

Cystic tumours of the testicle / by Frederick S. Eve.

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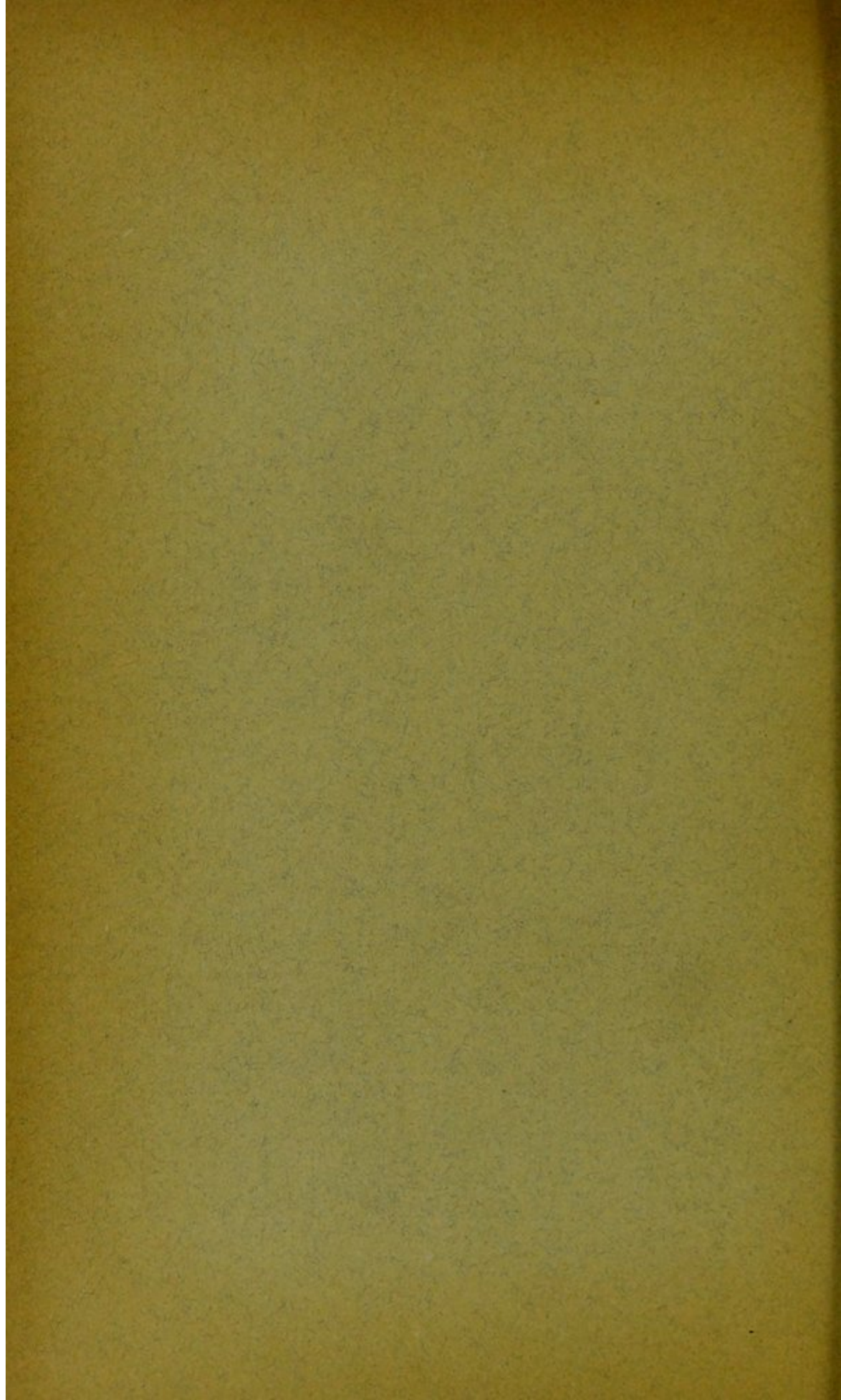
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Cystic tumours of the testicle.

[With Plate X, and Table of Cases.]

By FREDERIC S. EVE.

MY excuse for entering on the consideration of these peculiar tumours is the uncertainty still existing regarding some points in their morbid anatomy, and especially of their pathogenesis. Further, I am not aware of any considerable recent monograph dealing fully with the subject; nor do I think it probable that any observer has had the opportunity of examining so many specimens of the disease as I have been able to select from the museums of the Royal College of Surgeons and St. Bartholomew's Hospital.

The descriptions are based on a microscopic examination of twelve specimens, and to these have been added a table of twenty-eight recorded cases, in which a careful microscopical examination had been made.

These tumours may be divided into two well-marked groups—the innocent and malignant, or cystic fibromata or sarcomata. To these a third may conveniently be added, having characters often intermediate between them, and may be termed cystic myxomata or myxo-fibromata.

The common cystic fibroma or adeno-fibroma of the testicle is illustrated by many beautiful specimens in the College museum, of which No. 4220¹ may be taken as a good example. The characteristic features of this disease are only apparent on section, when the testicle is seen to be occupied by a tumour composed largely of cysts of tolerably uniform size, and usually not exceeding a quarter to half an inch in diameter. The cysts are largest and most numerous at the upper and posterior part of the tumour in a position corresponding to the mediastinum testis; they have a definite wall of fibrous tissue, and many of the cyst-like cavities are really of a tubular form; this is obvious on microscopic examination, and that they intercommunicate more or less widely is shown by the fact that fluid injected into one tubule issues from others at a considerable distance from it.

¹ Particulars of all the cases referred to under a number or the name of the author may be found by reference to the Table of Cases.

The contents of the cysts are various, the smaller often containing a ropy mucus, and the larger a clear or brown serous fluid. In very many tumours there are cysts filled with a solid, curdy material, having sometimes a pearly lustre. From this circumstance the name of pearly bodies or cholesteatoma¹ was given to them, from the supposed presence of crystals of cholesterine.²

The stroma in typical cases is dense and fibrous, and in nearly all the fibro-cystic tumours tortuous rods or nodules of cartilage are embedded within it. The rods have occasionally, as in simple enchondroma of the testicle, a narrow central channel, which is shown by microscopic examination to be produced simply by degeneration and softening. The amount of cartilage present is very variable and may be so insignificant as to escape observation, except with the microscope, or it may constitute the chief bulk of the tumour. It is said to be usually most abundant at the posterior part of the growth.

A thicker or thinner layer of the substance of the testicle, atrophied and compressed, may be distinguished in most specimens. It usually forms a thin covering to the upper and anterior, and more rarely to the lower part of the tumour.

Microscopical appearances.—Sections show large cyst spaces and tubules embedded in a variable amount of fibrous tissue. Their walls are formed of concentric layers of fibrous tissue, and some are lined with epithelium; but in many of the larger cysts this has disappeared, either by degeneration or in the process of cutting the sections.

In some instances the lining consists of several layers of epithelium; the outermost or deeper layer of cells are elongated or columnar; then follow several layers of spheroidal cells, which towards the free surface become longer, flat, and pavement-like. Caird and Richon observed (see Table), in their cases, that the middle or intermediate layer of cells were dentated or "prickle-cells," like those of epidermis.

In many specimens there are cysts filled with laminae of coherent, large, flattened epithelium forming the masses described

¹ Müller, cholesteatoma; Billroth, atheroma perlé; Cornil and Ranvier, epitheliome perlé.

² According to Kocher (op. cit., p. 335) in one variety of cystic disease the contents are fluid, ropy, and mucous, and in another they are fatty like those of atheromata of the skin. But this distinction does not, I think, exist as cysts are formed often within the same tumour, the contents of which present these differences.

above as cholesteatoma. They are evidently formed by the accumulation of epithelial cells in cysts, and their flattening by pressure. But in nearly all examples of cystic fibroma there are some cysts or tubules, especially the smaller ones, lined with longer or shorter columnar epithelium. In two typical examples from adults I found ciliated columnar epithelium (see figs. 1 and 2). In Athole Johnson's case of fibro-cystic tumour in an infant all the cysts were lined with ciliated epithelium; and Hertzberg has recorded a remarkable case of congenital tumour, in which were cysts forming chains, and lined with ciliated columnar epithelium. There was no adenomatous formation. The tumour was of walnut size, and involved the testicle only.

Changes are evidently brought about in the character of the epithelium by pressure. This is shown in fig. 2, in which at one part of the wall of a cyst lined with ciliated columnar epithelium the cells are quite flattened. Similar changes are observed in the epithelial lining of ovarian cysts. In explanation of the occurrence of several layers of flattened epithelium¹ in some of the cysts and tubules, it may be thrown out as a suggestion that the superficial cells are flattened from pressure; and this is the more probable as the flattened cells occur in the larger cysts and tubules. The columnar epithelium too may be caliciform or "goblet-shaped" from the formation of mucus within the protoplasm.

It is scarcely necessary to say that the cysts are evidently formed as the result of dilatation and cutting off of portions of tubules by valvular folds or otherwise. Microscopic appearances are observed which may be taken to indicate a new formation of epithelium and a continuous formation of tubules and cysts. In sections of a typical specimen of innocent cystic fibroma (No. 2789 St. Bartholomew's Hospital Museum) I noted solid rounded outgrowths or buds which projected into the surrounding stroma from cysts lined with ciliated epithelium (see fig. 1). The buds were composed of small round and apparently "embryonic" or young cells. Near them small columns or tubules filled with similar cells were cut across. Other appearances which may be similarly interpreted were observed in other specimens. There were also rounded groups and elongated strips of spheroidal cells,

¹ Two other hypotheses appear tenable on this point: one is, that the evolution of embryonal epidermic cells to cylindrical cells is not complete; the other that there is an attempt to form dermoid structures.

to be subsequently alluded to. The new formation of tubular spaces and cysts lined with small spheroidal epithelium was especially obvious in Mr. Hutchinson's case of cystic sarcoma (see Table). But I am entirely in doubt as to the probable mode of origin of this tumour, as it contained no columnar epithelium, and there was no trace of the body of the testicle, whereas the epididymis was well developed. This specimen I had the opportunity of examining when fresh.

Virchow speaks of sprouts of epithelium springing from the tubules in a case of cystic fibroma, and considers them evidence of epithelial new formation.

Occasionally, fibrous intracystic growths exist. And I have seen microscopic papillary ingrowths of epithelium.

The minute structure of the stroma of the cystic fibromata has some peculiarities of interest. The stroma of the denser forms is composed chiefly of interlacing fasciculi of coarse fibrous tissue; in parts it may be softer, looser, wavy, and reticulated, or studded occasionally with patches of myxomatous tissue. In many specimens are fasciculi of spindle-cells, which in some instances may be in process of development to fibrous tissue. But in others in which these cells persist, form well-marked bundles, and do not show any tendency to develop into fibrous tissue, there are good grounds for believing that the tissue is plain muscle-fibre.

In the Hunterian specimen No. 4220, in which the fibrous stroma was exceedingly dense and well developed, I noticed such bundles. It may here be mentioned that Malassez notes the presence of unstriped muscle in a specimen of cystic myxoma, and Lagrange in a mixed tumour in part cancerous.

Mr. R. W. Parker's case of congenital cystic myxoma is remarkable for the existence of bundles of unstriped muscle around the tubules.

The occurrence of striped muscle in tumours of the testicle will be adverted to in speaking of the cystic sarcomata.

The minute structure of the cartilage presents some points of interest. In many instances it has characters intermediate between those of hyaline and fibro-cartilage. The matrix is less transparent and more homogeneous than in ordinary hyaline cartilage, and forms thin bands enclosing nucleated cells with clear but scanty cell-substance. The cells are round, oval, compressed, rarely branched, and of relatively small size. The growth of the nodule takes place at its periphery, where there is a thin layer of

myxomatous-looking tissue; and the manner of transformation of this tissue into cartilage reminds the observer of the mode of formation of foetal cartilage from embryonic cells as, for example, in the protovertebræ.

The tumours of the second group or cystic myxomata are sufficiently distinctive to merit a separate description, the more so as they have attracted but little attention.

In illustration of them I shall take specimen No. 4228 in the College museum; it was removed by Mr. Liston from a man, aged 33. The disease had long existed, and was believed to have originated in a blow; its growth, slow at first, was at last rapid. There was no return of the disease after operation. A section of the tumour presents a soft glistening texture intersected by fibrous bands; scattered sparingly throughout it are cysts for the most part one eighth of an inch, but reaching half an inch in diameter. Many of them (especially the larger) are nearly filled with finely lobulated growths of soft connective tissue. No cartilage could be found either with the naked eye or with the microscope.

This tumour, in its microscopic characters, will bear comparison with some cystic myxomata or soft connective-tissue tumours of the breast. Its stroma consists of loose fibrillar connective tissue containing round, branched, and a few stellate connective-tissue cells, with fasciculi of fibrous tissue interspersed throughout it. But the chief peculiarity of the tumour lies in the existence of narrow slit-like tubules or solid rods of gland tissue. Some are nearly straight, and run for considerable distances across the section; many are curved and some branched. The tubules are lined with a single or double layer of small columnar epithelium, while that of the solid rods varies from small nuclei to columnar epithelium. Many of the tubules are dilated into irregular elongated or oval spaces or cysts with tubules and rods passing out from their walls. The gland tissue was everywhere surrounded by a thick zone of mucous connective tissue more transparent than that of the rest of the tumour, a peculiarity which exists in the myxosarcomata of the breast. Malassez has described a tumour similar to the preceding. The patient was twenty-one years of age, and had noticed an enlargement of the testicle for seven months. The tumour was composed largely of cysts, and was surrounded by the expanded substance of the testicle. The cysts were lined with flattened or with cylindrical epithelium, the latter

being in places ciliated, and in others goblet-shaped from the presence of mucus. The stroma was composed of soft connective tissue interspersed with bundles of spindle-cells, believed to be fasciculi of plain muscular fibres. The tubuli seminiferi in the expanded substance of the testicle were in various stages of compression and atrophy, but in no instance were they dilated. Malassez gives the name of 'myxoid cystom' or 'épithéliome myxoides' to this tumour.

The case described by Mr. R. W. Parker and also that of Richon may perhaps belong to this group, which, however, is connected by such gradual transitions to the cystic fibromata on the one hand and the cystic sarcomata on the other, that sufficient data are not always present to allow of exact distinction.

The cysts are not usually so large and abundant as in the cystic fibromata, and are usually lined with columnar or columnar ciliated epithelium, although in Malassez' case, in some cysts, the epithelium was pavement-like. The proper substance of the testicle was expanded over the surface of the tumour in Malassez' case, but was not observed in the others mentioned.

The third group, or cystic sarcomata, as they may roughly be termed, form a large proportion of cystic tumours of the testicle. The cysts are usually less abundant, smaller, and less uniformly distributed throughout the tumour than in the cystic fibromata. Cartilage is less constantly present, and often forms a mass at some part of the growth.

A layer of the expanded substance of the testicle proper is found in a considerable proportion of cases. The epithelial lining of the cysts, as far as I have been able to observe, does not differ essentially from that of the fibromata. It is often mixed, but columnar epithelium preponderates over the laminated form, while the reverse is the case in the fibromata. This may be due to the fact that the growth of the tumour is more rapid, and therefore there is less time for the expansion of tubules by an accumulation of fluid and consequent flattening and lamination of epithelium. Yet in the sarcomata, cysts are found filled with laminated epithelium, fig. 3 having been taken from one.

The characters of the stroma of these tumours are so various that it would lead me much beyond the space which this paper should occupy were I to describe them fully. Let me briefly state that it may be composed of round or round and spindle-celled

tissue, of fasciculi of spindle-cells alone, or intermingled with fibrillar connective and myxomatous tissue, or again, of fibro-sarcomatous tissue. Myxo-sarcomatous tissue is commonly present, either forming a considerable portion of the tumour or distributed in scattered patches. Billroth, Senftleben, and Ehrendörfer have recorded a case of malignant cystic disease of the testicle containing striped muscle. In Ehrendörfer's case the muscle was found in the centre and at the margin of the tumour. The fibres were long, narrow, and frayed out or "dendritic" in arrangement. This specimen of highly cystic tumour is described as cancer. But the diagnosis is open to doubt as the stroma was myxomatous besides containing muscle, and some of the cysts were lined with cylindrical epithelium. Moreover, the metastatic growths were not examined. It must also be remembered, in regard to cases described as "cancer" in the accompanying table, that most of them were examined before the line between sarcoma and cancer was drawn as sharply as at present, and when the tendency of sarcoma of the testicle to take an alveolar form was not recognised. I am therefore of opinion that most of these cases were sarcomata.

Cystic cancer undoubtedly occurs; and a good example exists in the College museum, No. 4235, the tumour involving the testicle of an Italian greyhound. There were also appearances indicative of cancer in some parts of specimen No. 4223 in the College Museum.

Having described the chief naked-eye and microscopic characters of the cystic tumours of the testicle, two questions remain for consideration:—First, what is the relation of the different forms of cystic tumours among themselves? And that having been discussed, there then comes the next questions,—How do they originate, and what are their homologies?

In regard to the first question, the chief point to endeavour to decide is, whether the innocent and malignant cystic tumours of the testicle are practically different, that is, originate in different structures, and have different relations to surrounding structures, or whether they are merely varieties of the same form of tumour. This question may, I think, be decided by examining the relation of the cystic fibromata and sarcomata respectively to the remains of the testicle, and by comparing each tumour to see if certain structures are common to both.

In the accompanying table, it is noted that in six cases of presumably malignant tumours a layer of testicle substance was

spread out over the whole or some portion of the surface of the tumour, a condition well known to be observable in most cases of cystic fibroma.

Again, the tubules and cysts in the cystic sarcomata, like the fibromata, are lined both with the columnar and flattened epithelium. Certain structures, as striped and unstriped muscle, ciliated epithelium, and cartilage constituting characteristic features of the cystic fibromata, are present in the malignant varieties. In three cases described as "cancerous," in two of which the diagnosis was confirmed by subsequent metastasis, striped muscle-fibre was found; and in one of these ciliated epithelium also existed. Unstriped muscle was said to be present in Malassez' case of myxoma, in Mr. Parker's of congenital sarcoma, and in Lagrange's mixed malignant tumour. The mean age at which adult patients came under observation with each form of tumour differs but slightly.

Finally, in my opinion, it may with truth be said that certain tumours show conditions intermediate between the innocent and malignant growths. Such, I take it, are those with a stroma composed of a mixture of fibrous and mucous connective tissue (cystic myxomata). And several apparently well-marked examples of cystic fibroma (as, for example, No. 2789 in St. Bartholomew's Hospital Museum) show microscopically many suspicious nodules of round-celled tissue.

All these facts incline me strongly to believe that there is no genetic difference between the cystic fibromata and sarcomata; that their origin is similar, although the character of the stroma differs. The development of cysts is much more marked in the cystic fibromata, but this may be explained by the rapid growth of the sarcoma tissue compressing the epithelial tubules in the malignant, and the slower growth allowing more time for their dilatation in the innocent tumours.

These two forms of tumour, therefore, probably originate in the same manner. But, before passing on to consider this second question, it may be convenient to state the views with regard to it expressed by previous writers.

Sir Astley Cooper believed that the cysts arose by dilatation of the tubuli seminiferi, and hence entitled his monograph on this subject the "Tubular Disease."

Curling first showed that the disease originated in the mediastinum testis, and held that the cysts were produced by dilatation

of the normal tubuli of the rete testis. Virchow and Billroth assented to this view, but both commented on the fact that a new growth of epithelium was observable in their cases. Nepveu, Klebs, and others considered that the cyst formation was due to compression of the tubuli by a primary growth of cartilage or connective tissue. In late years examples of cystic disease have been described as cystic adenoma by Kocher, Malassez and Ehren-dörfer. Kocher's able article is not free from some confusion, as he hesitates to place some specimens of common fibro-cystic disease among the cystic fibro-adenomata.

Mr. Shattock¹ and, after him, Mr. J. Bland Sutton,² have contended that cysts in cystic disease of the kidneys originated from Wolffian remains included in the permanent kidney,³ and the latter author has drawn a parallel between this disease and cystic disease of the testicle.

Mr. Sutton says (*op. cit.*), in the innocent variety of cystic disease of the testicle, "the cystic spaces are lined with tessellated epithelium, and arise from dilatation of the collection of mesonephritic remains familiar as the organ of Giralde's, situated between the testis and epididymis." But he has not supported this view as regards the testicle by any original histological observations. In passing, it may again be mentioned that the cysts in the innocent or fibro-cystic disease of the testicle are not exclusively lined with tessellated epithelium, as first stated by Mr. Curling.

Some time previously (Erasmus Wilson Lecture on "Cystic Disease of the Breast and Testicle," 1883) I suggested the possibility of the origin of the cystic disease of the testicle from foetal remnants, and stated the case as follows:—"The mixed character of their [cystic tumours] constituents, as in the presence of cartilage and sometimes of striped and unstriped muscle, lends some support to the view that they are of the nature of teratomata, and perhaps originate in connection with the anterior or sexual portion of the Wolffian body normally present in the mediastinum testis." It was for this lecture that the greater part of the work involved in this paper was done. It is my intention, in the succeeding portion of it, to consider the question of the actual mode of origin of the tumours under discussion.

¹ 'Trans. Path. Soc.,' vol. xxxvii, 1886, p. 287.

² Erasmus Wilson Lectures, 1887, 'Lancet,' Feb. 5th, 1887, p. 256.

³ Mr. Lockwood has combated this view, see 'Brit. Med. Journal,' March 5th, 1887, p. 501, as I think with good reason.

Curling's view, that cystic disease begins in the mediastinum testis, is generally accepted. It is supported by the following considerations:—the position of the tumour, the existence of a layer of the parenchyma of the testicle expanded over it; the presence, in nearly all specimens, of tubules lined with columnar and, in some, of columnar ciliated epithelium, which could only have been derived from the structures of the hilum and epididymis. On the other hand, careful examination of the peripheral layer of expanded parenchyma of the testicle (among other observers by Malassez and Ehrendörfer) has shown simply atrophy of the tubuli seminiferi without any trace of cystic dilatation. Ehrendörfer observed colloid masses in the atrophied tubules, but these changes never went on to cyst formation. Further, any observations showing that the disease is due to dilatation of the tubuli seminiferi are wanting. In the accompanying table of forty cases of innocent and malignant cystic tumours, in twenty-one there was a more or less distinct layer of testicle parenchyma at some portion of the surface of the tumour.

But it is necessary to go further, and inquire if the cysts are simply due, as Curling apparently believed, to a dilatation of the normal tubules of the rete testis? Or again, if we are to accept, with Kocher and others, the view that there is a new formation of epithelium, or an adenoma springing from the normal ducts in this region? Or lastly, if the cysts and tubuli originate solely from an adenoma-like growth of certain structures enclosed within the hilum, and derived from the remains of the Wolffian body?

Apart from arguments which might be adduced on general grounds, there is microscopic evidence in favour of the view that an actual new formation of epithelium takes place.

I have already adverted to the fact that in innocent tumours I observed evidence of new formation in the form of buds of small, apparently embryonic, cells springing from fully-formed tubules (see fig. 1).

Billroth and Senftleben noted solid dendritic sprouts of epithelium in the malignant tumours described by them, and Ehrendörfer has figured appearances indicating a new formation of epithelium (op. cit., Taf. v, figs. 21, 21). These three cases all contained striped muscle, and although described as cancers they clearly belong to the malignant form of cystic tumour.

Granted, then, that there is a new formation of epithelium, it

would be difficult to disprove an assumption that this new growth proceeded from the normal tubules of the hilum. I must rather adopt the alternative and bring forward reasons in support of the view that it originates from foetal remains.

In the first place there can be no doubt that the epididymis and vasa efferentia are formed from the anterior or sexual segment of the Wolffian body or mesonephros. The exact mode in which the junction of the Wolffian tubules with the tubuli seminiferi takes place is still uncertain. Mr. Lockwood in his recent lectures has advanced the view that there is a distinct growth from the Wolffian body into the hilum; and this may be in some measure borne out by the circumstance that, embedded in the hilum of the normal testis, are numerous groups of peculiar cells, which Klein believes to be derived from the epithelial columns of the Wolffian body, and analogous to similar remains in the hilum of the ovary. The cells are polyhedral, and are "arranged in plate-like, cylindrical or irregularly shaped, anastomosing masses" lying between the laminae of intertubular connective tissue. In some animals these structures are very abundant, and in the boar they form a predominant portion of the whole testicle (Klein).

Roth also observed, in the rete testis, vasa aberrantia lined with ciliated columnar epithelium, which ran for a considerable distance along the epididymis, and terminated in caecal extremities.

If Klein's view of these structures be correct, there are therefore in the hilum of the testicle abundant foetal rudiments. Considering their origin from the Wolffian body, they might be anticipated, in the event of their taking on active growth, to form tubules lined with columnar or columnar ciliated epithelium, in fact structures resembling the epididymis and its prolongations into the testicle. And, as the rudiments in question are composed of polygonal epithelium, a complete transformation of these to columnar cells in some tubules might not take place. Another explanation is thus offered of the ununiformity of the epithelium in certain cystic tumours. I also observed in more than one example of cystic fibroma appearances favouring this view, and an imperfect attempt has been made to show them (fig. shown). There are rounded groups and strip-like masses of spheroidal cells lying near and even continuous with tubules.

Again, let me remind you that the tubules of the epididymis, coni vasculosi, and vasa efferentia only are lined with *ciliated*

columnar epithelium, while the vasa recta forming the rete testis are lined with short columnar cells. Now, the presence of columnar ciliated epithelium in many tumours in adults has been noted; and in a case of large cystic tumour in an infant recorded by Mr. Athole Johnson, all the cysts were lined with columnar ciliated epithelium. Supposing that these growths were adenomata originating from normal tubuli they must have been derived from the vasa efferentia or epididymis and not from the rete testis lying in the hilum; but, owing to the peripheral position of the first named ducts, the tumours would in that case be expected to project backwards and involve the epididymis. On the contrary, however, they project forwards into the testicle, and I cannot therefore think that they can be derived directly from the vasa efferentia. But the foetal rudiments or interstitial cells of Klein not only occupy the hilum but the interstices between the tubuli seminiferi. Therefore the acceptance of the hypothesis that the cystic adenomata originate from these rudiments is the only way I see out of the dilemma in which one is otherwise placed in explaining the presence of ciliated epithelium in these tumours.

The hilum cysts of the ovary (described in 1881 by Coblentz in his almost classical monograph on cysts originating in foetal rudiments in the female ('Virchow's Arch.,' Bd. 84, S. 26) offer a nearly, but not quite analogous example of cysts formed by dilatation of remains of the Wolffian body, and in Hertzberg's case (see Table) of congenital cystic disease of the testicle the resemblance seems to me extremely close. But the analogy does not entirely hold good, for although the ovarian hilum cysts may be filled with papillary growths, it has not been shown that there is any adenoma-like growth of epithelium, and the stroma is insignificant in amount.

It might further be argued that the mixed character of the stroma of the cystic tumours of the testicle allied them to the teratomata, and pointed to their origin from foetal rudiments. Too much stress must not, however, be placed on this, as cartilage commonly occurs in the sarcomata apparently arising in the body of the organ. The frequent occurrence of cartilage in tumours of the testicle may probably be explained by the circumstance that the stroma of the testicle is derived from embryonic cells lying in close relation to the protovertebræ. The presence of striped muscle may be similarly explained, as Cohnheim pointed out in the

case of the myo-sarcomata of the kidney. Again, regarding the striped muscle found in cystic tumours of the testicle it cannot be maintained that it is derived from the gubernaculum Hunteri, for in the only two instances of this mode of origin recorded respectively by Neumann¹ and Rokitansky, the tumours were situated at the inferior pole of the testicle near the point of attachment of the gubernaculum. They were solid, composed for the most part of striped muscle, and were distinct from the testicle.

The presence of smooth or unstriped muscle may, however, be taken as a further indication that the tubules of the cystic tumours have a common origin with those of the epididymis and coni vasculosi, the tubules of which are surrounded by a layer of unstriped muscle. This is especially so, when, as in Mr. R. W. Parker's case of congenital tumour, the tubules are surrounded by a layer of muscle.

The chief conclusions to which this inquiry has led me may be briefly stated as follows :

1st. There is no genetic difference between the innocent and malignant cystic tumours of the testicle; they are merely varieties of the same form of tumour.

2ndly. The tumours originate in the hilum of the testis.

3rdly. There is evidence of a new formation in these tumours of highly organised epithelial tissue, and it is therefore convenient, for anatomical classification, to describe them as adeno-fibroma, myxoma, or sarcoma, as the case may be.

4th. That the prototype of the epithelial formations is found in the tubules of the vasa efferentia and rete testis.

5th. There are grounds for believing that the tubules and cysts originate in certain elementary outgrowths from or rudiments of the Wolffian body existing throughout life in the hilum testis.

6th. But it is incorrect to say that they are derived from the organ of Giraldés, for these tubular remnants of the Wolffian body are situated between the testicle and epididymis, and altogether outside of the testicle. Besides, the cystic disease is produced, not merely by a dilatation of pre-existing tubules, but by a new formation of epithelium.

A brief analysis of the table of cases may be of some value, and is of interest as showing a much closer parallel than might have been anticipated between the innocent and malignant groups. It

¹ See 'Cent. f. Chirurgie,' No. 52, 1886, S. 912.

Table of Cases of Cystic

Reference.	Nature of Tumour.	Of Stroma.	Age of Patient.	Duration.
Hunterian, R. C. S. Mus., No. 4220	Cystic fibroma	Fibrous	...	...
R. C. S. Mus., No. 4222, Mr. Cock	Ditto	Fibrous ; masses of small spindle-cells	...	...
R. C. S. Mus., No. 248, Sir A. P. Cooper	Ditto	Fibrous	...	...
St. Bart.'s Hosp. Mus., No. 2789	Ditto	Fibrous, but many nodules of round-cells	40	Slowly growing
St. Bart.'s Hosp. Mus., No. 2793, Sir J. Paget	Ditto	Fibrous	58	20 yrs.
F. M. Caird, 'Edinburgh Med. Journ.,' Nov., 1885	Ditto	Ditto	24	16 mos., followed a blow
Athole Johnson, 'Trans. Path. Soc.,' vol. vii, 1855, p. 241	Ditto	Ditto	2 yrs. 9 mos.	2 yrs. 6 mos.
Hertzberg, 'Virchow's Jahrbuch,' 1885, Bd. ii, p. 247	?	Ditto	2 yrs.	Congenital
Wurzberg Mus., Kocher	Cystic fibroma	...	...	...
Ditto	Ditto	...	...	...
Kocher, Case 1, 'Billroth and Pitha's Handbook'	Ditto	Some nodules of round-cells	...	...
Kocher, Case 2, idem.	Ditto	...	...	...
Virchow, Case 1, 'Archiv,' Bd. viii, S. 404	...	...	...	...

Disease of the Testicle.

Cartilage Present.	Muscle Present.	A Layer of Testicle Substance expanded over Tumour.	Results.	Nature of Epithelium of Tubules and Cysts, and other Particulars.
Yes	Probably unstriped muscle	Not observable	...	Chiefly spheroidal and flattened; smaller tubules with cylindrical. Solid columns of small spheroidal cells. "Cholesteatomata" cysts abundant and of moderate size.
Yes	?	Yes	...	Columnar and ciliated epithelium chiefly; some flattened. Stripes and rods of spheroidal cells.
No	...	Not observable	...	Spheroidal and flattened epithelium; a few small tubules with columnar.
Yes	...	Yes	Patient in good health 4 years after operation	Ciliated columnar, sub-columnar or cubical. Solid buds of epithelium springing from tubules.
Yes	...	Not observable	Ditto 12 mos. after operation	Tube-like spaces filled with small spheroidal epithelium, which for most part had disappeared.
Yes	No	Yes	...	Chiefly tessellated; a few with cylindrical. "Cholesteatomata."
No, but osseous mass	...	Yes	...	Ciliated columnar. Many cysts.
No	No	Tumour lay in testis	...	Tumour of walnut size involving testicle. Composed of cysts forming chains lined with ciliated columnar epithelium.
Not mentioned	...	Yes	...	...
Yes	...	Yes	...	Cysts filled with flattened epithelium.
No	...	Not noted	...	Tubules lined with, also columns of columnar epithelium, with "buds" springing from them.
Much	...	Yes	...	In part ciliated columnar epithelium.
Yes	...	Yes	...	Pavement-like epithelium.

Table of Cases of Cystic

Reference.	Nature of Tumour.	Of Stroma.	Age of Patient.	Duration.
Virchow, Case 2, idem.	Cystic fibroma	...	...	...
Jabez Hogg, 'Trans. Path. Soc.,' vol. iv, p. 180	...	...	30	1 yr.
Curling, Case 1, 'Med.-Chir. Trans.,' vol. xxxvi, p. 240.	Cystic fibroma	...	37	7 mos.
Nepveu, Case 1, 'Soc. Anatom.,' 1870, p. 66	Ditto	Fibrous, some islets of mucous tissue	28	11 mos.
Nepveu, Case 2, idem.	Ditto	...	25	...
Ehrendörfer, 'Langenbeck's Archives,' Bd. xxvii	Ditto	Fibro-myxomatous	...	...
R. C. S. Mus., No. 4228, Liston	Cystic myxofibroma	Ditto	33	Long duration
Malassez, 'Arch. de Physiologie,' vol. vii, p. 122	Ditto	Chiefly myxomatous	21	7 mos.
Richon, 'Bull. Mém. de la Soc. de Chirurgie,' p. 132, 1883	Cystic myxosarcoma	Myxomatous	22	½ yr., appeared after blow
R. W. Parker, 'Trans. Path. Soc.,' vol. xxxvi, 1885, p. 299	Ditto	Patches of myxomatous tissue	3 mos.	Congenital
S. Q. Silcock, idem., p. 301	Sarcoma	Spindle-celled and myxosarcoma	8 mos.	Congenital
R. C. S. Mus., No. 4231, Mr. Hutchinson	Cystic myxosarcoma	Myxomatous	5 mos.	...
R. C. S. Mus., No. 4233, Mr. Cock	Sarcoma, a few cysts	Round-celled	55	10 mos.
Ditto, No. 4237, Hunterian.	Sarcoma, minute cysts interspersed	Ditto	...	...
Ditto, No. 4223, Mr. Hancock	Chondrosarcoma, cysts small and few	Spindle-celled and fibrillar	...	...
R. C. S. Mus., No. 4224	Chondrosarcoma	In part fibrillar	...	...

Disease of the Testicle—continued.

Cartilage Present.	Muscle Present.	A Layer of Testicle Substance expended over Tumour.	Results.	Nature of Epithelium of Tubules and Cysts, and other Particulars.
Yes	...	Yes	...	Sprouts of epithelium from dilated tubules.
Chiefly	...	Yes	Recovered and remained well	...
...	...	Yes	...	Flattened epithelium. "Tumour developed in rete testis."
Yes	Fasciculi of spindle-cells	Yes	In good health 2 yrs. after operation	Cysts lined with pavement epithelium.
Yes	Ditto	...	...	Buds of epithelium projecting from dilated tubes.
...	...	...	...	Cylindrical epithelium.
No	No	Not visible	No return	Branching tubules of columnar epithelium, surrounded by myxomatous tissue.
No	Unstriped muscle	Yes	...	Cylindrical, ciliated, calyciform, and some flattened epithelium.
Yes	...	No	...	One layer of columnar, or several layers of epithelium of which inner were flattened, middle "prickle" cells and outer cylindrical.
No	Unstriped muscle around tubules	No	...	Cylindrical epithelium. Growth studded with minute cysts.
...	...	...	...	Tubules scattered in sarcomatous stroma.
Yes	...	No	...	Embryonic gland-tissue composed of small spheroidal epithelium. Origin doubtful.
Yes	Probably unstriped	...	...	Flattened and columnar epithelium.
No	...	...	Metastasis	Small spheroidal epithelium, filling some tubules.
Yes	...	...	...	Masses and rods of sub-columnar and spheroidal epithelium.
Yes	...	...	...	Spheroidal and columnar.

Table of Cases of Cystic

Reference.	Nature of Tumour.	Of Stroma.	Age of Patient.	Duration.
R. C. S. M., No. 4225, Sir. W. Fergusson	Cystic myxo- sarcoma	Spindle-cells and myxo- sarcomatous	...	...
Mr. V. Horsley, 'Trans. Path. Soc.,' 1883	Cystic- sarcoma	Round-celled sacoma in nodules?	Adult	18 mos.
Mr. F. S. Edwards	Sarcoma, cysts not numer- ous	Fibro- sarcomatous	30	18 mos.
Billroth, 'Virchow's Arch.,' Bd. viii, S. 433	? "Cancer"	...	25	3 mos.
Senftleben, 'Virchow's Arch.,' Bd. xviii	Ditto	...	35	1½ yrs.
Ehrendörfer, 'Langen- beck's Arch.,' Bd. xxvii, S. 354	Ditto	Myxomatous tissue	22	1½ yrs.
Sir H. Thompson, 'Trans. Path. Soc.,' vol. vi, p. 240	Ditto	...	25	6 mos.
Curling, op. cit., Case 2	Ditto	...	32	18 mos.
Mr. W. Haward	Ditto	...	30	2 yrs.
Billroth, 'Virchow's Arch.,' Bd. viii, S. 270	Ditto	...	31	1 yr.
Lagrange, 'Progrès Méd.,' No. 19, 1882, p. 367.	Mixed, "in part cancer"	...	23	3 mos., imme- diately fol- lowed a blow

Disease of the Testicle—continued.

Cartilage Present.	Muscle Present.	A Layer of Testicle Substance expended over Tumour.	Results.	Nature of Epithelium of Tubules and Cysts, and other Particulars.
Yes	...	Yes	...	...
...	...	Not noted	Secondary growths in lungs, liver, and bladder	Cylindrical and flattened epithelium.
Yes	...	No	...	Several layers of spheroidal or one of short columnar.
Yes	Striped muscle	...	Metastasis in lumbar glands	Sprouts of epithelium from dilated tubules.
...	Ditto	Yes	Died soon after operation with typhoid symptoms	Cysts lined with flattened and ciliated epithelium.
Yes	Ditto	Yes, nearly all	Metastasis	Flattened and cylindrical epithelium.
Yes	...	Yes, in part	Died of cancer	...
...	...	...	Metastasis in lumbar glands	...
Yes	...	Yes	Ditto and in lungs	Collections of large epithelial cells in meshes of fibrous tissue.
...	...	Yes	Metastasis in lumbar glands	Sprouts springing from tubules and columns of epithelium.
No	Unstriped muscle	Yes	...	Macroscopic cysts lined with columnar or flattened epithelium. Peripheral portion of tumour "pure cancer."

has been found convenient to include those tumours containing a large proportion of myxomatous tissue among the sarcomata. The two groups will be spoken of respectively as cystic fibromata and sarcomata, the former being nineteen the latter twenty-one in number.

Age.—Of nine cases of fibromata, in which the age was stated, two occurred in infants, and in one of these the disease was congenital. The mean age of six adults was 30 years. Of sixteen cases of sarcomata there were three in infants, two being congenital; and of the thirteen adults the mean age was $29\frac{1}{2}$ years.

The age taken is that when the patient came under observation; therefore the occurrence of the sarcomata at a younger mean age than the fibromata may in some measure be accounted for by the more rapid course of the disease. The case (see Table) in which cystic fibroma had existed for twenty years is omitted.

Duration.—Excluding again the same case, the mean duration of five cases of fibromata, in which this particular point was stated, was fifteen months.

Of thirteen cases of sarcomata, twelve months. Metastasis occurred in eight cases of sarcoma; in no case of fibroma.

A layer of testicular parenchyma was spread out over the surface of the tumour in thirteen cases of fibroma; it could not be observed in three, and no note was made in three.

In the sarcoma it existed in eight, was unrecognisable in five, and no note was made in eight.

Cartilage was present in twelve cases of fibroma, absent in four, and not noted in three. Among the sarcomata it was present in eleven, absent in five, and not noted in five.

Tissue resembling plain muscle-fibres was observed in three cases of fibromata and four of sarcomata; but, owing to the difficulty of distinguishing it from growing or embryonic connective tissue, these statements must be taken with reserve.

Striped muscle existed in three malignant tumours, but was not found in any case of fibroma.

Several of the sarcomata appeared immediately after a blow, and in some the growth was exceedingly rapid.

Only cases in which a careful microscopic examination was made have been included in the table; and I do not pretend that it is a complete collection of these. Possibly, too, one or more tumours may have been included among the cystic sarcomata in which the

cysts were hardly a sufficiently conspicuous feature to warrant it. In conclusion, I may express the hope that the facts herein collected may be of value, whether the hypothesis of which the case is stated be generally accepted or not.

March 15th, 1887.

DESCRIPTION OF PLATE X.

To illustrate Mr. Eve's paper on Cystic Disease of the Testicle.

FIG. 1.—Cystic fibroma of testicle. The drawing represents a cyst lined with columnar ciliated epithelium. From its walls buds composed of small, round, epithelial cells project into the stroma. Some of these buds are seen in transverse section to the left. (No. 4 Hartnack, oc. No. 2.) From specimen No. 2789 St. Bartholomew's Hospital Museum.

FIG. 2.—From a cystic fibroma of the testicle, showing tubules lined with ciliated epithelium; at one part flattened from pressure. ($\times 230$ diam.)

FIG. 3.—Cyst filled with laminated epithelium. Above a small tubule lined with columnar epithelium. From a cystic sarcoma of the testicle. ($\times 11$ diam.)

FIG. 4.—Gland-tubule from a cystic myxo-fibroma of the testicle. The tubule is at one part dilated, at another obliterated from pressure; it is lined with small columnar epithelium.

Fig. 1 is from a drawing by T. Godart; Figs. 2 to 4 from drawings by Mr. Eve.

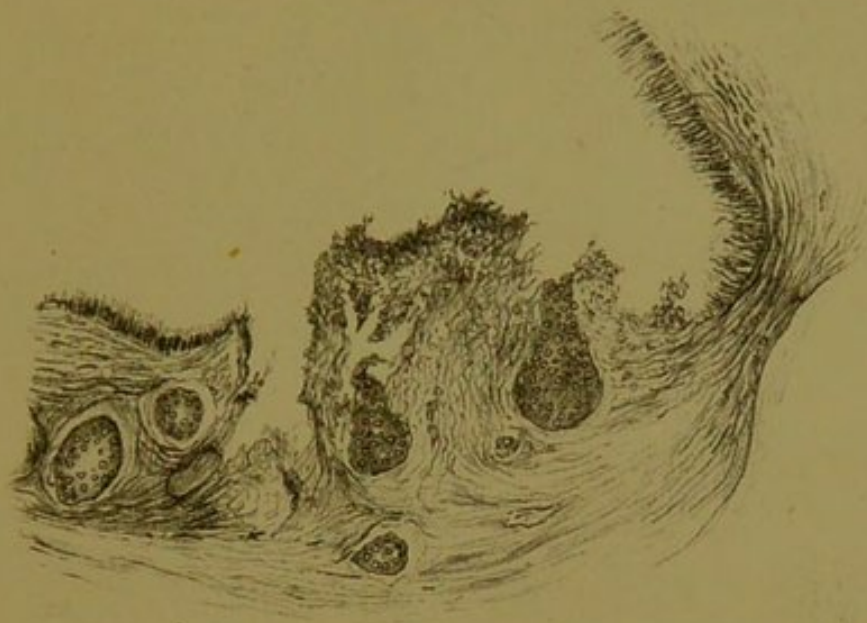


Fig. 1.

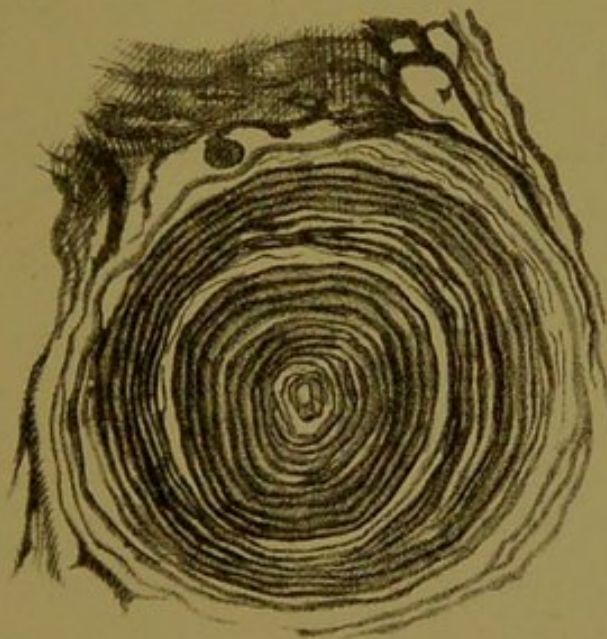


Fig. 3.



Fig. 4.

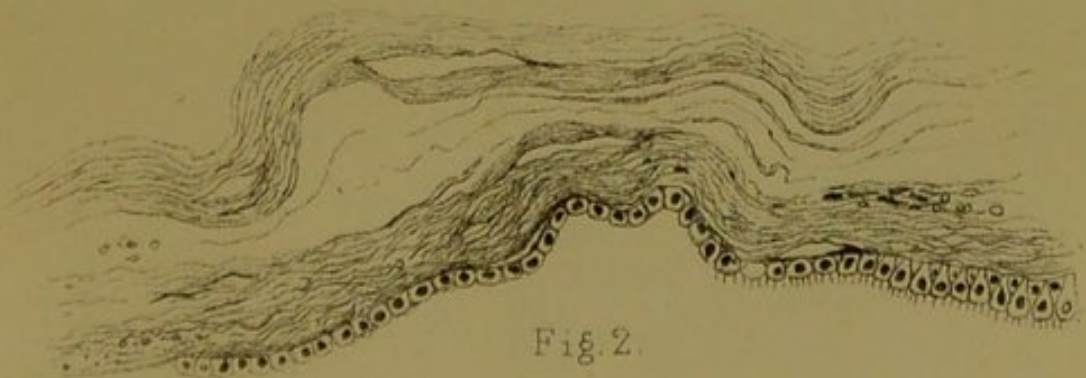


Fig. 2.

