PLATE I.

[*Face page* 229.

V. THE ANATOMY AND HISTOLOGY OF AN EARLY TUBAL GESTATION.

WITH LANTERN DEMONSTRATION.

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OF late years a great deal of work has been done on the anatomy of the pregnant tube. Many points are, however, still in dispute, and although we can add little that is new, we feel that the following description of the findings in an early case is worthy of being placed on record. The pregnancy is a fairly early one—probably between the second and third week—and as the affected portion of the tube was examined by means of serial sections, 1971 in all, and the other pelvic organs were obtained, post mortem, in a fresh condition, a complete picture of the condition can be presented. The case is further of interest from the fact that the patient died of internal hæmorrhage from a minute perforation of the tube wall, a termination which is not frequent at such an early period.

The history of the case is as follows. The patient was an unmarried woman, aged 30, employed as a shop assistant. She had for some time been subject to gastric disorder, for which she was from time to time treated by her medical attendant. On the night prior to her death he was called in on account of some slight abdominal pain and diarrhœa, and, seeing her again next morning, the symptoms suggested to him that she was suffering from a recurrence of her gastric trouble. He was informed that she had had a normal menstrual period two or three weeks previously. She became rapidly worse in the

afternoon, and when seen by Mr Caird in consultation early in the evening was so ill as to put operation out of the question. She died shortly afterwards, and, as the diagnosis was very uncertain, a post-mortem examination was immediately made at the request of her doctor and Mr Caird. To them we are indebted for permission to publish the case.

Post mortem. The body was that of a well-developed adult female. On opening the abdomen dark fluid blood welled out, and the abdominal viscera were bathed in blood, while in the pelvis were large clots. The blood and clots when removed filled a large wash-hand basin two-thirds full. The pelvic contents, when examined from above, showed at once the source of hæmorrhage. At the uterine end of the right Fallopian tube there was an almond-shaped swelling measuring a little over 1 cm. in its long axis. This was of a dark, almost prune juice colour and covered by glistening peritoneum, except over a small area about the middle. In this region a lighter brownish-red coloured zone was visible; this was covered by peritoneum, which was more opaque and lustreless, and in its centre a minute perforation was present from which blood oozed on gentle pressure. The condition was diagnosed as a ruptured tubal pregnancy.

The right ovary showed no abnormality, but the left was enlarged and cystic, and growing from the junction of ovary and ovarian ligament was a small fibroma. The uterus was enlarged, soft, and somewhat boggy to the touch; on section its cavity was lined by a thick decidua.

The pelvic contents were removed *en masse* for further examination. The other organs of the body, heart, lungs, liver, etc., showed no evidence of disease except the extreme anæmia from death due to hæmorrhage. The swelling on the tube before mentioned was found on closer examination to be situated in the isthmus. It bulged more towards the broad ligament attachment than to the upper surface, along which the thicken-

ing due to lumen could be traced almost to the middle of the swelling. It measured 1·3 cm. in length, 1 cm. in breadth, and 1 cm. in thickness. The rest of the tube, including the fimbriated end, appeared quite normal. There was slightly more tortuosity in the right (pregnant) tube than in the left (Plate II.).

The gestation sac and adjoining parts of the tube were fixed in formaline, embedded in paraffin, and cut in serial section for microscopic examination. The proximal and distal portions of the tube were also examined microscopically as well as the following tissue: the left tube, uterus, cervix, right and left ovaries, part of ovarian ligament, broad ligament, and cellular tissue in region of uterine arteries.

In discussing the results of this examination we shall take up the points in the following order:—

1. The anatomy of the pregnant tube, especially with reference to the possibility of the presence of diverticula of the lumen.
2. The method of embedding of the ovum.
3. Decidual formation in pregnant tube and other tissues.
4. The trophoblast and its mode of invasion.
5. The ovum with its embryo and membranes.

Anatomy of the Pregnant Tube.—On transverse section of a portion of the affected tube on the uterine side of the gestation sac the following appearances are presented (Plate III., Fig. 1). The muscular and fibrous tissue constituting the greater thickness of the wall show no abnormality. The lumen is centrally situated and is lined by a mucous membrane covered with columnar epithelium. The villous processes of mucosa are more numerous and complicated than usual, and join across the lumen to produce a net-like or honeycomb appearance on section. On these villous processes the epithelium is swollen and in many places desquamated. The fibrous tissue core shows marked engorgement of the blood capillaries with pro-

liferation of the endothelial lining and accumulation round the vessels of cells mainly of the small lymphocyte type, but also all intermediate forms from these to fully-formed polyblasts. The fixed connective-tissue cells of the part are also swollen up and increased in number. In sections nearer the growing ovum active proliferation of these latter cells would appear to explain the presence of the young spindle-shaped cells which have the appearance of being the precursors of a decidual reaction in the villous process of the tube. In sections still nearer the site of the ovum the villous projections of the mucosa become less complicated, and gradually disappear until finally only one large projection is visible, and in this, as will be shown later, there is a marked decidual reaction. The epithelial lining of the tube remains intact until it is replaced by fibrinous exudate which intervenes between the lumen and the ovum bed. On the other side of the gestation sac, towards the fimbriated end, no such adhesion of the villous processes is present, the mucosa being of normal appearance (Plate III., Fig. 2).

In tracing the tube lumen through successive sections, a further interesting appearance is demonstrated (Plate V.). In the sections beyond those showing the above described honeycomb appearance of the mucosa, the lumen becomes less circular in shape, and a projection of the connective tissue of the wall into it is seen. This projection meets the opposite wall of the cavity and appears to convert the single into a double lumen. This double lumen is seen through many sections, and the two cavities undergo a change in shape and size. They are for a considerable length of the tube widely separated from each other, and then they approach one another again and finally fuse into a common cavity. If only the middle sections had been seen, the interpretation put upon the appearance would have been that a double channel was present. By a study of the arrangement of the muscle fibres and from the fact that there is obvious obliquity in the section of the lumina, together

with the fact that the single cavity can be traced into the double one and then on to the single one again, it is apparent that this appearance is not due to a double channel or the presence of a diverticulum, but to the tortuosity and folding of a single tube. The same appearances can be produced by twisting and folding a single rubber tube in various directions.

While it is universally admitted that diverticula of the tube lumen do occur, no weight can be attached to the conclusion that their presence has been the etiological factor in any case of tubal gestation unless serial sections have been made.

Other observers have sought to explain the occurrence of tubal gestation by the grafting of the fertilised ovum in a tube, the epithelial lining of which has been altered by a recent catarrhal process. This view merits careful consideration. In the present case there is evidence of recent catarrh in both tubes, but that in the left—the non-pregnant tube—is so slight in degree as almost to be accounted for by post-mortem change. On the right side, however, it is distinctly present, especially on the uterine side of the gestation sac; but the appearances are, in our opinion, such as can be wholly accounted for by the reaction of the tissues subsequent to the implantation of the ovum. On the other hand, the fusion of the villous processes of mucous membrane across the lumen may have played a part in the arrest of the developing ovum in its passage along the tube, a possibility which is strengthened by the fact that such fusion is only present on the uterine side of the ovum. This cribriform structure of the tube lumen may have been produced by a previous salpingitis, although the possibility of its being of congenital origin must not be lost sight of. The amount of recent catarrhal change present is not sufficient to account for it.

Mode of embedding of Ovum.—In sections through the middle of the gestation sac the ovum, with its villi, fills up the whole interior of the tube and no lumen is visible. At both extrem-

ities of the gestation sac, on the other hand, the lumen is quite intact, and the ovum is seen to be extending not along it, but in the muscular coat of the tube. There is thus evidence that the mode of growth of the ovum is in the tube wall, and that probably it had primarily become embedded there. In sections a little within the limits of the gestation sac the floor of the lumen, where it abuts upon the ovum bed, is formed of a fibrinous layer which completely shuts off all communication between them (Plate IV.). By tracing the sections from this point in towards the centre of the sac the process by which the lumen has been destroyed can be seen (Plates VI. and VIA.). The path of least resistance seems to be in the area just outide the innermost circular muscular fibres of the tube, and along this the villi extend towards each extremity of the tube, and also in a circular direction so as to surround the lumen. At the same time, they extend, although at a slower rate, into the fibrinous layer forming the floor of the lumen, so that in intermediate sections the appearance produced is that of a tube lumen more or less semicircular in shape, with a fibrinous wall towards the bed of the ovum and the rest composed of muscular fibres (Plate VI., Fig. 2). At the sides the villi and trophoblast are seen extending round the lumen for a short distance on either side, but separated from it by the inner muscular fibres. Towards the roof of the cavity the muscular wall is practically intact, except that, just in advance of the trophoblast, there is a loosening and breaking down of the muscle fibres, a point which will be referred to later. Tracing the sections still farther towards the centre, it is found that the lumen gets smaller and smaller owing to the eating up of the limiting muscle by the advancing trophoblast, until in the centre all trace of the original lining of the lumen is lost, and the whole of the interior of the tube is occupied by the ovum and its villi (Plate VIA., Figs. 1 and 2).

The extent to which the villi have penetrated and destroyed

the muscular wall of the periphery of the tube varies in different parts. It is greatest towards the side on which the ovum originally embedded itself, and it is here that the rupture occurred which caused the death of the patient. The process by which rupture took place will be more fully described later.

The reaction of Maternal Tissue to the Growing Ovum.—The chief interest in this connection lies in the question as to whether there is or is not any decidual formation occurring in other than uterine tissue. As is constantly found, there is present in this case a well-marked decidual lining to the uterine cavity. This can be readily differentiated microscopically into compact and spongy layers, the former consisting of a close aggregation of cells possessing in the main a uniform structure (Plate VII., Fig. 1). The cell wall is irregular in outline, the cell body large and coarsely granular, containing a large nucleus which is usually centrally placed and oval in contour; in it the chromatin network stains deeply and is coarse in structure. Interspersed among these decidual cells are others smaller in size, possessing a nucleus which stains more deeply and appears more homogeneous.

The only other situation in which true decidual formation of this type is found is in the villous processes of the mucous membrane of the pregnant tube on the uterine side of the gestation sac. It has been already noted that towards the site of the implantation of the ovum the villous processes of mucous membrane disappear, with the exception of one which persists almost up to the point where the lumen is destroyed; it is in the connective tissue of this process that the most marked decidual reaction is present. The appearances are practically identical with those found in the uterine decidua. The evidences of a very active young connective tissue-cell formation are present, so that a mass is formed consisting almost entirely of cells which are spindle-shaped, and from their appearance and

structure are, without doubt, similar in nature to the decidual cell of the uterus (Plate VII., Fig. 2). They are of the type of young fibroblasts such as are seen in the "process of repair." As in the uterus, there is present another type of cell, smaller in size. This decidual formation is also present in the mucous membrane of the interstitial portion of the pregnant tube. It is entirely absent in the tube of the opposite side, in the ovaries, and in the cellular tissue of the broad ligament.

So far, there is no difficulty in interpreting the appearances presented, but when the wall surrounding the ovum is examined with reference to decidual formation, difficulties arise. There is here no decidual "membrane." There is, however, evidence of cellular reaction identical in nature with that which, in the uterine and tubal mucosa, produces such a membrane. In studying this reaction it is necessary to go beyond the area of trophoblastic invasion, in order to exclude the possibility of confusion between maternal connective tissue cells and isolated trophoblastic fœtal cells.

If the area chosen be such as that towards the base of the tube, where large vessels are present, the following appearances are presented (Plate VIII., Fig. 1). In both artery and vein changes involving all their coats are seen. The endothelial cells of the inner coat are swollen up and increased in number, some lying free inside the lumen of the vessel and others attached loosely to its wall. Underneath these and in the middle coat the connective tissue cells are increased in number and altered in appearance, whilst throughout all the coats red blood corpuscles are interspersed. The muscle of the middle coat is fragmented and disintegrated, and interspersed throughout it these connective tissue cells lie. They possess the structure of the young fibroblast, having a spindle-shaped cell body with striated cytoplasm, an oval nucleus centrally placed, containing a large nucleolus and a coarse chromatin network. In the outer coat these cells are also present, but there is in

addition an extravascular accumulation of cells, some of which are of the lymphocyte type, and others which possess the characteristic structure of the mononucleated cell of an "inflammatory exudate"; there is also an occasional polymorphonuclear leucocyte (Plate VIII., Fig. 2). Some of these cells are undoubtedly derived from the endothelium of the perivascular lymph spaces. In fact, all the appearances very closely resemble those met with in the zone of reaction of an infected wound, except that the degree of muscle disintegration is greater.

In the extravascular tissues the young connective tissue cells are also increased in number, and endothelial reaction is present in many of the capillaries.

The type of cell here described is identical with that which goes to form the decidua of the uterine and tubal mucosa, but in the tube wall they are so few in number as never to lead to the formation of a distinct membrane. The reason for this probably is that the tissue in which the reaction is occurring is not a highly cellular almost embryonic structure such as that of the uterine mucous membrane, but one in which a great deal of destruction of muscle must occur before the connective tissue cells are available to take part in the process. This may also explain how it is that the most marked reaction is present in the coats of the vessels, and only to a lesser extent in the general connective tissue of the part.

The Trophoblast and its Mode of Invasion.—In sections through the middle of the gestation sac the chorionic vesicle covered with epiblast and containing the embryo in its amnion is well seen. The vesicle is lined with mesoderm, and this has extended out with the epiblastic buds to form villi, many of which are vascularised. The process of vascularisation can be traced as arising locally from the formation of blood capillaries and blood cells. The greater part of the bed of the ovum is occupied by the villi lying in the intervillous spaces. Most of

them are covered with two layers of epithelium, Langhans' layer and syncytium. At the limits of the growing ovum the mode of extension of the trophoblast can be well studied, especially at the point where it is working its way round the lumen of the tube.

At this point it is seen that well in advance of the outermost limit of the trophoblastic invasion there is hyperæmia and œdema of the tissues, producing a separation of the muscle fibres. The endothelium of the dilated vessels has, in many cases, become swollen and in places separated. A little nearer the ovum vessels are still more dilated, and there is blood extravasation in the surrounding tissue, in which the œdema is more marked. The muscle fibres are broken up and disintegrating. Still nearer the line of advance, the blood extravasation is increased, and there is commencing fibrin formation. The large connective tissue cells previously described as probably decidual in character are present throughout these areas, but now, in addition to them there are other cells of much the same type, but with a relatively smaller cytoplasm and larger and more deeply staining nucleus. These are fœtal cells derived from Langhans' layer, and they form the advance guard of the invading trophoblast. They are destructive in action, and invade and destroy the vessel walls, and complete the disintegration of muscle. The fibrin deposit is greatly increased in amount. Beyond this fibrin layer and nearer the ovum bed the syncytium is met with for the first time. It is applied to the fibrin-lined spaces and is seen extending along vessel walls. In this situation its structure can be well demonstrated, and its origin from the adjacent villi traced (Plate IX., Figs. 1 and 2). The bud-like processes consist of a finely granular protoplasm, which contains numerous large nuclei with a coarse open chromatin network and large nucleoli.

This is the process of invasion which is seen in all parts of the tube wall, and it would appear as if the destruction of

maternal tissue in advance of the actual trophoblastic cells must be due to a biochemical process which prepares the way for them. It is instructive to note that in those places where the reaction of the maternal tissues in the form of endothelial proliferation and increase in number and size of the connective tissue cells is least marked, and where fibrin formation is absent or small in amount, the ovum has penetrated most deeply into the tube wall. It is at such a point that rupture has occurred.

By reference to Plate X., Fig. 1, it will be seen that the tube wall is especially thin at one point, and that here there are situated large thin-walled vessels. It will further be noted that whereas round the rest of the periphery of the ovum there is a fairly thick uniform layer of fibrin, at this point it is almost entirely absent. This area may be called "the area of impending rupture." On examination under higher magnification (Plate X., Fig. 2) practically no reaction on the part of the maternal tissues such as has been noted in the other parts of the tube is present. The endothelial cells are not swollen up or desquamated, and there is no proliferation of the connective tissue cells of the part, but there is an extensive invasion by trophoblastic cells. On tracing this area of the wall through successive sections the mode of production of the rupture can be learned. At a part a little nearer the broad ligament attachment than the very thin area above mentioned there is a large blood sinus in the wall. The wall of this has been destroyed by trophoblast, causing a large hæmorrhage into the ovum bed and an extravasation of blood into the thinned-out wall of the tube (Plate X., Fig. 2). This hæmorrhage, while extensive, has disturbed the relations of the ovum very little. It must, however, have considerably raised the tension inside the tube and also further weakened the wall so that, possibly as a result of muscular contraction of the remainder of the tube wall, the peritoneal coat of the thinned-out portion has given way and an

intraperitoneal hæmorrhage has occurred (Plate Xa., Figs. 1 and 2).

Judging from the appearances in the tube wall, more especially at the site of rupture, it would thus appear that the trophoblastic invasion is most marked at those places where there is a failure of response on the part of the maternal tissue, and where fibrin formation has not occurred to any great extent. The resisting power of the fibrin layer is well demonstrated where it forms an effective barrier between the tube lumen and the ovum bed (Plate IV.), thus preventing rupture into the lumen. This fibrin formation together with the reaction which occurs in the endothelial lining of the vessels, the possible migration of endothelial cells through the vessel walls, and the changes of a decidual character in the connective tissue cells, all seem to be for the purpose of, or at least to result in, an arrest in the rate and extent of advance of the fœtal epiblast.

If this view of the decidua is correct, it must be looked upon, not simply as a suitable bed in which the ovum can bury itself, but as a barrier laid down to prevent the too great destructive action of the trophoblast. The absence of any distinct decidual membrane in the tube wall would thus readily explain the frequency of tubal rupture.

A further point of interest may be mentioned, viz., the very large amount of hæmorrhage which occurred as the result of a rupture of such small size in the tube wall and from the opening up of a comparatively small vessel. Spontaneous arrest of the bleeding may have been prevented by the failure of the weakened muscle coat to contract, and there is the further possibility that the coagulability of the blood may be altered by the action of the trophoblast, which seems to possess the power of extending along vessel walls without producing clotting.

The Embryo and Membranes.—It is not proposed to enter

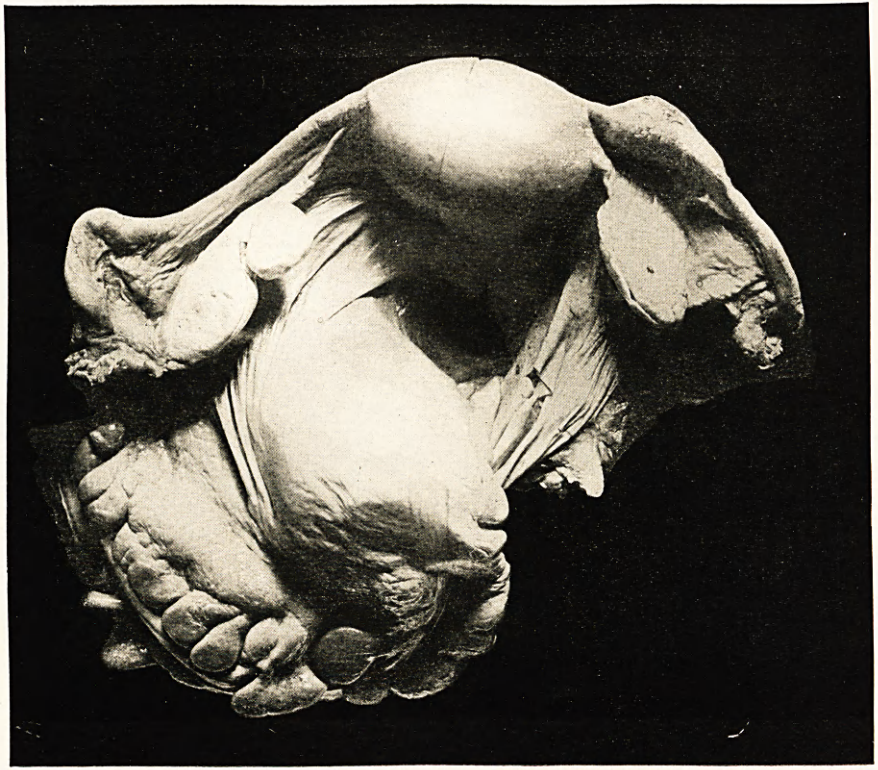

PLATE II.

FIG. 1.

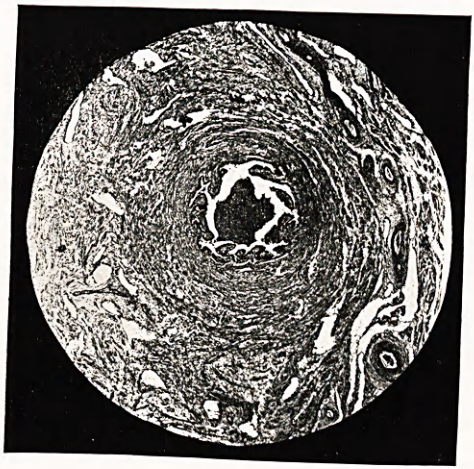

FIG. 2.

PLATE III.

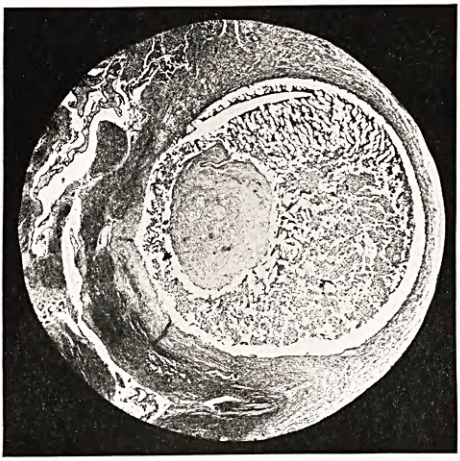

PLATE IV.

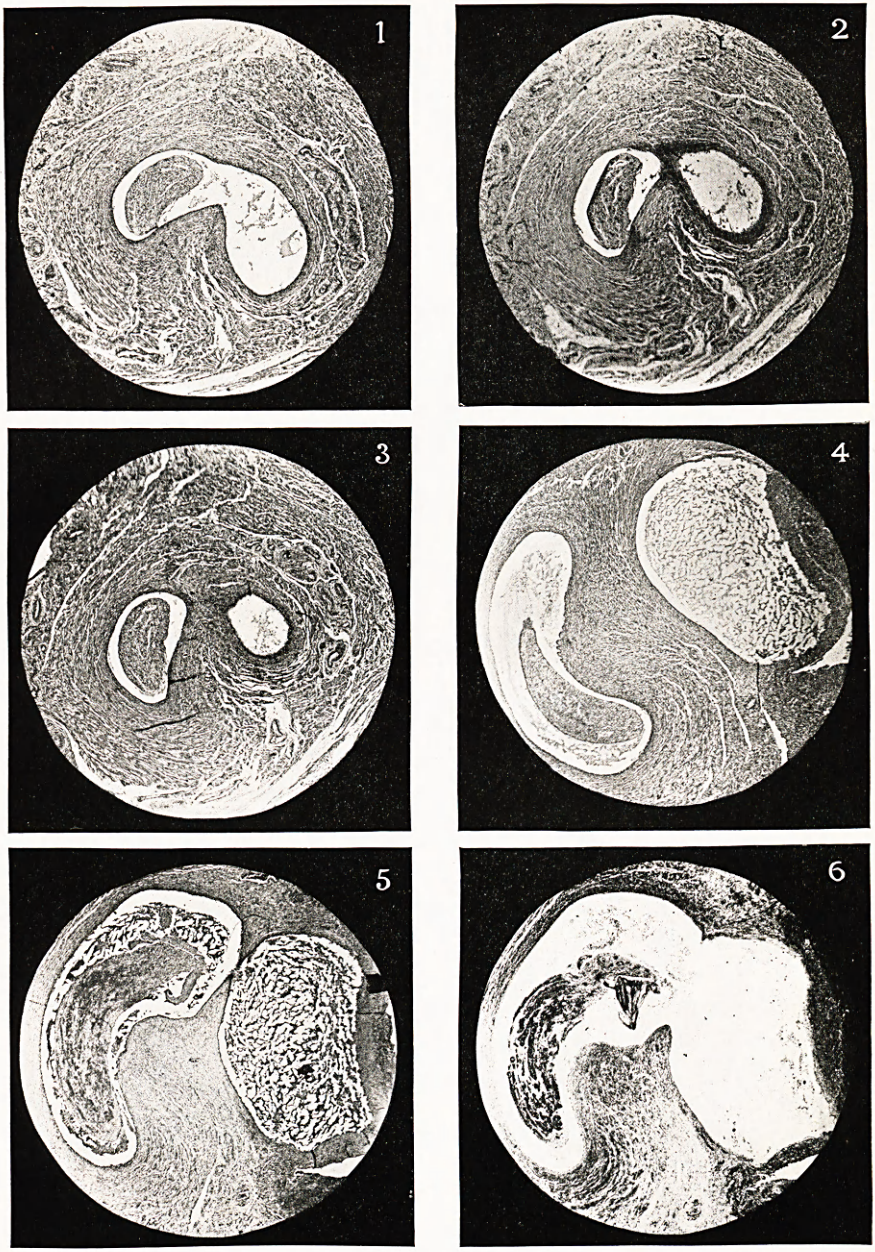

PLATE V.

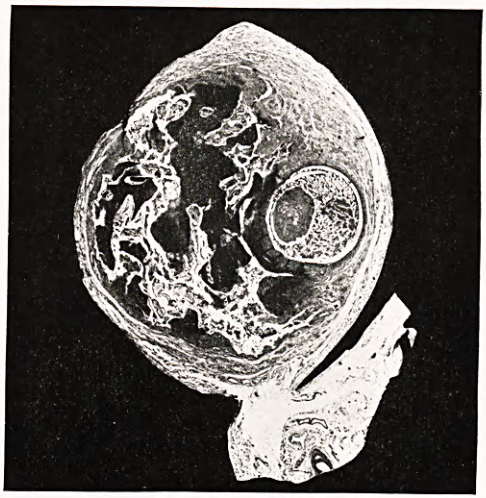

FIG. 1.

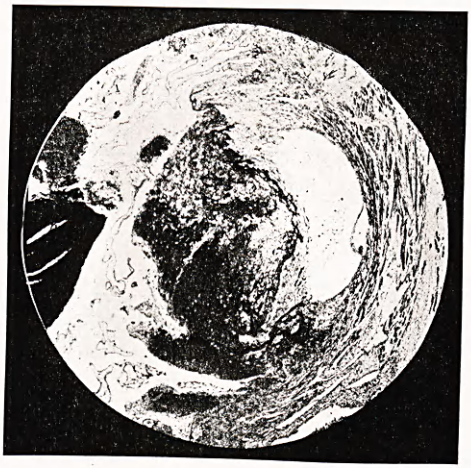

FIG. 2.

PLATE VI.

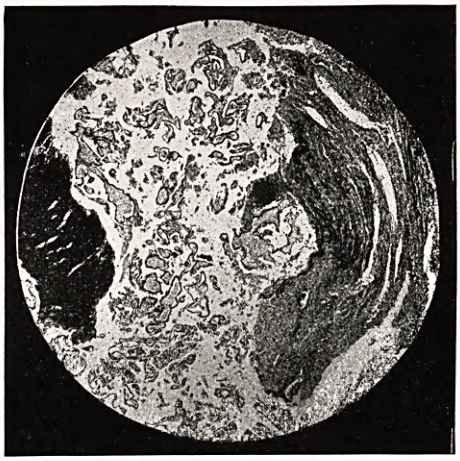

FIG. 1.

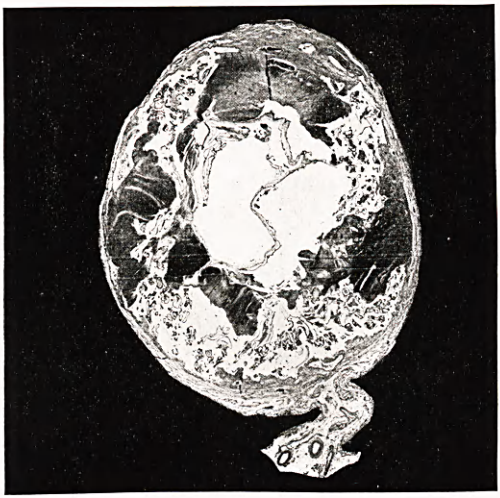

FIG. 2.

PLATE VIA.

FIG. 1.

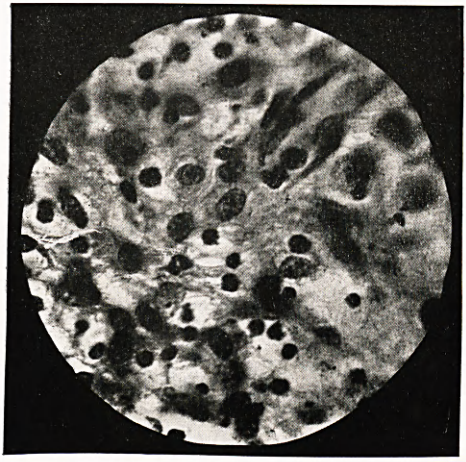

FIG. 2.

PLATE VII.

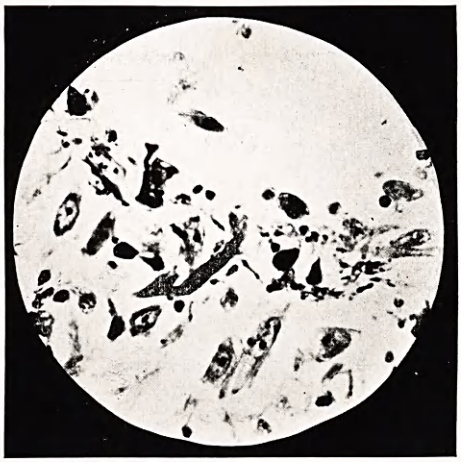

FIG. 1.

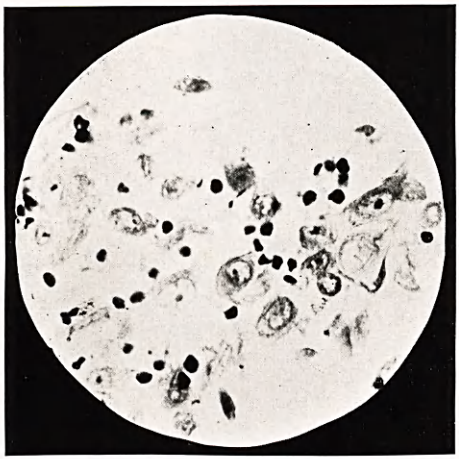

FIG. 2.

PLATE VIIA.

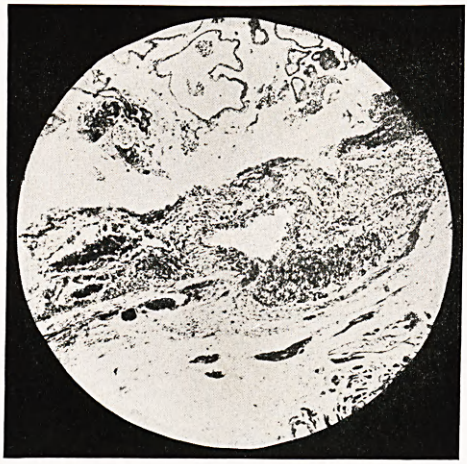

FIG. 1.

FIG. 2.

PLATE VIII.

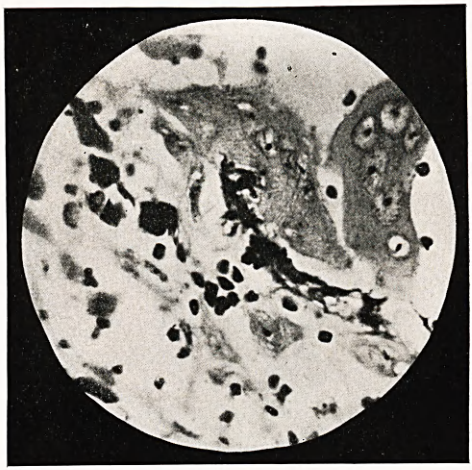

FIG. 1.

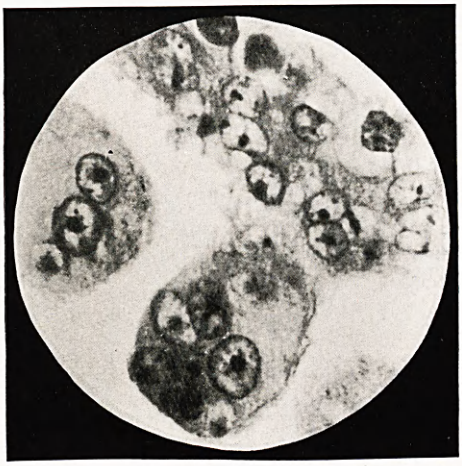

FIG. 2.

PLATE IX.

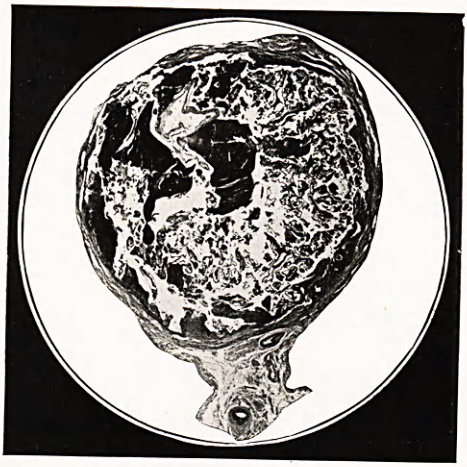

FIG. 1.

FIG. 2

PLATE X.

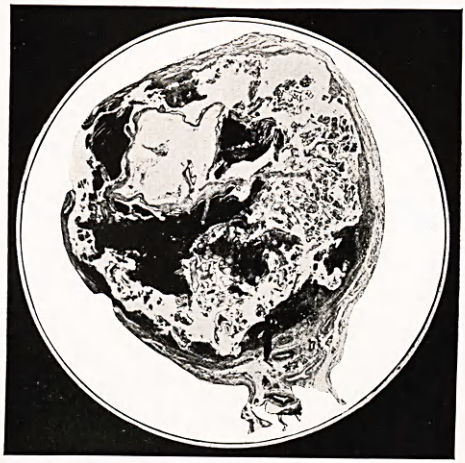

FIG. 1.

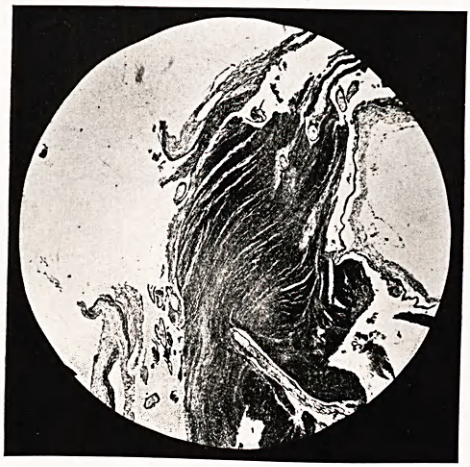

FIG. 2.

PLATE Xa.

PLATE XI.

into any detailed description of the embryo and its membranes, and we reproduce a micro-photograph (Plate XI.) simply to indicate the extent to which development has proceeded, and in order to give evidence as to the age of the ovum. There is no menstrual history to rely on in fixing this age, and it must be arrived at by comparing the dimensions and development of the embryo with those of other embryos described by various authors.

The measurements of the complete embryo are as follows:— 1·9 mm. × ·87 mm. × ·64 mm. These measurements correspond to those ascribed to embryos between the second and the third weeks. It is cut in its long axis, and the relations of the membranes are very well seen in the sections. The amnion is a closed sac of fairly large size inside which the embryo lies. The yolk sac, very much folded, communicates with the ventral aspect, and the belly stalk connects the mesoderm of the chorionic vesicle with the ventral aspect towards the caudal extremity.

The interpretations put upon the different appearances met with in tubal gestation are many and various, but we have purposely abstained from making any reference to the views held by other investigators, as these have been fully set forth in several articles already published.

Description of Plates.

Plate I. (*Coloured*).—Right side of uterus and right Fallopian tube viewed from the front. Note the minute rupture in centre of the gestation sac.

Plate II.—The pelvic organs removed *en masse* seen from behind. Note the enlargement of the uterus; the almond-shaped swelling on the right tube and the large size of the right ovary, and the presence, at its junction with the ovarian ligament, of a small fibroma.

Plate III. Fig. 1.—Transverse section of the lumen of the right tube on uterine side of gestation sac. The villous projections of mucous

membrane are complicated folds united to one another. The epithelial covering is in many places desquamated. The connective tissue cores show dilatation of vessels and an increase in the cellular elements.

Fig. 2.—Transverse section of the right Fallopian tube on the outer side of the gestation sac. Compare with Fig. 1. The mucosa appears healthy. In the cavity is some catarrhal debris.

PLATE IV.—Transverse section of lumen in region of developing ovum. The lumen is intact and is separated from the ovum bed by a dense layer of fibrin. Note how the villi are extending round the lumen outside the innermost circular muscle fibres. The interior of the tube is filled with catarrhal debris.

PLATE V.—Selected sections of tube on inner side of gestation sac to show how a fictitious appearance of a diverticulum is produced by convolution of the tube. On tracing the tube from Fig. 1 to Fig. 6—from the inner to the outer end of this section of it—it would appear as if a single cavity became a double channel, to re-unite into a single cavity again This can however be seen to be due to obliquity of section.

PLATES VI. and VIA.—To show the process of obliteration of the tube lumen by the developing ovum.

PLATE VI. Fig. 1.—Transverse section of tube at periphery of ovum. The lumen is intact and filled with catarrhal debris and separated from the ovum bed by a layer of fibrin.

Fig. 2.—Section nearer centre of gestation. The lumen is being encroached upon by the fœtal tissues which are destroying its wall. The fibrin layer is still present. Note the villi extending round lumen external to the inner circular muscle fibres.

PLATE VIA. Fig 1.—Shows almost complete disappearance of lumen. Only part of wall left.

Fig. 2.—Transverse section of centre of gestation. No trace of lumen visible. Embryo and its membranes well seen.

PLATE VII. and VIIA.—To illustrate decidual formation.

PLATE VII. Fig. 1.—Uterine decidua (× 1000). Note the irregularity of the cell outlines, the large, coarsely granular nucleus, and prominent nucleolus. Between the large cells are others of a smaller size, with deeply staining homogeneous nuclei.

Fig. 2.—Decidual tissue from centre of villous process of mucosa of pregnant tube. Note the similarity in appearance of the cells to those of the uterine decidua.

PLATE VIIA. Fig. 1.—Section of maternal tissue outside the area of trophoblastic invasion showing alteration in wall of blood-vessel—pro-

liferation and separation of cells of endothelial lining, formation of young connective tissue cells in the extravascular tissue, and the presence amidst the latter of cells probably of endothelial origin.

Fig. 2.—Section of tissue from the zone of trophoblastic invasion showing isolated trophoblastic cells. Note the similarity in appearance of these to decidual cells.

PLATE VIII. Fig. 1.—Section of maternal tissue at junction of tube with broad ligament, showing alteration in larger blood-vessels—proliferation of endothelium and disintegration of wall—cellular increase in extravascular tissue and invasion of latter by isolated trophoblastic cells.

Fig. 2.—Section of maternal tissue (×1000). High-power view of wall of blood-vessel seen in Fig. 1, showing formation of young connective tissue cells and presence of cells of endothelial origin—an attempt at decidual formation.

PLATE IX. Fig. 1.—Shows syncytial mass applied to maternal tissue and, beyond it, invasion of same by isolated trophoblastic cells.

Fig. 2.—Epiblastic covering of villus showing origin of syncytial bud from outer plasmodial layer, internal to which is the cellular layer of Langhans. The protoplasm of the syncytium is granular and contains large nuclei with coarse chromatin network and darkly stained nucleoli.

PLATES X. and XA.—To illustrate rupture of the tube.

PLATE X. Fig. 1.—Transverse section of tube. In the interior note the villi and the chorionic vesicle on section. The wall near the latter is thin and evidently on the point of rupture. There is absence of fibrin formation at this part.

Fig. 2.—Higher power view of "area of impending rupture" as seen in Fig. 1. A blood-vessel (v.) has been opened into and from it bleeding has occurred into the ovum bed.

PLATE XA. Fig. 1.—The rupture in the tube wall. Note the open mouth of the vessel seen in Fig. 2, Plate X.

Fig. 2.—Higher power view of rupture. Note the everted edges of the ruptured wall and the large amount of blood in the tube.

PLATE XI.—The embryo and its membranes. The embryo (E) is cut in longitudinal section. It is attached to the mesoderm (M) of the chorionic vesicle by the belly stalk (S) along which the amnion runs for a short distance and then follows the mesoderm to enclose the embryo. The yolk sac (Y) is much folded and can be traced on to the ventral aspect of the embryo.

A., amniotic cavity. Ch., epiblastic covering of chorionic vesicle.

Sir A. R. Simpson said the demonstration had been an extremely interesting one and a valuable contribution to the transactions of the Society. Forty years ago nothing had been known of all this, and they could only sit at the feet of the young men and learn.

Dr Freeland Barbour thanked the authors for a most magnificent piece of model scientific work. He had been greatly struck with the excellence of the microscopic photographs and reproductions. He could not pass over the clinical fact of hæmorrhage from such a minute opening causing death. It showed the great importance of operating at an early period in such cases. The part that endothelial cells play in decidua was an interesting histological fact. He congratulated Dr Watson on his lucid explanations.

Dr Haultain said that the subject was so full of matter that it was impossible to do justice to it as a whole. He could merely touch on one or two interesting points. (1) He noticed that the proximal end of the tube, the end next the uterus, was very deficient in endothelial lining. This deficiency was an argument in favour of Tait's statement, that tubal gestation is due to catarrh and destruction of cilia. The examination of the section from the other side confirmed this. (2) The embedding of the ovum in the uterine wall. There appeared to be deficient decidual reaction, decidua being the first line of defence. The ovum was surrounded by muscle and fibrin on the other aspect. There were many other points as regards this question of fibrin. (3) Hæmorrhage of great extent from a small opening. This was probably due to the fact that an opening in the vessel had been made by the trophoblast. By phagocytic action the trophoblast can penetrate blood-vessels, project into them, and yet prevent coagulation of the blood. (4) Finally he would ask, when, in cases of extra-uterine gestation, should the abdomen not be opened? Probably this woman was thought too far gone for operation, but he thought that in cases of this

sort it was never too late to operate until the patient was actually dead. In two cases he had opened the abdomen when the patient was practically dead, almost no pulse, pale, and corpse-like. One died, the other recovered. When a woman bled into her abdomen, it was never too late to operate and give her a chance. He had enjoyed the demonstration extremely.

Dr Haig Ferguson said he had enjoyed a most admirable paper. There was one practical point; in this case the gestation appeared to be in the isthmus of the tube, not in the usual position. It struck him that the tube did not rupture from distension but from the action of erosion. He had seen two similar cases, and corroborated Dr Haultain that it was never too late to operate. In one of his cases the tube was not distended at all, but a small vessel was spouting, and the abdomen was full of blood. She made a good recovery from the operation. Usually in such cases the tube bursts from distension, but when situated in the isthmus the action is due to erosion.

Mr Wade, replying to *Dr Fordyce* with reference to decidual formation, said that they thought it to be reaction of the tissues due to chemical process. It was to be found in other situations, such as wounds healing, etc. It was to be seen in the tube on the side where rupture occurred. It appeared also in the periphery of the developing ovum, and this slight reaction had materially contributed to rupture. The responsibility lay on the part of the tissue. The young fibroblasts actively dividing appeared to form a live decidual cell. It was impossible to say whether they bore a chemical substance. Mr Wade next dealt with the points raised by Dr Haultain. (1) Catarrh. Catarrh is present, but is probably to be explained by the reaction of the epithelium lining subsequent to the plantation of the ovum. Probably preliminary desquamation is responsible for the implantation. (2) When to operate. In this case the patient

died before operation could be carried out. (3) Dr Haig Ferguson's point regarding the cause of rupture. Erosion certainly caused rupture so far. The erosion opened into the blood-vessel when there was extreme peritoneal bleeding, and then rupture took place by burst. Mr Wade thanked the Society for the kindly and appreciative manner in which they had received the paper, and said that it was due to the work of such men as Sir A. R. Simpson that such results were now attainable.

The President concluded by testifying the astonishment with which this paper had filled him with regard to the amount of work expended and the clearness of the demonstration. Pathologists must enlighten them as to the liability to dangerous hæmorrhage in such cases. When rupture took place near the uterine end the bleeding was severe, at the fimbriated end it was slower. The only hope lay in immediate operation.

MEETING VIII.—JULY 8, 1908.

Professor STEPHENSON, *President, in the Chair.*

I. The following gentleman was elected an Ordinary Fellow of the Society:—David Lawrence Luckhoo, M.D. (Toronto), L.R.C.P.S.E., L.F.P.S.G., New Amsterdam, British Guiana.

II. *Dr Haultain* showed—(*a*) CYSTIC DEGENERATION OF AN ACCESSORY OVARY. The fact that the ovary, removed at the operation and now exhibited, was accessory, was supported by the evidence of some eight or ten doctors who had been present at the operation. Two ovaries, with tubes and ligaments, were still left attached to the uterus after this one's removal. He had not seen a case before. Microscopic sections had shown the structure to be ovarian.