enamel-cap. This projection of connective tissue constitutes the tooth-papilla upon the surface of which the dentine is formed. The cells composing the enamel organ, now the enamel cap, undergo various modifications. Those forming the inner layer—that nearest the tooth-papilla—become elongated and beautifully columnar; and from them the enamel-fibres are formed. The other cells remain for a time polyhedral, but subsequently the middle layer is converted into a gelatinous tissue, composed, apparently, of stellate anastomosing cells, with a clear soft intermediary substance. This layer is finally absorbed, and the external or superficial layer of cells forms the cuticle of the enamel (Klein, Waldeyer).

The resemblance between the tumours and the rudimentary enamel organ is at once apparent. The tumour consists of columns and alveoli lined with columnar epithelium, resembling that of the inner layer of cells of the enamel-organ, and inclosing a gelatinous tissue with the appearance of a network of stellate cells, which is comparable to the gelatinous tissue in the centre of the enamel-organ.

There now remains to be considered, first, the relation which the tumours described by Falkson and Bryk bear to those of which I have just given the details; and, secondly, the origin of the disease. I am disinclined to believe that any really generic difference exists between these tumours; for those which most nearly resembled the rudimentary enamel organ presented the ordinary clinical and naked-eye characters of the multilocular cystic tumours first described. If the most highly developed and the most elemental types were taken alone, without regard to the structure of other tumours, it might be believed that they differed in nearly the same degree as an adenoma differs from a cancer. But among the twelve tumours examined, I have observed some which lie in an intermediate position between these two extremes. As already mentioned, in some the cell-columns or alveoli were bounded, as in Falkson's and Bryk's specimens, by a single row of elongated or imperfectly columnar cells, while the central cells had undergone degeneration. In parts of others (No. 2198), the cells in the centre of alveoli presented the appearance of a network of anastomosing cells, although the microscopic characters of the greater part of the tumour more nearly agreed with those of the growth first described.

For these reasons, I think that all the tumours belong to the same group, the individual specimens presenting only differences in degree of development.

As regards the mode of degeneration leading to the appearance of a network within the alveoli, it could be distinctly observed in the tumour first described and in several others, that colloid material collected within the substance of the cells, pushing the nuclei to one side, and giving rise to the form known as the signet-ring cell; by the approximation of the compressed walls of such degenerated cells the appearance of a network was produced, with the nuclei at the

* *Transactions of the Pathological Society*, vol. xxiii, p. 181, and vol. xxii, p. 242.

† *Virchow's Arch.*, vol. lxxvi, p. 504, plate viii, fig. v.

‡ *Langenbeck's Arch.*, vol. xxv, 1881, p. 793, plate xii, fig. ii.

* Kölliker, *Grundriss der Entwicklungsgeschichte*, 1880.

points of contact. This is, I believe, the explanation of the formation of an apparent network in all the tumour formations.

I will now ask you, in the second place, to consider the probable mode of origin of the tumours.

After repeated examinations, I have been able to observe in several specimens appearances distinctly indicating that they originate by an ingrowth of the epithelium of the gum. Sections of a tumour of the superior maxilla showed pear-shaped ingrowths of epithelium connected with the epithelium of the gum by their narrow extremities. The cells composing them had completely undergone degeneration except at the periphery, and two similar ingrowths were continuous with the mass of the tumour. In the same sections, a prolongation downwards of the interpapillary processes of the epithelium as fine lines into the tumour was observed. Sections taken from specimens 2198 and 2203, and passing through the margins of ulcerated sockets from which the teeth had fallen out, showed, as the alveoli were approached, a gradually increasing thickening of the epithelium of the gum, and, near the margin, numerous papillary processes of epithelium passed down and became continuous with the cell-columns forming the tumour. Indications of ingrowth of epithelium near the alveoli over the tumour were also observed in other specimens. Again, Büchteman* describes a case in which he observed a similar ingrowth of epithelium which was in "unmistakable connection with the tumour-formation."

The mode of origin of the cystic tumours is therefore analogous to that of an ordinary epithelioma. Their precise relation will be discussed further on.

Multilocular cystic tumours have frequently followed some form of injury, irritation by decayed teeth, or long continued inflammation; these may be looked upon as exciting causes by inducing an increased blood-supply to the part. An epulis has, in some instances, preceded their formation. This is not surprising, as I have met with five epules from children and adults, composed largely of columns of epithelial cells.

The cystic disease is more common in early adult and middle age, but may occur at any period of life. Coote recorded a case in a child six months old, and another in a man aged 75. Wilks also described a case in which the disease was congenital. Of twenty-six cases in which the age was stated, twenty of the patients had reached the age of twenty years when they came under observation; and in one half of these cases the disease occurred between the ages of 20 and 40 years inclusive.

The clinical characters of these tumours are almost sufficiently indicated by the descriptions of the specimens already given. They are rounded, and usually lobulated on the surface from the presence of numerous cysts. They project, as a rule, more from the external than the internal surface of the bone. At some parts of the tumour, there is fluctuation, and at others the characteristic parchment-like crackling can be obtained by pressure on the thin bony covering of the cysts. Not-unfrequently one or more of the teeth have fallen out from the affected portion of the jaw, and a glairy fluid has been observed by the patient to issue from the open alveoli.

On puncture, a turbid brownish serum, a sero-sanguineous or a glairy colloid fluid, may be obtained from different parts of the same tumour. If the disease involve the upper jaw, I think it could not, as a rule, be diagnosed from other solid growths in the antrum, unless the cysts were unusually large.

The tumours are slowly growing, existing sometimes† for twenty years; they have very little tendency to implicate surrounding parts, or the neighbouring lymphatic glands, and, if completely removed, rarely recur and still more rarely become disseminated throughout the system. Their comparative innocence is probably explained by the bony capsule forming their boundary, by their low degree of vascularity and by the remarkable tendency of the epithelial cells composing them to undergo degenerative changes. The effect of a bony envelope in diminishing the malignancy of tumours was distinctly shown by Mr. Butlin in the case of the central tumours of bones, which were necessarily surrounded by the expanded wall of the bone in the early part of their growth.

The general impression formerly existing, that all the multilocular cystic tumours are innocent, is entirely unfounded. Recurrence has taken place in many recorded cases after the cysts have been opened and their contents sponged or imperfectly gouged out. In a case treated in this manner by Syme, recurrence took place twice. The more radical gouging operation recommended by Mr. Butcher is, he tells me, perfectly successful in his hands; "the gouging", he writes, "must be carried out fearlessly and far wide of the disease".

Recurrence sometimes takes place after the complete removal of the affected portion of the jaw. Here is a portion of a recurrent growth removed by Mr. Heath twelve years after the tumour (No. 2203) already referred to. I have also examined a growth from the upper jaw, which recurred some years after the removal of a tumour from the same situation in a child. The recurrent growth in both cases possessed the usual microscopic characters of multilocular cystic tumour.

In completion of the evidence showing the truly malignant nature of some of the cystic tumours, I am able to quote the following case, for the notes of which I am much indebted to Mr. R. W. Parker, who also gave me microscopic sections of the morbid growths.

A rapidly growing tumour of the left side of the lower jaw was removed from a woman aged 60, by Mr. Jonathan Hutchinson, in the London Hospital; it had been noticed only thirteen weeks. The tumour was found on section to be soft, encapsuled, and it showed points of degeneration in its centre. The patient died eight days after the operation of broncho-pneumonia. The lumbar lymphatic glands near the suprarenal capsules were infiltrated with a morbid growth, but none of the viscera were affected. In minute structure, the tumour of the jaw consisted of columns of small epithelial cells undergoing degeneration at their centres; and the secondary deposit in the lumbar glands was the exact prototype of the primary growth. Here, then, was a rapidly, growing tumour of the variety under consideration, the elements of which had become disseminated throughout the system.

The multilocular cystic disease, like other tumour forms, doubtless possess a varying degree of malignancy. Advanced age probably increases their malignancy; and, I think, it will be generally found, that in proportion as the age at which the tumour appears is greater, it will more nearly approach in its minute structure the lowly modified form consisting of columns and masses of round epithelial cells, as in the specimen first described, and in Mr. Hutchinson's case, just related; in the former, the patient was forty-five and in the latter sixty years of age. This form is, therefore, probably more malignant than the more highly modified type occurring at an earlier age, and observed in its highest perfection in Bryk's case. Such a distinction, if found to be true in a larger number of cases in younger subjects, will be of the greatest practical importance in treatment. For it is almost superfluous to point out, that the gouging operation of Butcher would probably be effectual in the comparatively innocent tumours in young subjects; while in the malignant form, a more radical operation, such as the removal of a portion or the whole of one side of the jaw, would be indicated.

Finally, with regard to the position which these morbid growths occupy in the general classification of tumours, we find that they originate from an epithelial surface, that they are composed entirely of epithelial cells, that in many instances they recur locally after complete removal, and occasionally they give rise to secondary deposits; such a sum of characters naturally places them among the epithelial new formations, of which they may be considered a peculiarly modified variety. I therefore propose for them the name of multilocular cystic *epithelial* tumour. A considerable difference, however, exists between them and the ordinary epithelioma, owing to the kind of metamorphosis which the cells composing the cystic tumours undergo.

The gelatinous metamorphosis met with in the epithelial cystic tumours of the jaws depends, probably, upon the special characters and inherent tendencies of that portion of the epithelium of the gum from which they originate; peculiarities leading at an early period of fetal life to the formation of the rudimentary enamel organ by an ingrowth from the epithelium, and the destruction of its central cells by a special form of degeneration. It is, therefore, not surprising that an epithelial ingrowth occurring in later life from the same structure, should, after penetrating into the same locality, take on approximately somewhat the same form, and undergo the same retrogressive metamorphosis as the rudimentary enamel organ itself; but the growth, like all tumour formations, makes no attempt at the higher development of the normal structure.

Analogous peculiarities in metamorphosis are met with in many other tumours, in accordance with the structure in which they originate. For example: in the epitheliomata of the skin, lips, and tongue, the cells forming the columns undergo the same successive changes from without inwards to the centre of the column, as do those of the skin or mucous membrane from within outwards. The cells forming the peripheral layer of the columns resemble the elongated deep layer of cells of the epithelial surfaces; and the inner cells gradually become more flattened until they are compressed into a central cornified plug.

The cell columns constituting cancer of the breast not uncom-

* Langenbeck's *Arch.*, vol. 26, p. 249, plate iv.

† As in Mr. Wagstaffe's case, *Trans. Path. Soc.*, vol. xxii, p. 249.

monly undergo fatty degeneration, like those derived from the epithelium of the acini in the formation of milk.

I must not omit to mention that Magitôt, in his valuable essay (*Sur les Kystes des Mâchoires*), completely ignores the existence of the class of multilocular cystic tumours I have just described. He regards them as a variety of follicular or periosteal cyst, whose multilocular form has been determined by the resistance of the cancellous tissue of the bone to the growth of the tumour, leading to its division into many intercommunicating loculi. In an exhaustive table of all recorded cases of cysts of the jaws, he classes examples of multilocular cystic epithelial tumour as cysts of undetermined nature, or cysts originating beneath the periosteum of the fang. The nature of some of the specimens thus classified I have determined by microscopic examination, and have found that they are cystic epithelial tumours.

Magitôt contends, that "every spontaneous cyst of the jaws is essentially and exclusively dentary." Within this definition, I cannot agree to place the multilocular cystic tumours: for, although connected, as regards their origin, with the tooth-forming property of the gum, yet there is no evidence to show that they are in any way connected with the rudiments of normal tooth-follicles.

Another form of tumour is met with in the jaw, resembling the group we have been considering in containing minute cysts, derived from cylinders and alveoli filled with epithelial cells. I know of the existence of only one example in an enormous tumour of the lower jaw, which accompanied Mr. Christopher Heath's Jacksonian Prize Essay (R. C. S. Museum, No. 2234). It is a large lobulated growth, involving the lower jaw from the left angle to the middle of the right ramus. Its section has the appearance of a fibro-sarcoma, with occasional small cysts and nodules of bone interspersed throughout it. The tumour was removed from a man, aged thirty-two years. Eleven years before presenting himself for treatment, he noticed a small hard swelling, just below the right canine tooth. The swelling continued of the same size for five or six years, and then began to grow rapidly after a violent blow in the face.

The bulk of the tumour presented, in its minute structure, the characters of a fibro-sarcoma, consisting of spindle-shaped and round nuclei embedded in a homogeneous or faintly fibrillar tissue. Scattered throughout it, I found masses and cylinders of epithelial cells, resembling the epithelial elements of the cystic tumours. They were composed of large irregularly-shaped or branched masses, and of small columns composed of round epithelial cells, with a layer of peripheral elongated cells (see Fig. III). This

Fig. III, from specimen No. 2,234, Royal College of Surgeons' Museum.—Showing Masses and Alveoli enclosing Spherical Epithelial Cells with a Peripheral Layer of Columnar Cells. (a) The ground-substance consists of Fibrous Tissue with abundant round and spindle-shaped Nuclei.

to the other cystic tumours of the jaw, as an adeno-sarcoma of the breast does to an adenoma or a cancer.

A multilocular cystic tumour of the jaw may recur as a sarcoma, as is shown in a specimen (No. 2204) presented by Mr. Heath; it consists for the most part of round-cells, but some epithelial columns were found at its upper part.

Dentary Cysts.—The other varieties of cysts met with in the jaws are immediately connected with the teeth.

They admit of division into two distinct classes—1, cysts originating in connection with tooth-follicles, and called follicular, or if they contain a tooth, dentigerous cysts; 2, cysts originating beneath the periosteum of the fang, and hence called periosteal cysts. The follicular or dentigerous cysts originate in connection with teeth, which from displacement, or some other cause, have not been "cut," and have set up irritation. The tooth may have been placed too deeply, or in an oblique position, or its fang may have been undeveloped. In some instances it has been found inverted.

Dentigerous, or, as Magitôt calls them, follicular cysts, may be situated at any part of the jaws. When occupying the lower jaw they usually expand the external surface more than the internal, the tumour presenting itself as a rounded projection; but sometimes, as in specimen (No. 2195) in the College Museum, the walls of the bone are equally expanded. If the cyst arise in connection with the wisdom tooth, it may expand the ascending ramus.

In the upper jaw, dentigerous cysts have been observed occupying the antrum, the canine fossa, the orbital border, and even the hard palate. Mr. Cartwright describes a specimen in which the cyst occupied the antrum. Its wall, that is, the tooth-sac, was calcified but was not united to the walls of the antrum, so that it presented itself as a distinct bony cyst only attached to the lower part of that cavity.

The dentigerous cysts usually contain a clear serous, or a glairy fluid, sometimes it is yellowish, or brown from the presence of blood; rarely it contains pus from suppurative of the cyst.

A permanent tooth is most frequently the cause of the cyst formation, but in rare cases a temporary or a supernumerary tooth has been found within the cyst. When the contained tooth is supernumerary it is small and deformed. Even when the tooth belongs to the permanent set, its root is usually small and rounded, and is embedded in the cyst wall as far as the neck. The dentinal canal gives passage to vessels and nerves to the pulp, which is always much reduced in size. Occasionally the tooth lies loose in the cyst, either owing to the commencement of the cyst formation before the development of the fang; or, perhaps, from the fang undergoing absorption analogous to that which takes place in the shedding of the milk teeth.

Very rarely a cyst has been found occupied by two teeth, the follicles of which have become fused together.

A case is recorded by Barnes (*Med. Chir. Trans.*, vol. iv, p. 316), of a cyst in the upper jaw of a young man aged 17; there were two intercommunicating pouches, one of which contained a supernumerary tooth bathed in "pus," the other only a yellow fatty matter. The tumour was congenital, but had remained stationary until the age of twelve years.

Dupuytren, Tellander, and Tomes, have placed on record cases in which extraordinary numbers of irregular ill-formed dentary bodies were found within a single cyst. These, in Tellander's case, were twenty-eight in number, and presented the usual characters of supernumerary teeth. Such cysts as these and that described by Barnes are doubtless analogous to the dermoid cysts of the skin, ovary, etc.

Cysts in the jaws have been observed, containing no tooth, but filled with layers of a fibrous appearance, sometimes free and floating in the liquid, more often adherent upon a point of the wall. (Magitôt).*

The existence of these cysts not containing teeth led Magitôt to divide the follicular cysts into three varieties.

1. Cysts developed during the early or embryonic period of the development of a tooth, before the formation of dentine and enamel.

2. Cysts corresponding to a period when the first rudiments of a crown have appeared in the follicle. To these he gives the name of odonto-plastic cysts.

3. Cysts of the coronary period, viz., cysts containing fully developed crowns of teeth, and corresponding to our dentigerous cysts. These have already been described.

One specimen in the College Museum (No. 194), is, perhaps, a cyst developed in the embryonic period; for I am quite at a loss otherwise to explain its pathogeny, it being certainly not dermoid. It

* Many, if not most of these cysts, probably, were dermoid. See Mikulicz, *Wien. Med. Woch.*, 1876, No. 44.

growth may be considered to occupy much the same position relatively

consists of the right side of the body of a lower jaw completely and uniformly dilated into a large spherical cyst with very thin bony walls. No tooth, or rudiment of a tooth, can be discovered in the cyst and its inner surface is lined with a thick soft membrane, thrown into folds. This lining is composed of small round epithelial cells. The condition of the teeth before the removal of the tumour is not mentioned. The patient was a woman, aged 35 years; the tumour had been growing for three years, and contained a thick dark fluid.

The odonto-plastic cysts—those of the second variety—are said to contain "hard grains, rounded and mamillated, or disposed in osseous plates applied and fixed upon a point of the wall"; these were found in one case to be composed of an osseous base covered with traces of dentine, which was again, in places, invested with enamel. Magitôt quotes a case of Broca's as an instance of this variety.

The same authority states that all the follicular or dentigerous cysts have a lining composed of two or three layers of polyhedral epithelial cells; this epithelial lining he regarded as a new formation, since "it has no equivalent in the wall of the normal tooth follicle." He also observes that epithelial cells are found in the fluid contents of these cysts.

Very few pathologists will be disposed to admit the possibility of the formation of an epithelial lining *de novo*, and I have examined three specimens of dentigerous cysts carefully with regard to this point, and find no trace of an epithelial lining. The minute structure of the wall was, in each case, precisely similar, consisting of fibrillar tissue containing granulation cells, which were more closely aggregated on the inner surface of the cysts. I think, therefore, that Magitôt is mistaken on this point.

The existence, or non-existence, of an epithelial lining to these cysts is not merely an anatomical detail, but a question of the first importance in considering their mode of origin.

If the view generally accepted with regard to the origin of dentigerous cysts be correct, we should not expect to find an epithelial lining to the cyst, as it is supposed that the accumulation of fluid takes place between the enamel and the tooth capsule.

In discussing this question, Mr. Tomes (*Dental Surgery*, pp. 625, 626) mentions that vesicular enlargements, containing serous fluid, are occasionally found over teeth about to penetrate the gums. "On incising this enlargement, the knife comes down on the enamel-coated covering of the coming tooth." Again, he says, "When the development of the enamel is completed, its outer surface becomes completely detached from the investing soft tissue, and a small amount of transparent fluid collects in the interval so formed." In these facts he finds "an explanation of the manner in which buried cysts arise; namely, by the gradual collection of fluid between the enamel and the tooth capsule."*

This theory completely coincides with the minute structure of the lining of the dentigerous cysts, but is not equally satisfactory when applied to cysts formed in an earlier period of development. The enamel organ would not then be separated from the surrounding connective tissue; and, further, the physiological explanation for the accumulation of fluid between the enamel and the tooth-sac is wanting.

A simple explanation of the origin of the cysts of the embryonic and odontoplastic periods suggests itself in the supposition, that they are due to accumulation of fluid within, and distension of the enamel organ itself, owing to an exaggeration of the degenerative process by which the cells in its centre are destroyed.

This theory would explain the existence of an epithelial lining in unilocular cysts not containing teeth, as in the specimen (No. 2194) from the College Museum.

The diagnosis between follicular cysts and solid tumours is usually easily made. Almost invariably one surface of the cyst is sufficiently thin in some places to admit of compression, when the characteristic diagnostic sign is obtained, known as the "crackling of parchment."

The diagnosis may be further facilitated by the absence of this shell at certain points, where fluctuation can be obtained. A puncture would, in doubtful cases, afford a certain test.

The dentition, although important, is, as Mr. Heath points out, not to be relied on as a diagnostic sign. So many variations in the number of teeth from congenital deficiency are met with, that the absence of one does not necessarily imply that it is misplaced.

The diagnosis between a follicular cyst and a multilocular cystic tumour would, I apprehend, in certain cases present considerable difficulties. The lobulation in the latter disease from the presence

of numerous cysts, the incompleteness of its osseous covering, and the presence of fluctuation at several points, would afford valuable aid to diagnosis.

Exploratory puncture would, in the case of the multilocular cystic tumour, give exit to either a colloid, or a brownish serous fluid in different parts of the same tumour, whereas the fluid within the follicular cyst is, usually, clear and serous.

Periosteal Cysts.—Another variety of cyst connected with the teeth requires a short notice. Not unfrequently cysts of small size are found attached to the apex of a fang of an extracted tooth. They sometimes cause excessive pain from pressure on the nerve. The cysts are, as a rule, not larger than a pea, but may attain half an inch in diameter. They lie beneath the periosteum of the fang, and, from this circumstance, have been named periosteal cysts. The apex of the fang on which they are situated is frequently absorbed, and, by the introduction of a probe after puncture, the fang is found exposed within the cyst cavity. The contained fluid is rich in cholesteroline. Mr. Tomes (*op. cit.*) considers that, in the first instance, the morbid process is, probably, identical with that resulting in the formation of an alveolar abscess; but, being less acute, a serous cyst is formed instead of a suppurating sac. The microscopic appearances of four specimens that I have examined bear out this view. The sections were made through the hardened wall, and, in some instances, through the dried contents of the cyst. The cyst-walls were composed of fibrillar and granulation tissue, and their cavities contained a cheesy mass, having the appearance of inspissation and degenerated pus or lymph. There was no trace of an epithelial lining to the cyst walls, such as Magitôt has stated to exist; but, upon their inner surface, was a layer of granulation cells; the lining, in fact, closely resembled that of the dentigerous cysts, but was thinner, less dense and more cellular.

Very commonly the crown of the affected tooth is the seat of caries. The cysts sometimes form a projection upon the outer surface of the jaw at the reflection of the buccal mucous membrane; if the wall of the bone have been sufficiently distended, "crackling" is obtained on pressure over the prominence.

I shall not enter into a consideration of the cysts of the antrum by dilatation of its mucous glands, for they are in no way connected with the teeth, and this cavity may be considered rather as an appendage to the nasal than a portion of the jaws.

Permit me to call your special attention to a few concluding remarks.

I shall not consider this study of the cystic tumours of the jaw in vain, if, by its means, I am able to bring forward one fact indicating the relation of the tumours to each other and to the malformations by excess.

The first step in this series of abnormalities in the jaws may be, perhaps, the formation of a more or less perfect supernumerary tooth, or the displacement of an ordinary tooth; in both instances a dentigerous cyst may result. Again, the rudiment of a supernumerary or suppressed tooth may give rise to a simple cyst lined with epithelium, probably by expansion of the enamel organ during the early or embryonic period of its growth. Allied to such simple cysts formed around a single supernumerary tooth, are those containing many imperfectly formed dentary bodies; these stand in much the same relation to the jaw as the dermoid cysts containing bone, teeth, muscle, do to the different parts of the body in which they occur.

And further still, the same tendency to abnormality in the dentition, or stated more exactly, a tendency to the formation of supernumerary teeth or the suppression of teeth, if not manifested until puberty or adult age may, perhaps, give rise to the form of multilocular cystic tumour, consisting of an enormous overgrowth of a tissue bearing a general resemblance to the rudimentary enamel organ; continuously growing, but having little tendency to recur after removal, and never becoming disseminated throughout the system.

And, if the morbid growth appears at a still later period of life, a form of tumour results resembling cancer both in its anatomical and clinical characters, but still possessing such a general likeness to the rudimentary enamel organ that its origin cannot be doubted; it may bear in type of development and clinical characters much the same relation to the other more benign form of multilocular cystic tumour as a cancer does to adenoma, but in a lesser degree, and between these two types every gradation in structure is observed.

Upon the chain of anatomical evidence just indicated, we may dare to argue that a tendency to variation first exhibiting itself in the formation of a supernumerary tooth, or possibly the suppression of a tooth may, through various modifications and dilutions in transmission, give rise by evolution and involution to all the

* As Mr. Tomes remarks, this view cannot be finally accepted until the presence of the cuticula dentis has been ascertained in teeth included in cysts; for, if the cuticle be absent, the fluid will probably have accumulated between the enamel and the cuticle.

different forms of cystic tumour of the jaw just mentioned. In support of this hypothesis, I may further add that all the different peculiarities in the number and form of the teeth are distinctly hereditary.*

PARTIAL EXCISION OF THE RECTUM: RECOVERY.

By ARTHUR E. BARKER, F.R.C.S. Eng.,

Assistant Professor of Clinical Surgery and Assistant Surgeon at University College Hospital.

REMOVAL of a considerable portion of the rectum for malignant growths being still a somewhat rare operation, the record of the following, though it be but a single case, may prove of use in view of the scarcity of data we possess at present for judging of the actual and relative risks of the operation and also its ultimate results.

J. T., aged 58, a whitesmith, was admitted into University College Hospital under my care on September 6th, 1881. He complained that since the beginning of summer he had noticed blood after his stools, and had suffered much from *pruritus ani*, stitch in the side, and flatulency, the distension of his abdomen requiring him often to undo his clothes for relief; he had also lost a little flesh lately, and noticed that he did not pass urine quite so well as usual.

His family history was good; none of his relatives were known to have had any tumours.

On examination, an irregular, flat, nodular growth was felt one inch and a half up the rectum, reaching from this point upwards for about another inch and a half, and laterally over the posterior and right aspect of the gut to a somewhat greater extent, but leaving the left and anterior part of the circumference free for fully one inch. The finger could be passed thus all around the margin of this flat growth, which was felt to be freely movable on the structures lying outside the rectum. No glandular infiltration could be detected anywhere. Blood was passed after each motion, and the patient complained of a bearing down pain; there was also much constant dull aching in the sacral and lumbar regions, groins and testicle, aggravated by standing long and by defæcation. There was no history of constipation alternating with diarrhoea, but then the bowels had been habitually relieved by laxatives, the motions being either liquid, or firm and small; there was no purulent or slimy discharge from the bowel.

The history of this case and physical examination of the rectum leaving no doubt that the case was one of epithelioma of the bowel (a view shared by my colleagues), the desirability of excision of part of the gut at once suggested itself, for the following reasons. 1. The growth appeared to be of comparatively recent formation, and was plainly limited to the wall of the gut, being freely movable with the latter on subjacent structures; no glandular infiltration was felt, or indeed to be expected, in view of the growth being so young, as cancers of the rectum go. 2. The patient was not too aged, and, except for some loss of flesh due to suffering and anxiety, appeared to be in fairly good health. 3. The growth was well within reach on all its aspects, and lay chiefly on the least dangerous aspect of the rectum.

I therefore removed the implicated portion of the rectum, as follows, on September 14th. A silver catheter was first passed into the bladder, and the patient placed in the lithotomy position. Along the finger passed into the rectum a sharp-pointed bistoury was introduced, and, being thrust directly backwards at the tip of the coccyx, was made to lay open the rectum from this point forwards directly in the middle line. In the wide chasm thus produced, the growth was brought well into view. I then divided the greater part of the circumference of the gut on its right, front, and posterior aspect, at a point midway between the lower margin of the growth and the border of the anus. Then, clearing the wall of the rectum from the surrounding structures with knife and scissors upwards at a full half-inch from the margin of the epithelioma, I finished the excision by a crescentic incision with Paquelin's cautery-knife above. Several vessels of considerable size were divided in this dissection, and bled freely, but were controlled finally with hemp ligatures. Being satisfied that all the growth was now removed, I placed a plug of salicylated wool on the wounded surface, to arrest a good deal of oozing which still persisted; this, with a drain-tube in the angle of the median wound, completed the dressing.

The growth, which appeared to have been completely removed with a good margin of sound tissue around it, presented all the characters of epithelioma of the columnar kind, as found in the rectum. The specimen is now in University College Museum.

* For further illustrations of the multilocular cystic tumours, the reader is referred to the plates indicated.

The subsequent course of the case may be briefly summed up. On recovery from the chloroform, a good deal of pain was complained of, but the patient slept fairly well during the evening. At 10 P.M., the urine was drawn off with a catheter, and one-third of a grain of morphia was given. Later on, the abdomen became very painful and distended, and remained so for some days. This condition, which gave rise to suspicion of peritonitis at first, was relieved a few days later by small doses of oil of cajuput, and proved to be nothing more than a return of the same flatulence from which the patient had suffered occasionally for some months. There was no real tenderness or rigidity of the abdomen, and no effusion of fluid, and the other evidences of peritonitis were absent. Nevertheless, this painful distension was disquieting while it lasted, and led me to the use of morphia freely, perhaps more so than was good for the patient's digestion. All troublesome symptoms soon disappeared, at all events, on its discontinuance. The temperature, during the first week, was above normal, ranging from 100° to 102.6°, the average being 101°. After this, it soon sank below 99° permanently. For the first few days, the urine had to be drawn off, and was found to contain a trace of blood, but this soon disappeared.

The wound was washed out regularly two or three times a day with Condy's fluid, followed by a solution of salicylic acid in spirit and water, a drain-tube being left in the intervals for the escape of gas and discharge. On another occasion, I should not plug the wound with wool, the removal of which gives some trouble when caked with clotted blood.

On the 6th, a little fæces came away, and continued to do so freely from the seventh day, with much relief to the patient.

From this time on, there is little to note, except that the patient made a steady and good recovery. He got up on the thirteenth day, and regularly after that, and left hospital on the twenty-eighth day. At this time, the whole wound was not completely healed, but had much contracted, being only about three-quarters of an inch broad from the margin of the anus. Above it, there was marked narrowing of the rectum, the finger only admitting the forefinger, but this without force or producing bleeding. There was incontinence of fæces when the motions were loose; otherwise, he had some control over them.

After this, I saw the patient from time to time, and gave him a bougie for occasional use, to prevent any further narrowing of the gut.

In May 1882, I asked him to come up from the country for inspection, and was agreeably surprised at the improvement in his general appearance and health. He stated that the bowel gave him no trouble now, except when he was constipated, when there was a little difficulty in evacuation; also that there still was a little incompetence of the sphincter when the motions were liquid, but only to the extent of allowing some moisture to escape. On examination of the bowel, no trace of recurrence could be detected anywhere; but I was surprised, after what he had stated in regard to the comparative ease with which he passed his motions, except when hard, to find a very marked narrowing of the gut about an inch from the anus. I could hardly believe his statement that it gave him no trouble. The posterior wall of the gut appeared to have shrunk greatly, and to have been drawn over tightly against the anterior and left side, where, it will be remembered, a small portion of the circumference of the level had not been removed. In this way, a narrow slit was produced, which only admitted the tip of the finger, and through which there was a difficulty in inserting the latter, owing to the valve-like arrangement of the contracted part behind. This arrangement, I think, explained the fact that the patient complained of no great difficulty in defæcation; for the fæces pressing against this valve from within would distend the gut, and force it away from the anterior wall, and so enlarge the slit, whereas the finger found a great difficulty in getting round the edge of the valve when pressed upwards against the anterior wall.

Having the patient in hospital, I advised him to let me seize the opportunity for dilating the narrow part, to which he consented. I therefore notched the valve on each side with a bistoury, and then inserted bougies of increasing size for a few days, after which he left hospital, feeling relieved. His reason for allowing the bowel to contract as described (for I had given him a bougie for his own use when he left the hospital) was, that he had feared incontinence of fæces if he kept the opening too large. Anything of this kind was peculiarly unpleasant to him, as his work obliged him frequently to go up and down ladders.

I saw the patient on August 23rd, 1882, almost a year after operation, when he came up to hospital at my request, that his rectum might be examined. He looked and felt in the best of health, and