Some observations on the origin and nature of the so-called hydatids of Morgagni found in men and women, with especial reference to the fate of the Müllerian duct in the epididymis / by John H. Watson.

SOME OBSERVATIONS ON THE ORIGIN AND NATURE OF THE SO-CALLED HYDATIDS OF MORGAGNI FOUND IN MEN AND WOMEN, WITH ESPECIAL REFERENCE TO THE FATE OF THE MÜLLERIAN DUCT IN THE EPIDIDYMIS.

By John H. Watson, M.R.C.S., *late Holt Fellow, University College, Liverpool; Assistant Demonstrator of Anatomy, London Hospital.*

In this communication I intend to consider the fate of the Müllerian duct in man first, since not only can one trace it definitely with the aid of the microscope, but by eliminating the fœtal residues likely to remain in connection with it, one is able to study with less chance of confusion the more complicated vestigial structures that are linked together with the Wolffian duct.

Most anatomical text-books state that tacked on to the testicle are two hydatid bodies, one having a pedicle, the other being without; and the sessile body is described as a derivative of the Müllerian duct. Now, in order to corroborate this last statement, I have made a considerable number of microscopical sections of testicles with the epididymis attached, the results of which are here stated as briefly as possible; and although very little, if anything, new has been made out, the work is interesting I think, in that it confirms the observations published by Löewe and Roth on the continent some time ago.

The Sessile Hydatid of the Testicle.

Before entering into the microscopical details, it will be worth while to note the macroscopical peculiarities of the sessile hydatid. After examining a large number of testicles, my own experience is that the sessile hydatid is much more frequently present than the pedunculated one; moreover, instead of being transparent and bladder-like, as its name implies, one

finds it to be a firm, fleshy body, the extremity of which appears to be in some cases drawn out into several very small tag-like processes; hence one is inclined to agree with Testut that in every sense of the word 'hydatid,' this body is misnamed. With regard to its exact position, it is fixed by a broad base to the upper pole of the testicle, the caput epididymis overlying it slightly; and a connection in the form of a band of tissue, over which the visceral tunica vaginalis is raised as a fold, is often to be observed between the two.

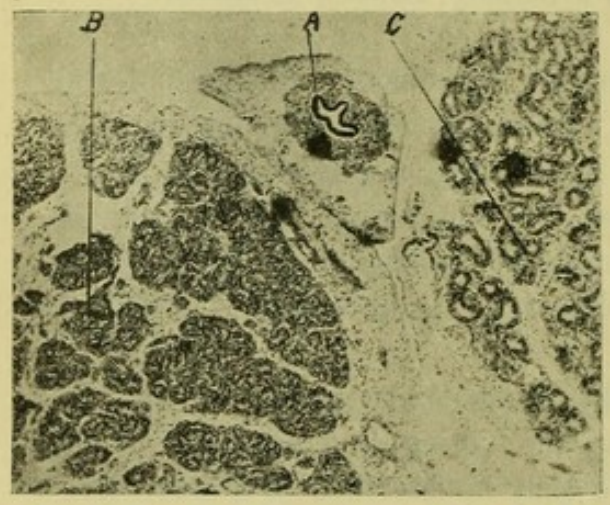

FIG. 1.—Section through sessile hydatid and adjacent parts of testis and epididymis (7 months fœtus).

A, persistent Müllerian duct in centre of hydatid; B, testis; C, epididymis.

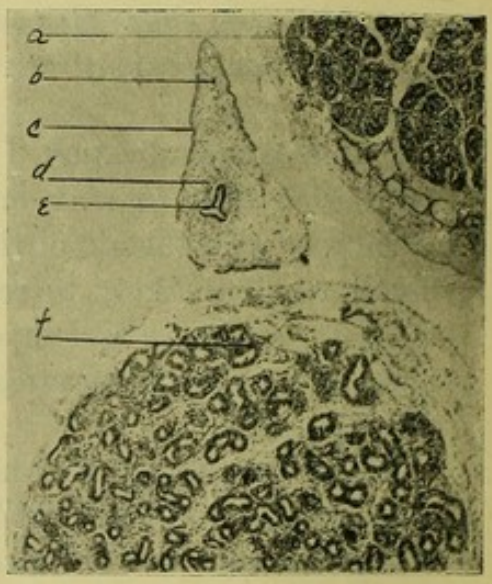

FIG. 2.—Section of sessile hydatid (8 months fœtus).

a, testis; *b*, hydatid; *c*, circumferential layer of cuboidal epithelium; *d*, concentrically disposed wall of Müllerian duct; *e*, lumen (triradiate) of duct lined with columnar epithelium.

The microscopical appearances of these bodies, of course, differ greatly according to the age of the subject from which they were obtained.

In all sections of fœtal testicles between the ages of 7 to 9 months, remnants of the Müllerian duct could be traced running along the anterior and outer border of the epididymis. The younger the testicle, the more obvious this solitary tubule appears, around which the neighbouring connective tissue is arranged concentrically.

The micro-photographs appended were taken of sections of the testicle of an eight months fœtus, which possessed a sessile hydatid only. The degenerate remains of the duct are visible in the epididymis, and as the sections approach the caput epididymis, there is a gradual dilatation of its lumen, which becomes very evident in a section across the hydatid (*vide* fig. 2), where it assumes a tri-radiate appearance. The hydatid itself consists of a groundwork of fibro-cellular material, which has a very noticeable concentric disposition around the centrally situated vestige of the Müllerian duct, whereas the periphery of the body is invested by a single layer of columnar epithelium. In one series of sections of the testicle of a 7 months fœtus,

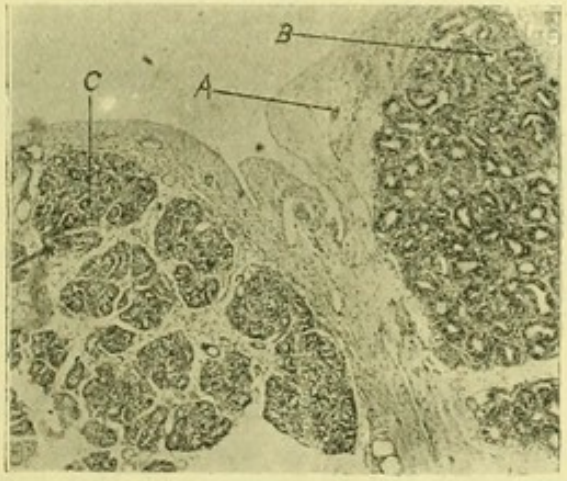

FIG. 3.—Section through body of epididymis (8 months fœtus).

A, Müllerian remnant in anterior border; B, epididymis; C, testis.

I was so fortunate as to get a section showing the communication of the duct with the exterior, *i.e.*, with the processus vaginalis. In making sections towards the tail of the epididymis, vestiges of the Müllerian duct are more difficult to recognise; in fact, it is not always possible to see a trace below the body of the epididymis, even in full-term fœtuses.

As one examines in this manner serial sections of the testicles of subjects of gradually increasing age, the evidences of the Müllerian duct are more and more difficult to see. For instance, in some sections of the epididymis of a boy aged 12, after very careful scrutiny, a doubtful collection of degenerate cells was made out in the position where the Müllerian

remnants should occur, and in close proximity one or two small vessels were placed, round both of which the connecting tissue was arranged in a circular manner; but in all sections of adult epididymes submitted to the microscope, not a single trace of the duct itself was visible, but in its place, as a rule, a few minute vessels were observed, embedded in the connective tissue, which is abundant in the prominent anterior border. The collection of fibro-cellular tissue at this point is interesting from an embryological standpoint, for into it is fused all that practically remains of the mesosalpinx, a structure that is very well marked during the third and fourth months of fœtal life. Sections of sessile hydatids taken from middle-aged and old people show nothing of the original structure of the Müllerian duct, except perhaps the lumen of the tube. This may appear as a single fissure or several smaller fissures, situated centrally, and devoid of any distinctive epithelial lining. The epithelium appears to degenerate, the opposite sides of the lumen come together, eventually fusing, and thus one can account for the presence of the multiple lumina which may be present.

No evidence whatever of the Müllerian duct is to be found in sections of an adult spermatic cord, nor have I seen any distinct trace of it in the cords of still-born infants examined microscopically.

Now one can leave the discussion of this sessile body, and treat with advantage the relationships and structure of the pedunculated hydatids, dealing first with that found in the female.

The Pedunculated Hydatid found in Females.

This, according to Quain, is "a pedunculated cyst, known as the hydatid of Morgagni, apparently peritoneal in origin, and frequently found attached to one of the fimbriæ, or to the tube itself." Again, most gynæcologists invariably refer to the same body as a "cyst of Kobelt." This double nomenclature, so to speak, is very unfortunate, and confuses one greatly when running through the literature.

With regard to the exact position of these pedunculated

bodies, my own experience differs from that set down by Quain. In those cases in which it was present—about 50 per cent. of all examined—it was never seen connected with one of the fimbriæ of the Fallopian tube, and it is the exception to find it completely blended at its base with the tube. Usually, however, it appeared to come from the anterior layer of the mesosalpinx, the pedicle by which it is attached springing from this layer at a spot 1 cm. or thereabouts from the fimbriæ ovaricæ, and practically opposite its centre, *i.e.*, a point midway between its base and apex. The length of the stalk itself varies greatly in different women, and even on opposite sides of the same

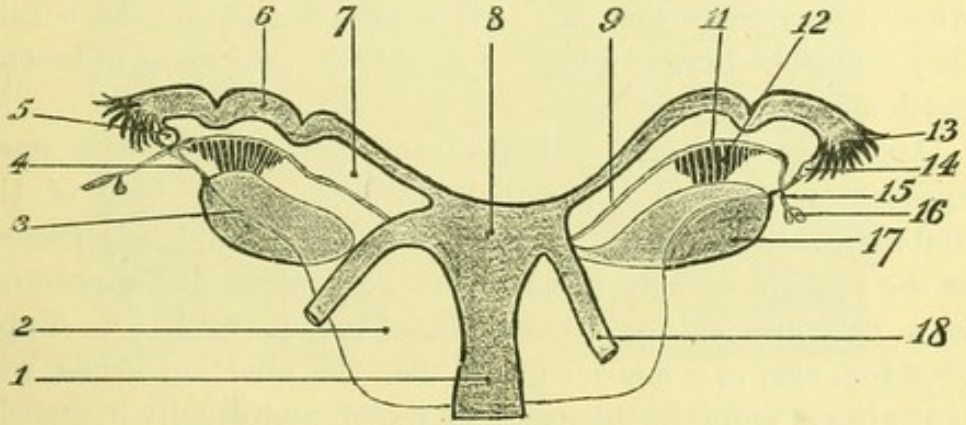

FIG. 4A.—Diagram of uterus and appendages (child 3 years).

1, cervix uteri; 2, broad ligament; 3, edge of broad ligament; 4, ovarian fimbria; 5, cyst at base of ovarian fimbria; 6, Fallopian tube; 7, mesosalpinx; 8, Cowper's uteri; 9, Wolffian duct (remnant); 11, collecting tube; 13, fimbriæ of tube; 15, hydatid stalk; 16, hydatid of Morgagni; 17, ovary; 18, round ligament.

individual. On a closer inspection, its proximal end is seen to be in continuity with the collecting tube (Wolffian duct proper) of the parovarium (*vide* fig. 5). Moreover, in a well marked specimen the proximal end or base of the stalk is connected by a ridge-like fold with the Fallopian tube, a second fold apparently running into one of the mesonephric tubules. These ridges being continued into the pedicle of the hydatid, give it a doubly infolded appearance (*vide* fig. 6) on one aspect, the other aspect of this band-like structure is quite even. The upper and lower margins merge into the aforesaid ridges, and there is a gradual tapering of the stalk as it approaches the cyst. In the rare instances in which I have seen a pedunculated

hydatid arising in the immediate vicinity of the fimbriated extremity of the Fallopian tube, a distinct connection through the broad ligament with the rudimentary Wolffian duct could always be made out with a good lens, if not with the naked eye.

The Hydatid Cyst.

In dealing with the cyst, one notices that it assumes many forms; it may be a unilocular sac, a cyst with partial constriction into two compartments, or a couple of separate small cysts may exist. The size appears to increase slowly up to puberty, when it may equal that of a pea, or even a cherry. As a rule, they do not become any larger; in old age they seem to become much smaller, in some cases almost to shrivel away.

And here I would call attention particularly to a small apparently mucous cyst which appears at the base of the fimbria ovaricæ (*vide* fig. 4A), and is quite as frequently present as the hydatid cyst itself. How to account for its appearance is a difficult matter. If one considers it to be a simple retention cyst of a mucous gland, then the question arises, why is it always found in this particular spot, and usually in association with a similar cyst at a corresponding point in the opposite broad ligament? My first impression was that it might be a stalkless hydatid of Morgagni, but this idea was discounted by the fact of there being present in the same case, as a rule, a well marked pedunculated cyst (fig. 4A). A plausible suggestion is, that the duct of a large mucous gland at the ostium abdominale, lying contiguous to the ovarian fimbria, is very liable to be kinked owing to the drag of the ovary, and thus the lumen of the duct being occluded, a cyst forms. Even this, however, is a mere theory, and lacks microscopical investigation. There can be no doubt, however, that it is frequently taken for the hydatid of Morgagni, which is an entirely different structure.

The Parovarium (Organ of Rosenmuller).

A brief reference to the parovarium here will help perhaps in following out the sections described later.

It is comprised of a series of rather straight and parallel tubules lying in the mesosalpinx. To these the term 'efferent' has been applied. Their number varies between 15–20. They are connected by one extremity with a broader tube running parallel almost and just below the Fallopian tube, which is known as the 'collecting tube' (it is a remnant of the Wolffian duct proper); the other extremity stretches towards the hilum of the ovary. Of these efferent tubules, it is needless to say that both the upper and lower end of the series gradually

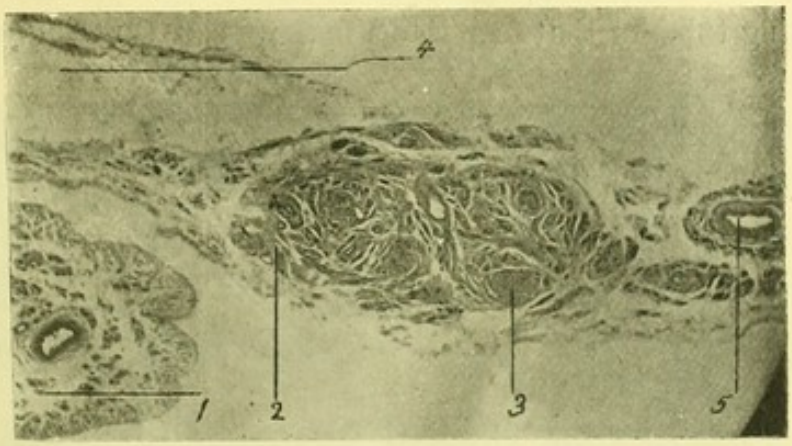

Fig. 4.—Section across collecting tubule.

1, hydatid stalk; 2, fibro-muscular tunic; 3, tubule in transverse section; 4, broad ligament; 5, accompanying artery in section.

become shorter and crowded together, more especially the former. Roth has described a duct which he calls the 'tubo-parovarium,' a vestigial canal joining the collecting tube of the parovarium with the Fallopian tube—a condition of things that I have searched for in vain so far.

A section across the collecting tube shows a most remarkable appearance under the microscope (*vide* fig. 4): instead of seeing a comparatively simple tubular structure, one observes numerous tubules cut across with well defined walls. The lumen of each is lined by—

(1) A single layer of columnar cells, which is surrounded by

(2) A very thick layer of cells, polyhedral in outline, evidently involuntary muscle in cross-section.

(3) Outside this again is a coat of involuntary muscle, disposed circularly, altogether a much thinner layer than the previous

one; each tubule is separated by a varying amount of inter-tubular connective tissue.

(4) The entire collection of tubules is practically encapsuled by a fibro-muscular tunic.

In concluding the description, one must not forget to notice the large vessels (artery and vein) lying in close proximity. The whole structure reminds one of a section of the epididymis in the male (even to the artery to the vas deferens), with which it practically corresponds. One, of course, must make allowances, when comparing, for the deficiencies in the sections of the collecting tube, in that one is dealing with a functionless, and

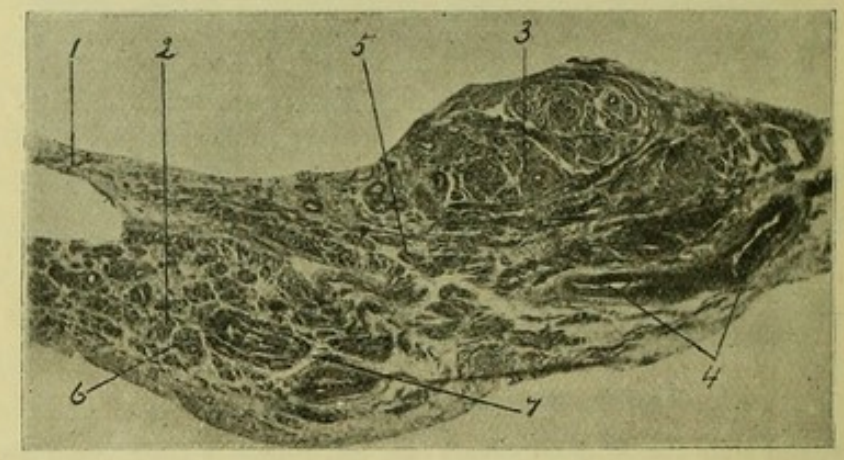

FIG. 5.—Section at the point of fusion of hydatid pedicle with collecting tube.

1, broad ligament; 2, hydatid stalk; 3, collecting tubule; 4, parovarian vessels; 5, intervening fibro-muscular tissue; 6, almost complete tubule in hydatid stalk; 7, vessels of hydatid.

hence much atrophied Wolffian duct, whereas in the male it has attained its highest development. When a section is examined as close as possible to the point at which the base of the hydatid stalk enters the broad ligament, one sees that the hydatid pedicle and the encapsuled collecting tubule are practically superimposed (fig. 5); that in the pedicle itself similar tubules transversely cut, but much more atrophied than those described as part of the much coiled Wolffian or collecting tube, are visible. Again, each of these structures is accompanied by a large artery and vein; moreover, at this point (*vide* fig. 5) they are separated by an intervening bundle of fibro-muscular tissue. A section a little nearer the uterus

shows the disappearance of this intervening tissue, and the fusion of these two structures with one another, even to the junction of the accompanying vessels.

In minutely investigating the pedicle, the infolded character (previously referred to) of one surface is very well shown (fig. 6), but the most noticeable feature is the large artery and vein in its midst, and disposed around these are some very scattered and partially obliterated tubules, with a very sparse coating of involuntary muscle, which I consider to be the remains of the continuation of the collecting tube, or rather

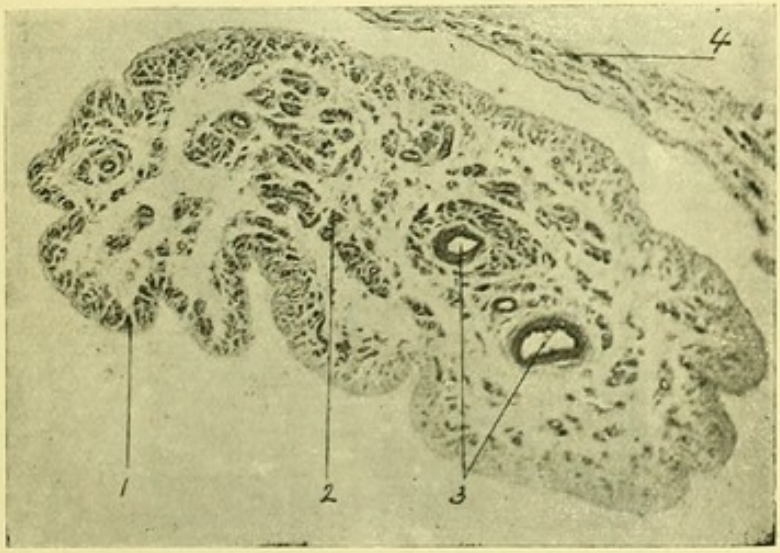

FIG. 6.—Section of hydatid stalk (from female) near its point of emergence from broad ligament.

1, peripheral fibro-muscular layer ; 2, atrophied tubules ; 3, large central vessels ; 4, broad ligament (adjacent).

Wolffian duct proper, into the pedicle. These tubules, moreover, are dotted about in a groundwork of fibrous connective tissue. As one examines more and more distal sections (*i.e.*, nearer the cyst) their number decreases, and the more evident their degeneracy appears, until they, to all intents and purposes, vanish. A more remarkable feature is the continued large size of the artery and vein. Surrounding these vestigial structures is a curious layer extending right round the periphery, and composed of involuntary muscle fibres, with a large admixture of somewhat dense fibrous tissue. The surface of the pedicle has an endothelial lining.

The Histology of the Cyst.—The microscope reveals its wall to comprise a single layer of cuboidal nucleated epithelium, resting on a layer of fibrous tissue, in which a small quantity of involuntary muscle is interspersed. This layer varies greatly in thickness, depending to a large extent upon the amount of distension. A point which has been much discussed is the character of the epithelial lining. Fleischl, Ballantyne, and Williams regard it as ciliated. Klob and Kölliker aver that it is flattened pavement epithelium. My own experience is as quoted above, with one exception found in a cyst taken from a

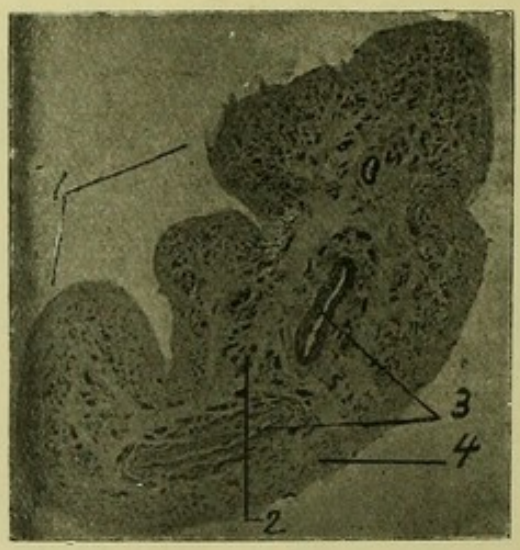

FIG. 7.—Section of hydatid stalk close to cyst.

1, ridges noted in text; 2, atrophied tubules; 3, central vessels; 4, peripheral fibro-muscular layers.

child which had a lining of ciliated epithelium. Previously I had confined my attention to specimens taken from adults; possibly there is a tendency for the cilia to disappear with advancing age, and the epithelium to change its character owing to increased tension. Before making any definite statements as to the exact nature of this cyst, it will be well to refer to the *pedunculated hydatid* found in the male.

The Pedunculated Hydatid of the Male.

This body, when present, which by the way is the exception rather than the rule, is attached by a short pedicle close to the

apex of the caput epididymis, *i.e.*, roughly to the upper end of the Wolffian duct, from which, of course, the epididymis is developed in part, and therefore, comparatively speaking, it is placed in a position identical with that of the hydatid body in the female. The dimensions of this cyst are subject to much variation; it is certainly much smaller than that found in women. The histology of the cyst wall is simply a lining membrane of beautiful cuboidal or columnar celled epithelium—(my own observations lead me to think the ciliated epithelium of other writers a variable quantity)—here again lying on a fibrous

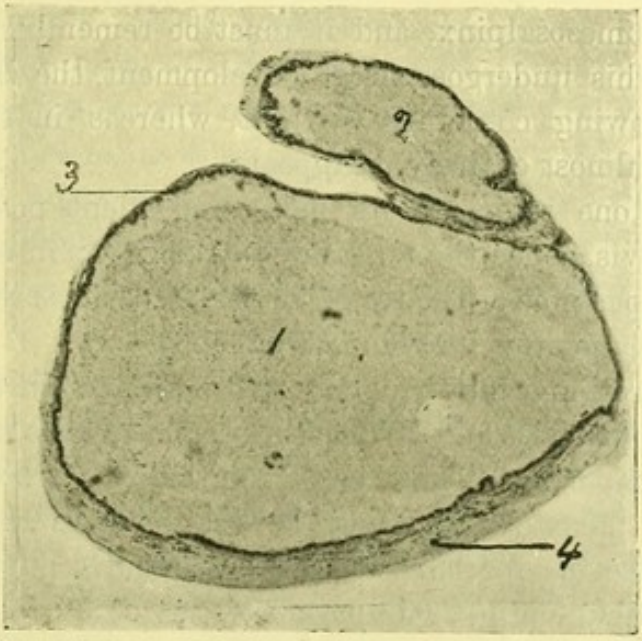

FIG. 8.—Section of cyst of pedunculated hydatid. (Micro-photograph.)
1, lumen of cyst; 2, loculus; 3, layer of columnar epithelium; 4, fibrous wall.

muscular wall (fig. 8). Of the structure of its pedicle at the present moment I greatly regret being unable to say anything definite, as my efforts to obtain reliable sections have been failures, more especially since at the present time the question of the homologies of these pedunculated bodies in the male and female is a vexed one. For instance, to cite two of the most recent anatomical text-books, viz., Testut and Poirier, the former definitely states they are homologous structures, whereas H. Rieffel, writing in Poirier's treatise, says, that owing to the uncertainty of their embryological origin it is impossible to make a final statement.

The arguments in favour of the identity of the pedunculated bodies in the male and female are—

(1) The fact that the pedicles arise from corresponding points in both sexes, as previously stated.

(2) The histological structure of the cyst wall in both sexes is identical.

(3) The differences in regard to the length of the hydatid pedicle in the male and female may be accounted for by—

(*a*) an embryological.

(*b*) a mechanical factor.

(*a*) In all embryos of the 3rd or 4th month there is a well marked mesosalpinx, and it must be remembered that in the female this undergoes great development, the hydatid and its stalk growing conjointly with it, whereas in the male it rapidly and almost entirely disappears.

(*b*) Here one refers to its more dependent position in a woman's pelvis, hence the tendency to elongate; in man it rests upon the upper pole of the testis, so that tension is relieved, and there is every facility for complete atrophy.

A yet more important problem still is to explain their origin. To do this, numerous and diverse theories have been propounded, the more important being based on embryological grounds. For present purposes they may be cut down to the following four, since they are perhaps the most frequently put forward.

The pedunculated hydatid may be—

(1) A reduplication of a peritoneal fold;

(2) A relic of the pronephros;

(3) The ampullated extremity of the Wolffian duct;

(4) A cystic condition of one or more of the mesonephric tubules.

To discuss these briefly:—

No. 1 theory has been put down from the fact that it appears in a standard English anatomical work; but there can be no hesitation in saying, from what we have already seen, that the statement is not well founded.

No. 2. The pronephric origin is supported by such authorities as Gegenbaur, Roth, and others.

The arguments in its favour shortly are:—

A. The pronephros is a purely secretory organ, consisting of

a series of tubules (nephrostomes), communicating, on the one hand, with the cœlom, on the other with the Wolffian duct, and having, of course, a glandular lining of non-ciliated cells (Kollmann). In the process of development the cœlomic opening is closed, and later the functionless Wolffian duct is obliterated, but the secretory function of the pronephric tubules persisting, causes the cystic formations.

B. The histological structure, *i.e.*, the fact of there being a non-ciliated instead of a ciliated epithelial lining, which one expects to find in Wolffian derivatives, and moreover the apparent isolation of the cyst from the remaining mesonephric tubules, is, if anything, evidence in its support.

C. Lastly, many authorities (Minot) consider the duct of the pronephros continuous with the upper end of the Wolffian duct; and, so far as one can say at present, the vestiges of the duct seen in sections of the hydatid pedicle may be equally either Wolffian or pronephric.

The above reasons seem to me now unconvincing, and outweighed by the cons tabulated below.

Reasons against:

(1) The presence of a pronephros in man is now denied by most authorities.

(2) The Müllerian duct is said to be the duct of the pronephros (Rossmann, Ampt, and Berry Hart); and therefore if any pronephric remains are present, they should be connected with it, and not with a pedicle containing traces of the Wolffian duct.

(3) The fact that many authorities maintain the cyst has a lining of ciliated epithelium. This, of course, is really a minor consideration, and one with which my own experience does not agree, but it is very probable that it occurs in the cysts taken from young children.

(4) Lastly, what I consider to be a point of importance is the continuation of the blood-vessels accompanying the Wolffian duct right up to the cyst itself. Had the cyst been derived from a pronephric tubule, its blood supply ought to have come from an entirely different source.

The arguments here quoted against the pronephric theory may be adduced in favour of their Wolffian origin, so that one

has now, I think, no alternative but to decide between the two remaining suggestions, viz.—is it the remains of the ampullated extremity of the Wolffian duct, as originally set forth by Kobelt, an idea that has had the support of Luschka and Hennig; or is it simply a cystic mesonephric tubule, as contended by such authorities as Kobelt, Follin, Rokitansky, Henle?

In favour of the latter view is the fact that we sometimes see two cystic bodies tacked on to the hydatid pedicle (assuming that it contains the upper end of the Wolffian duct); and it is practically certain that the anterior extremity of the Wolffian duct is not bifid (*vide* fig. 1); but again, if we grant its origin from a mesonephric tubule, it is difficult to understand why they should be isolated from the main body of the mesonephros; so it is impossible to say even now from which of the two the hydatid is derived, although one must not forget that it is not unlikely that it may be developed from either.

Conclusions.

The general statement as to the Müllerian origin of the so-called sessile hydatid is undoubtedly correct, for by the aid of microscopical sections it is possible to find remnants of the Müllerian duct in male fœtuses and children, and even to trace it along the anterior and outer border of the epididymis, right into the hydatid itself.

To elucidate the nature of the pedunculated hydatids is a much more difficult undertaking, for although the literature on the subject is exceedingly profuse, it can only be described as chaotic; therefore, in recording my own observations, I have looked upon that pedunculated cyst which occurs the most frequently as the true hydatid of Morgagni, *i.e.*, a small cyst, having a stalk of variable length, which usually springs from the anterior layer of the mesosalpinx, occasionally from the fimbriated extremity of the Fallopian tube, and which can invariably be traced to the parovarium through the broad ligament. This pedunculated cyst is the homologue of the stalked hydatid attached to the epididymis of the male, both

being derivatives of either the mesonephros or the anterior end of the Wolffian duct. The cyst occurring at the base of the fimbria ovarica is of doubtful origin, possibly a distended mucous gland, or a cyst of the tubo-parovarian duct; but further investigation is needed to settle this question.

Finally, the complicated nature of the collecting tube of the parovarium, and its similarity on section to the structure of the epididymis, is a very interesting feature, and one alludes to it here again because it is a fact of which apparently very little notice is taken in anatomical works.

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