On the structure of the human placenta, and its connections with the uterus, etc / [Thomas Radford].

ON

THE STRUCTURE

OF

THE HUMAN PLACENTA,

AND ITS

Connections with the Uterus, &c.

BY

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Dedication.

TO THE MEDICAL STUDENTS ATTENDING THE AUTHOR'S LECTURES.

GENTLEMEN :

I feel a propriety, as well as a gratification, in dedicating the following short Essay to you. It was to you the original manuscript was submitted; and the spirit of kind feeling which was manifested on the occasion, is to me a source of great pleasure; not alone for the approbation you expressed of its doctrine, but more especially as indicative of that, which every teacher must be proud to acknowledge, the esteem and approbation of his class.

I remain,

Your well wisher,

THOMAS RADFORD.

Manchester, King-street.

NOTICE.

The following short Essay was read at the opening of the "Manchester Obstetric Society," on Thursday Evening, October 11th, 1832.

In consequence of the absence of the writer at the time, sentiments which were intended to be delivered "vivâ voce," were in consequence omitted.

The author has to acknowledge the kindness and liberality of Mr. Fawdington, for the loan of the most beautiful preparations from which the drawings were made. The physiological views which these preparations so clearly and so satisfactorily prove, have since been corroborated by injections made both in the human and also in the brute placenta, by Mr. Bryden, the author's Nephew and Pupil, whose assiduity and acquirements entitle him to great praise.

The Lythographic Drawings were made by Mr. Physick, and correctly represent the parts from which they were taken.

ON THE

HUMAN PLACENTA.

TO understand correctly, the nature and influence of Uterine hemorrhage, we must be acquainted (at least to as great a degree as it is possible, on points in reference to which such different opinions exist) with the organization of the Placenta, the circumstances which regulate its location, and the mode of communication between this organ and the Uterus. It is the design of the author to give a short account of these objects of enquiry. Coincident with the changes in the ovaria consequent upon impregnation, new actions are produced in the Uterus. Its size is increased, its vessels become enlarged, an effusion occurs, which being first gelatinous, shortly becomes membranous, assuming a firmer texture, and is freely supplied with vessels; which, when injected, form a beautiful vascular network. Velpeau denies the organization of this membrane at any period of gestation,—a denial which appears to be totally unfounded. It has been named membrana decidua, the caducous coat, &c. &c. and by Velpeau, the anhistous membrane, which he says is "synonymous with the inorganic membrane." This efflorescence consists of two layers:—1. The outer which surrounds the whole internal surface of the womb, terminates at the orifices of the fallopian tubes, and at the os uteri, and is gradually lost in the mucous plug, which during pregnancy seals up that aperture.—2. The inner layer, which stretches completely across the orifices of the fallopian tubes, and also across the mouth of the womb. When the impregnated ovum has burst from the ovarium, it remains unconnected by vessels with the surrounding parts, whilst passing down the fallopian tube towards the uterine extremity, where its farther progress is prevented by the inner layer of the deciduous

membrane, stretched across this opening. The progress of the ovum being thus arrested, its vessels enter into free communication with the vascular surface with which it lies in contact; a communication which takes place in the tube itself when any circumstance occurs to check the progress of the ovum through this its proper passage. Whilst preparations are thus made for detaining the ovum by the inner layer, and for providing a fit medium of vascular communication with the mother by the outer layer, the ovum advances, so as to secure an immediate communication of the vessels of the embryo with those of the outer layer, lining the uterus in the immediate vicinity of the fallopian entrances, and which have been separated from contact with the inner layer of the deciduous membrane. At this early stage of gestation there is no funis umbilicalis, the embryo in appearance like a small speck of mucus, being attached immediately to that portion of the ovum which enters the uterus last. The consequence of this arrangement is, that the part of the ovum most distant from the embryo, is in contact with and carries forward the inner layer of the decidua, whilst the portion of the fœtal membranes with which the embryo is connected, is immediately applied to the more vascular outer layer; and hence the placenta is found in all natural cases a little to one side of the fundus uteri. It must be observed, that the portion only of the outer layer, which is uncovered by the inner layer, appears to be fitted for the connection of the membranes, and for giving attachment to the placenta, whilst the inner layer seems to bound the extent of the placenta. Thus to the proper formation of the placenta, there seem to be three requisites: first, that the ovum shall be detained at the uterine entrance of the fallopian tube, by the inner layer of the decidua; secondly, that the portion of the ovum to which the embryo is attached, shall be the part last making its exit from the fallopian tube; and thirdly, that the portion of ovum to which the embryo is attached, shall remain in connection with a portion of the outer layer of the decidua uncovered by the inner layer. Defect in any of these three circumstances, will be attended with corresponding irregularities in the development of the ovum: but of these, defect in the formation or function of the inner layer of the decidua, would appear to be the cause of the dan-

gerous situation of the placenta, over the os uteri.* If from any deficiency of the inner layer, the ovum fails to be arrested at the entrance of the fallopian tubes, it must necessarily be thrown into the cavity of the womb, by a continuation of those actions of the tube, by which it has been passed along its canal; and, when once projected into the uterine cavity, it is obvious that the situation of the placenta will depend upon the position of the ovum, when thus arrested, so that it can form an attachment with the

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* Dr. Lee's conclusions from the various facts which he adduces, are, that the fallopian tubes are open during the early months of gestation: that the ovum may attach itself to the fundus, body cervix, or even over the centre of the os uteri: and that the deciduous membrane does not form a shut sac or inorganic layer, before or subsequent to the arrival of the ovum in the cavity of the womb.—*Med. Gazette. vol. 2, page* 399.

When in London, I had the pleasure of a personal introduction to Dr. Lee, when he stated that he had read a paper before the Medico-chirurgical Society, and of which the above quotation, published in the Gazette, is an abstract. At this time I mentioned that it was my opinion that these tubes were open in some instances, and that this circumstance would account for the placenta fixing itself on the lower parts of the uterus. Through the kindness of Mr. Partington, I have lately had an opportunity of examining a gravid uterus, at the period of three months, in which one tube was quite pervious allowing air which had been forced in at its abdominal termination to pass into the uterine cavity. On the other side it resisted the most forcible attempts to blow in air, but by distending the tube to a certain distance with air, then taking hold of this part and forcing it along with the finger, it was made to pass into the uterine cavity. The apertures in the decidual membrane, through which the air had passed, appeared to have been lacerated. The placenta was fixed on the posterior part of the uterus, near to the cervix. It is correct to state, that the uterus had been opened by removing a section of the anterior parietes, and had been kept unsuspended in a glass containing weak spirit and water, from which circumstances it had become partially decomposed.

Mr. Life informs us that he examined the uterus of a female who was advanced six weeks in pregnancy, in which case the fallopian tubes had no communication with the sac formed by the decidual membrane. In this instance the placenta was attached towards the fundus, partly covering one of the fallopian orifices.

vascular lining of the uterus: for the placenta must form from that point to which the portions of the ovum, which is immediately connected with the embryo are attached. Hence we find the placenta variously situated with respect to the os uteri, sometimes presenting centrally, and sometimes having only a thin edge lying across the orifice. Although the ovum, when thus projected into the cavity of the womb, generally possesses sufficient vitality to connect itself with the surrounding decidual membrane, yet it does not in every instance meet with an organization sufficiently perfect to form a regular placenta. This organ, is indeed perfect in function, but it is thinner and more expanded: an occurrence which is sufficiently accounted for by considering the case as a defect in the inner layer of the decidua. This circumstance takes place in fallopian conceptions; the placenta, being thin and extensive in its insertion. We find that Burns and Velpeau, two very celebrated obstetric writers, take a view of the matter different from that which has been stated. Burns ascribes the effect to the embryo presenting foremost at the uterine cavity, the rest of the membranes usually following it. "When this happens," he says, "then the inner layer of the decidua, which was stretched across the orifice of the tube, and which is afterwards to become the decidua reflexa, will contribute to the formation of the placenta. In this case by the distension of the ovum, and the yielding of the decidua reflexa, the placenta will come at last to be inserted over the mouth, or over some inferior part of the uterus."*

To this opinion we object, on account of the length of time which elapses before the decidua reflexa is carried forward, so as to come into connection with the surrounding vascular parts. During this time that membrane alone will have to perform the function, which under other circumstances is performed by the decidua in connection with the uterus, for which it is unfitted by its natural powers, inasmuch as its office would appear to be rather to limit the vascularity of the chorion with which it comes in contact. When the ovum enters the uterus naturally, the embryo seems to present itself to the inner layer, pressing it forward to produce the decidua reflexa; hence an irregular

* Burn's Anatomy of the Gravid Uterus.—Page 153.

vascular body is formed posteriorly, betwixt the chorion and the outer decidual layer at the fallopian entrance. Thus the portion of the ovum to which the embryo is attached, becomes connected with a membrane which is incapable, from its situation and natural function, of supplying it with blood. The death of the embryo ensues, and the defective ovum after being sustained a short time, is expelled as in ordinary abortion, and no vestige of a fœtus is found upon examination.

Velpeau offers a different explanation of this phenomenon, he says, "upon entering the womb, the ovule necessarily meets with the anhistous sac, and can proceed no farther without detaching it. Now if the adhesion of this sac is the same throughout, the vesicle follows its original direction, glides along the fundus of the womb, which with the assistance of the decidua seems to prolong the channel of the tube to the opposite side, or else it stops as soon as it issues from the tube, and then the placenta attaches itself to one of the angles of the uterus. If the adhesion be stronger above than it is below, we may conceive that the ovum will descend more or less towards the cervix; if the adhesion be stronger in front it will be directed backwards, and so of the other points. This hypothesis is further confirmed by direct observation; of 34 women who died at L' Hopitàl, de Perfectionnement, I found upon examination of the parts, that the centre of the placenta corresponded to the orifice of the fallopian tube in 20 cases: it was in front of it in 3 cases, behind it in 2, below it in 3; and in 6 cases only towards the front of the uterus."* However plausible this opinion may appear; and howsoever well pleased the author may be with it as an explanation of the circumstances which influence the placenta, as to the situation which it is to assume in the uterine cavity, we must confess that his opinion is not satisfactory to our mind, nor are the facts adduced sufficient to warrant his deductions.

We find a Placenta existing in *all* mammiferous animals, but it presents different external characters and internal organization in different animals. Analogy has afforded considerable scope to Anatomists and Physiologists, for the investigation of the structure and functions of this organ. How

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* Velpeau, De L'art des Accouch: Page 293.

far the deductions which have been drawn are correct in reference to the human placenta, is very doubtful; and certainly they are far from being established. The human placenta is usually circular, and from six to eight inches in diameter. It varies in its thickness in different parts of its structure; and we also observe a great dissimilarity in this respect in the placentæ of different individuals. When detached from the uterus it presents two surfaces; its fœtal and its uterine. The fœtal is smooth, being covered by the amnion, which may be separated from the chorion that lies underneath, and is in more intimate connection with the vascular structure of the organ. Upon this surface are observed through the membranes, innumerable vessels of large size, proceeding from the insertion of the umbilical cord, like radii towards the circumference. The uterine surface of this organ is universally smooth, covered by the deciduous membrane, which in part conceals its lobulated character. If the placenta be handled roughly, its character will be altered, and the lobes will be more extensively separated; a circumstance which destroys the natural continuity of the decidual membrane, passing from one lobe to another over the sulci, in a manner resembling the distribution of the arachnoid membrane, over the convolutions of the brain. Upon this surface no trace of large vessels can be discovered, and only here and there we see small membranous projections, which appear to be the remains of minute branches, passing from this organ to the uterus, and which are beautifully shewn in the placenta attached to the uterus, and represented in the plate, to which I shall have again to refer in a subsequent part of this paper.

This organ has been generally described by writers * as of double origin, consisting of two distinct portions, the one, the maternal or cellular, which is formed by the ramifications of the uterine vessels into "the decidua, and "through it in all the district of the placenta. They continued "of the same size as in the substance of the uterus, and form-"ed coils, some of which were half an inch long. Then they "opened into the substance of the placenta either terminating "on its surface or barely entering into its texture. They at

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* Noorthwych, Rœderer, Haller, John Hunter, Wm. Hunter, Donald Monro, Dr. Burns, and Dr. Blundell.

"once ended in or opened into the cells of the placenta, which "were finely filled with grains of injection all the way to the "fœtal surface."*

The other portion is the fœtal or arborescent, and is formed by means of shaggy points of the chorion, and the ultimate and minute division of the umbilical vessels, which circulate the blood of the fœtus. Velpeau says, "that "Arantius, Hoboken, Warthon, Wrisberg, Reuss, Lobstein, "Meckel, and others among modern writers, have made "many attempts to unveil the nature and structure of the "placenta. It might be supposed that in this respect, "science has nothing more to desire; but in turning over the "most esteemed works on the subject, this opinion is soon "altered on perceiving that twenty different sentiments "yet have their antagonists and defenders."† — This statement of Velpeau proves, that the organization of the placenta is not thoroughly understood by the French authors, and certainly in our own country we have had recent proofs of the same circumstance, in the writings of Dr. Lee and Dr. Burns, whose opinions are directly opposed to each other. The former, in a paper read before the Royal Society, maintains that the placenta is entirely fœtal, and says, "the "facts which have now been stated, warrant I think the con- "clusion, that the human placenta does not consist of two "parts,maternal and fœtal, that no cells exist in its substance, "and that there is no communication between the uterus "and placenta, by large arteries and veins. The whole of "the blood sent to the uterus by the spermatic and hypogas- "tric arteries, except the small portion supplied to its parietes, "and to the membrana decidua by the inner membrane of the "uterus, flows into the uterine veins or sinuses, and, after "circulating through them, is returned into the general cir- "culation of the mother by the spermatic and hypogastric "veins, without entering the substance of the placenta. The "deciduous membrane being interposed between the um- "bilical vessels and the uterus, whatever changes occur in "the fœtal blood, must result from the indirect exposure of

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* Dr. Burn's paper, Medical Gazette, vol. 2nd, p. 647.

† L'art des Accouchmens—Page 280.

" this fluid, as it circulates through the placenta, to the " maternal blood flowing in the uterine sinuses."*

The Doctor founds his opinion on the following facts, 1st. That if the placenta be examined in connection with the uterus, which has not been disturbed by injection, &c. that no large blood vessels are to be detected passing from the uterus into cells in the placenta. He admits that numerous small vessels are to be observed proceeding to the decidua, but are not peculiar to this membrane, which intervenes between the placenta and the womb. 2nd. If air be forced into the uterine vessels whilst the placenta adheres to the uterus, the inner membrane of this organ is raised, but the air does not pass through the decidua into any part of the placenta. 3rd. The uterine surface of the placenta is invariably covered with the deciduous membrane, and no openings in it can be perceived, nor any appearance of vascular tubes continued through this membrane into the placental cells.— 4th. On the results of an enquiry made by Dr. Nimmo and Mr. Broughton, into the state of the preparations deposited in the Hunterian Museum, Glasgow, and also on his own examination of the preparations in the Museum of the Royal College of Surgeons, London.† Dr. Burns, of Glasgow, has published a subsequent statement of the preparations belonging to the late Dr. Hunter, in which conclusions are drawn opposed to those of Dr. Lee, and consequently affirmative of the Hunterian doctrine.‡ Since this paper just referred to, was published, he has had an opportunity of investigating the parts in their recent state, " which (he says) will give more " satisfactory information than can be derived from the in- " spection of the preparations." In the subject of this inquiry, he injected both the uterine arteries and veins, but not those of the fœtal or umbilical system. After detailing the conditions of the several parts which were very minutely examined, he comes to the following general conclusion, which we will give in his own words. " This dissection " proves distinctly the intimate structure of the placenta to " be as Dr. Hunter supposed, cellular in the maternal portion,

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* Philosophical Trans: Page 63—Vol. for 1832.

† Paper in Phil: Trans: and also Medical Gazette, Vol. 2nd. 568 page.

‡ Medical Gazette, Vol. 2. page 503.

" and arborescent or branching in the fœtal portion. It proves " the existence of intervening portions of soft canals, " going from the openings of the arteries and veins, on the in- " ner surface of the uterus, to the cells of the placenta. These " canals, when injected, may be left attached either to the " uterus or placenta, but are with equal readiness separated " from both. We cannot trace them, as trunks, into the pla- " centa, for they terminate in cells, which they cover; " neither can we always expect to find them adhering to, or " projecting from, the uterine or placental surface, being so " easily broken or brushed off. It also illustrates the " readiness with which uterine hemorrhage may be produced " by the rupture of one of these fragile portions, especially of " the sinuses. Strength and defence are afforded by the inti- " mate adhesion of the ovum to the uterus; but if separation " take place the vessels are left unsupported; and if not necessa- " rily torn in the act of separation, they must be soon ruptured, " and blood will be discharged. The coils of the arteries may " also render them less apt to be torn by any pressure " on the uterus, or change of shape produced."* The question at issue between the writers just quoted, is simply this: is the placenta of double origin partially depending upon the mother, and partially upon the fœtus? or is it altogether belonging to the fœtus? Both sides of the question are advocated with great ability, and facts brought forward by each writer, which he considers as conclusive of the justness of his views, and the stability of the doctrine he supports. In a question of so much importance as that of the placental circulation in reference to hemorrhage, it becomes the duty of every scientific enquirer to advance any theory which may influence the cause of humanity. Impressed with this feeling we have ventured to state our views and the facts which have formed their basis, and if our opinions in any essential degree differ from those already advanced, we trust that they will be received with that spirit of liberality which should ever characterize scientific enquirers. The placenta occupies on the uterine surface a space equal to its own dimensions, and has a layer of decidual membrane interposed between the two surfaces. The uterine arteries penetrating the uterus, run through the muscular substance, and

* Medical Gazette, vol. 2nd, page 647.

freely anatomising continue a spiral course along the decidual membrane, supplying it, and terminating in the placenta. Now this distribution of vessels is not confined to that part of the decidual membrane, which is situated beneath the placenta, but is observed throughout its entire structure; but they are not so numerous in those other portions, which are not in the vicinity of the placenta. This fact is proved by the experiment of Dr. Burns, which was accomplished by throwing wax injection into the uterine vessels.

Do these vessels terminate by open mouths or in cells? This point in physiology has been usually tested by the use of wax injection, which appears to us too crude to permeate the minute subdivisions of those vessels which pass into the uterus, and which in our firm opinion do really exist; and if an opportunity offers itself, we shall use the size injection which was used in the cases to which we shall shortly refer. The uterine veins are vessels of large size, which pass in trunks ultimately dividing themselves into a number of tubes which take the name of sinuses. These sinuses are observable throughout the entire structure of the uterus, but are more developed in the vicinity of the placenta, and are much more numerous on the inner edge of its parietes than on the outer.

Can these congregrated apertures when filled with wax injection, have led erroneously to the notions of the existence of placental cells? If plate first be well examined, this interrogatory will not appear to be so unimportant; but on the contrary, will tend to establish its propriety. When the placenta is separated from the uterus, and the decidual efflorescence removed, a number of openings are discovered, through which if a probe be introduced it will pass into the uterine sinuses.* These apertures are covered over by the decidual membrane, which acts as a protector against the risk of bleeding. A similar enquiry may be made here as was proposed in respect to the arteries. Do tubes which are continued into these apertures arise from cells? The same mode of investigation has been here adopted; wax injections have been *invariably* used, which are objectionable on two grounds:—1st. They are too crude to pass along a very minute division of capillary vessels. 2nd. By accumulating

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* Plate Third—Figure 3.

at the uterine terminations, and becoming more solid a laceration of the decidual membrane, may be effected, and thereby create an appearance of cells. The abdomen of a female who was at the seventh month of pregnancy was opened, as also the uterus, and the fœtus removed; the placenta being allowed to remain attached to the uterus. The umbilical vein was then injected with size, which passed freely through the entire structure of the placenta, leaving no part uninfluenced from the amniotic surface to the uterine, at which part a thin boundary answering to the decidua may be seen, of a different color, and which is well represented in plates 1 and 2. The entire structure of the uterus was permeated by the injection, and some of the sinuses partially filled, and all of them colored by it. The vessels of the decidua are most minutely injected, and afford a most beautiful illustration of the capillary arrangement of vessels. The preparation of which plate 3rd is a representation, is a portion of the uterus, with the decidua attached upon one half of its surface, and the vessels form a most beautiful arborescent appearance. From the other half the decidua has been removed, and on this account the injection is seen extravasated. The preparation to which we have already referred, and one side of which is represented in plate first, illustrates the nature of the connection of the placenta with the uterus. The large number of sinuous openings in the vicinity of the placenta, are well shewn by the uterine parietes being reflected, and are fixed in their position by pins on the other side of the same preparation. The placenta has been partially separated from the uterus, thus bringing into view vessels passing from the placenta into the uterine structure.* In the interstice between the placenta and the uterus, there appears a flocculent cellular substance. The appearance is well represented in the plate. A direct vascular communication is shewn to exist between the fœtal and maternal systems, by the case just mentioned; a fact which has been denied by most physiologists. No stronger corroboration, however, is needed, than to find the uterine structure every where pervaded by injection thrown into the fœtal umbilical vessels. But when in addition to this evidence, it may be actually demonstrated

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* Plate 2nd, c. c.

that vessels in considerable number may pass from the placenta through the decidua, to the uterine parietes, there can be no hesitation in admitting it as an established point of physiology.

In drawing the attention of the profession to the existence of an intervascular connection between the mother and child, we have no wish to arrogate to ourselves the merit of a new discovery; for on the contrary, we learn from Adelon, that Chaussier by injecting the umbilical vein with mercury, not only filled the placental vessels, but also the uterine tissue and its veins. This writer also states, that Bèclard, by means of oil injected into the umbilical vessels, accomplished the same object.* Dr. Williams mentions that after throwing oil into the aortal system of several pregnant bitches, this fluid was detected in the blood of the pups, which were carefully examined.† Magendie observes, "when a quantity of camphor is injected into the veins of "a dog, the blood soon takes a strong odour of camphor. "After having made this injection in a bitch with pups, I ex- "tracted a fœtus from the uterus: at the end of three or four "minutes, its blood had no odour of camphor; only a second "fœtus, extracted after a quarter of an hour, had a strong "odour of camphor. It was the same with the other fœtuses. "Thus, notwithstanding the want of direct anastamosis between "the vessels of the uterus and those of the placenta, it cannot "be doubted that the blood of the mother, or some of its ali- "ments, passes promptly into the fœtus; it is probably de- "posited by the uterine vessels at the surface, or in the tissue "of the placenta, and absorbed by the radicles of the umbi- "lical vein."‡

M. Dubois formerly exhibited to the Academy of Surgery, a specimen he had prepared, and in which the injection passed into the placenta, through which he demonstrated the placento-uterine vessels. Although these writers mention that the fluids were detected in one system which had been injected into the other, yet none of them have demonstrated the channel of communication by which this was accomplished. Dr. Blundell surmises that such

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* Physiologie de l'homme—Tome 4, page 483

† Edinb: Med. and Surg. Journal—Vol. 25 page 87.

‡ Physiology, page 508—Dr. Milligan's Translation.

a communication exists, for he says at page 134,—"But "you may ask me here, is there no communication between "these cells and vessels? That there is a communication, "though by orifices exceedingly minute, there can, I think, "be little doubt, for how else could the child be nourished, "or how could the infectious diseases of the mother be com- "municated?" And at page 195 he again says, "And "there seems to be a communication between the cells and "the vessels, by means of very minute pores impervious to "the integral red blood, but transmitting the subtler parts, "and by means of those pores supposed to exist, though "not to be demonstrated to the eye the subtler parts of the "maternal blood, the serum and coagulable lymph are "absorbed into the vessels of the fœtus."*

The placenta which was every where pervaded with injection, proves every part of it to be accessible to the fœtal vessels, and there is no part in it which answers to the portion which is usually described as the maternal or cellular. Indeed such an organization appears unnecessary, if there be, as there most certainly is, a direct vascular communication from the mother to the fœtus, and as there is great reason to conclude from the fœtus to the mother; an idea which is supported by the experiment of Chaussier, Béclard, Magendie, and Dr. Williams, to whose opinions we have before referred. Again we may readily imagine that the large vascular openings which are to be detected under the placenta, covered by the decidual membrane, will answer all the purposes of such a structure, as we have between the extreme terminations of the umbilical vessels and these apertures, merely the delicate and thin decidua. These openings communicate with that cavernous arrangement of the uterine sinuses, which is beautifully exemplified in plate 1st.

We think we have proved the structure of the placenta to be entirely fœtal and vascular; its elements being principally composed of the umbilical vessels, which divide and subdivide into branches of so small size as can scarcely be detected by the naked eye. In correspondence with the objects to be accomplished by the placental circulation, and the several exigencies of the fœtal system, these vessels

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* Lancet.—Vol. 1st, 1828-9.

are variously distributed. One division, and the greatest, of the capillary system of the umbilical veins anastomoses with similar branches of the umbilical arteries. The other and most probably a very small division, passes on through the decidua to anastomose with the uterine vessels. It will be obvious from this organization, that the fluid which circulates through the fœtal system, and contributes to its support, is derived in part from the mother. It is not our design to assert that red blood is transmitted from the mother to the child. No doubt however exists in our minds that some of the elements of the blood pass to supply its demands: else, for what other purposes are those vessels destined, which we have demonstrated to exist between the placenta and the uterine parietes? Another circumstance which tends to corroborate this doctrine, is the communication of disease from the mother to the fœtus. Several objections may be raised against the theory of a direct vascular communication existing between the mother and fœtus in utero; it may be said that the child would suffer from the loss of blood in cases of uterine hemorrhage, if this mode of connection existed; but in many instances in which excessive discharges of blood have taken place from the uterus, the child when born shewed no signs of having suffered from the mother's loss. Dr. Williams says, "It is also well known, "that the fœtal system does not appear to be in the least "drained of its blood when an impregnated animal is "killed by the butcher." "A cow far advanced with calf "was slaughtered; presently, on examining the calf, it was "found to contain a large quantity of blood, which issued "out in a stream on dividing the jugular vessels. In this in-"stance, the maternal fœtal circulation must have been ob-"structed soon after the cow had been '*stabbed*' and while the "irritability of the fœtal heart and of the maternal and fœtal "vessels had been yet active; for the blood of the cow "naturally rushing towards the point where there was the "least resistance, the uterine vessels could only have replen-"ished the system of the calf for a very limited period."*

This condition of the fœtal circulatory system in cases where the mother has lost considerable quantities of blood, does not in our opinion tend to disprove what is stated to be

* Ed. Med. and Surg. Journal.—Vol. 25th, page 102.

the mode of connection between these two systems. The vessels are extremely minute and (it may be) only convey the more subtle parts of the blood. Now it will be readily granted that as their calibres are so extremely small a complete obliteration will readily take place, when the cause of distention is removed. And "it would appear to "me to be a law of the animal economy, that as soon as "blood ceases to enter the umbilical vessels from the uterine, "that blood also ceases to enter the uterine vessel from the "umbilical."*

Deposits of ossific matter are occasionally found on the surface of the placenta, which in some cases lie in patches having the healthy decidual membrane interspersed between each layer, while in other cases it extends over the whole of its surface; a condition of the placenta, which may be considered as unfavourable to a continuous vascular communication. But can the existence of a thin scale of bone which is accidental, warrant the inference of non-vascular communication? Do we not find vessels traversing the thickest and the firmest bones in the body, in order to arrive at the medullary membrane?

Another argument opposed to the theory of a direct contiuuous circulation has been founded upon the absence of isochronism or synchronism, between the pulsations of the heart of the fœtus, and those of that of the mother; the beats of the fœtal heart being double the number of those of the maternal during the same period of time. The truth of this is to be ascertained by the application of the Stethoscope to the abdomen of the woman. This mode of enquiry was first suggested by Kergaradec,† whose opinions have since been corroborated by several medical writers.‡ However plausible this theory may appear to the advocates of the doctrine that some intermediate structure subservient to the purposes of circulation, exists between the vessels of the mother and those of the child; we must confess that duly considered, it is to our mind far from satisfactory; for cannot tubes exist between two

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* Ed. Med. and Surg. Journal—Vol. 25, page 102.

† Memoire sur l'Ausultation, &c.

‡ Dr. Kennedy—Dublin Hospital Reports, Vol. 5.—Dr. Ferguson—Dublin Medical Transactions, Vol. 1.—New Series.

sets of vessels, whose pulsations are unequal, and yet not influence the actions of either? Is there no analogy in the office of these canals, and the excretory ducts of some glands? It is unnecessary to attempt to overturn a speculation by argument, in any case in which facts can be adduced sufficiently strong to point out its fallacy. This we can do in reference to the point under consideration. The placenta was supposed by Harvey to perform the function of a gland; but this office is not necessary if it be admitted that nutritious fluids are conveyed directly from the mother to the child; it must be granted, however, that this organ is an agent of great importance in supporting fœtal life. In addition to the degree of sustenance which the child derives directly from the mother, the placenta serves a valuable end in changing the qualities of the blood which flows from the fœtus and circulates through its structure, and thus renders it subservient to the objects of fœtal life.

Although these objects can only be accomplished for any length of time, so long as the placenta remains attached to the uterus, yet we are of opinion that the placenta possesses an independent power within itself to maintain for a short period the life of the fœtus. "Likewise, as an "additional means of preservation, the fœtal blood pro- "pelled to the placenta (after the maternal fœtal commu- "nication has been cut off,) would appear to pass from the "umbilical arteries, through the anastomosing branches "existing between them and the umbilical vein, into the "latter, to be again returned into the fœtus. In this way, "the fœtal circulation after the cessation of the maternal "fœtal, might be carried on uninterruptedly as long as the "irritability of the heart and vessels of the fœtus would "be able to circulate the blood. Is it not this adjustment "of means to ends that regulates occasionally in some "animals, the fœtal circulation during parturition, from "the instant the sanguiferous communication is cut off "between the offspring and the parent, until the former "respires? And is it not to the above law and prospective "contrivance, that the infant owes its preservation, when "its life is saved, by the Cæsarean operation, after the death "of the mother."* Mr. Green has related a case, (to

* Edinb: Medical and Surg. Journal, vol. 25, p. 103.

which Dr. Blundell alludes in his valuable Lectures) of a pregnant woman, who was killed by a stage coach passing over her body. She was removed to St. Thomas's Hospital, and the child, which was extracted by the Cæsarean operation, was restored, after continuing the resuscitating measures for a quarter of an hour.*

Velpeau says, "The child does not always cease to live "at the same moment with its mother, although most fre- "quently it dies first."—We might even believe, admitting "as true what has been written upon the subject, that life may "be maintained in the ovum, more than twelve, twenty-four, "or even forty-eight hours. The Princess of Schwartzenberg, "who died at Paris, in consequence of a burn, could not be "opened until the next day, and the fœtus was, notwithstand- "ing, found to be living. Another woman, mentioned by M. "Gardien, was not operated upon until after forty-eight hours "had elapsed, and the child was found to be still alive. "Flajani, Veslingius, and several other authors, relate cases "of a similar character; but can we give credit to the asser- "tions of Cangiamila, when we find him affirming in his "Sacred Embryology, that in the space of twenty-four years, "twenty-one children were saved in this manner at Montereali, "thirteen at Girgenti, and that the Cæsarean operation was "performed under these circumstances twenty times at Syra- "cuse, in the course of eighteen months."†

Dr. Campbell says, "That where a pregnant female, in "perfect health, is suddenly destroyed by accidental vio- "lence, the section of the abdominal and uterine parietes, "quickly and dexterously resorted to, ought, in the majo- "rity of instances, to save the fœtus. I allude to the case of "a woman in South Richmond-street, to whose assistance I "was called in the summer of 1826, and who shortly after "my arrival gave birth to an entire ovum in the sixth month. "The fœtus was alive; but as at this time it could not be "reared, and as the membranes were entire, it occurred to "me that it would be interesting to determine how long it "could live within its envelope, without deriving any ad- "vantages from its parent, and very little, if any, from the

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* Traite Element: De L'art des Accouch.

† Lancet.—Also Med Chir. Trans.—Vol. 12.

" atmospheric air. The ovum was placed in a large plate " upon a table, in a small warm confined apartment; and all " present had an opportunity of observing the fœtus turn itself " occasionally in the *Liquor Amnii*, for the space of twenty " minutes, when its movements finally ceased." Again he states " a young friend of my own, some years ago, while on a " sporting excursion, killed a hare, and without taking any " further notice, carried it home; and in about half an hour " after it was shot, an unusual jumping movement was ob- "served within the abdomen, when the sportsman immedi- " ately laid open the cavity, with his penknife, aad emanci- " pated a leveret, which lived for more than a year after- " wards, and had been seen by many persons, some of whom " came from a considerable distance to view this wonderful " phenomenon."*

Dr. Smellie relates the case of a female, who was flooding in consequence of a placental attachment over the os uteri. He says, "a strong pain immediately succeeding, I " examined and found the placenta pushing through the os " externum, and the delivering of this was immediately fol- " lowed by that of the child, which was alive, although the " placenta came first."†

In a small obstetric work, is related a case of placental presentation in which it is stated, "I then thought it highly " necessary to inform myself of the reasons of her violent " flooding; aud touching her, found a great deal of coagu- " lated blood, which I brought off and then perceived the " after-birth to present first: I got that immediately; and then " brought off the child. 'Twas a fine boy, and lived about " half an hour,"‡

A case is detailed by Mr. Bailey, in which the placenta was expelled in the act of getting into bed, " and was sus- " pended between the thighs by the funis. The hemorrhage " was extremely profuse, and the prognostic delivered to the " friends of the patient was unfavourable, in reference to the " preservation of the child. The patient was delivered by

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* Edinb. Med. and Surg. Journal---Vol. 38. page 272.

† Collection of Cases and Observations.---Number 3.—Case 5.

‡ A Complete Practice of Midwifery, by Sarah Stones.—Obs. 27. page 93.

"passing the hand and bringing down the feet of the child "which to all appearance was dead. It was immersed in "warm water, and the region of the heart rubbed with some "spirit. Soon after being put into the water, &c., made "convulsive effort to breathe, and was ultimately restored." *

From the facts just stated, we are authorised to draw the following practical inferences;—1st. That the fœtus continues to live for at least a short time after the death of the mother, which warrants, nay even demands, that the child should be removed by an incision, though the abdominal and uterine parietes; and moreover it is uncertain how long vitality may exist, in a fœtus thus deprived of its natural support, we should not limit this measure by any rule, which is alone founded on the length of time which may have elapsed since her death.—2nd. That in all cases where the entire ovum is expelled from the uterus, it becomes the duty of the practitioner immediately to rupture the membranes, as it is proved that the child will live some time after its expulsion from this cavity, although shut up in its membranous sac.—3rd. That the child continues to live in cases in which the placenta is completely detached from the uterus, and excluded from its cavity; providing its organization is not broken up.

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* London Medical Repository—Vol. 16. page 453.

FINIS.

LEECH AND CHEETHAM, PRINTERS.

Explanation of the Plates.

PLATE I.

Represents a Section of the Gravid Uterus, with a portion of the Placenta adhering to it.

A. A. A.—The fœtal surface of the placenta.

B. B.—The line of demarcation existing between the uterus and the placenta.

C. C. C.—The cellulous structure of the uterus, which is much more conspicuous towards its internal surface.

D. D.—The peritoneal surface of the uterus, which is partially covered by one edge being reflected and fastened by three pins.

PLATE II.

Represents the opposite Side of the same preparation described in Plate I.

A. A.—The fœtal surface of the placenta.

B. B.—The uterine parietes which are raised from the placenta, and supported in their position by two pins.

C. C.—Vessels seen passing from the placenta to the uterus.

D.—The placenta, whose substance is uniformly filled with injection.

PLATE III.

Figure 1st—Represents a Section of the Gravid Uterus, with a portion of the Decidual Membrane adhering to it.

A. A. A.—The deciduous membrane, upon which are seen a most beautiful arborescent arrangement of capillary vessels.

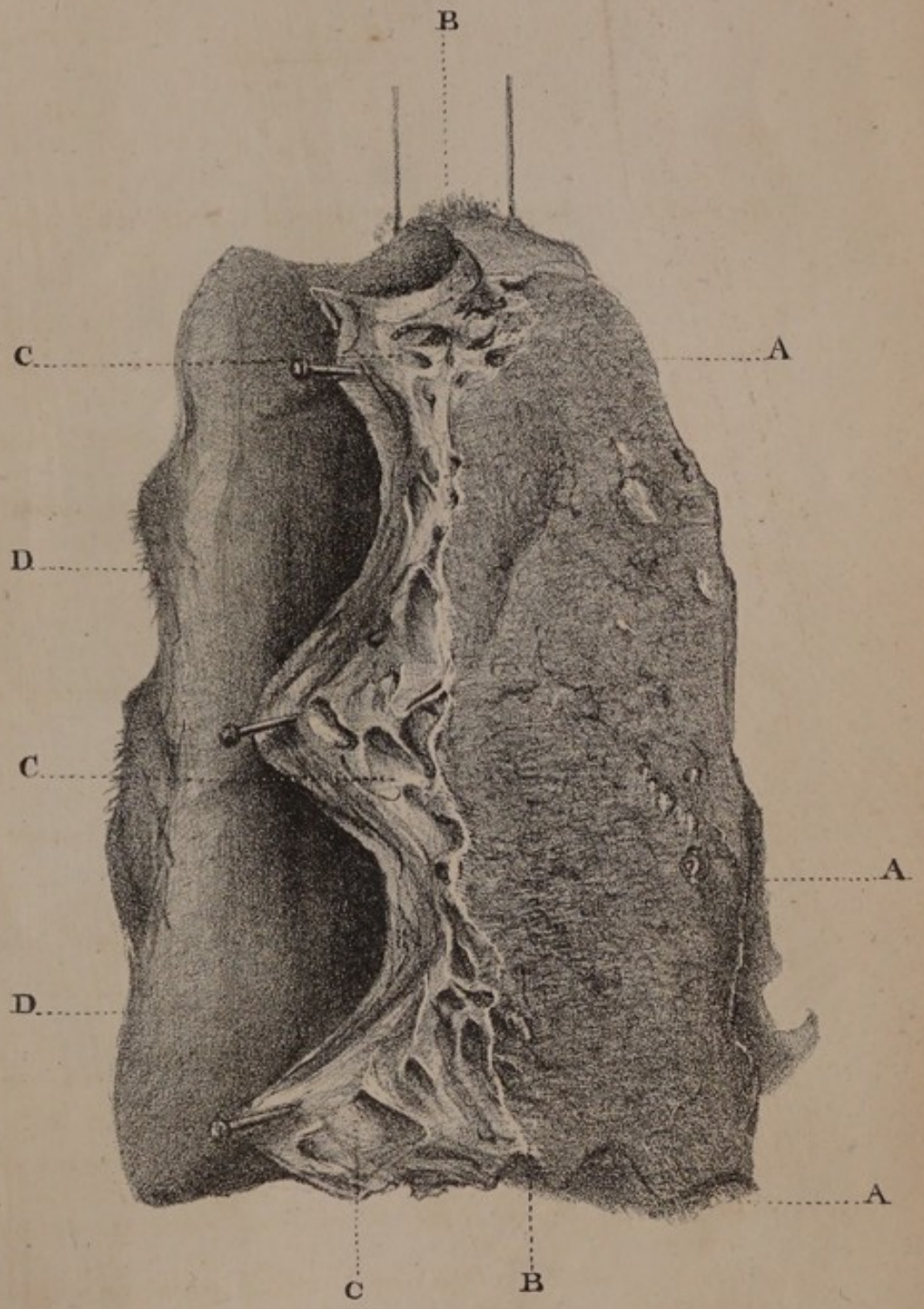
B. B. B.—The surface of the uterus, from which the decidua has been removed.

FIG. 2nd.—The edge of the section of the uterus, on which are seen the opening of the sinuses.

FIG. 3rd.—Represents the openings in the inner membrane of the uterus, where the placenta had adhered.

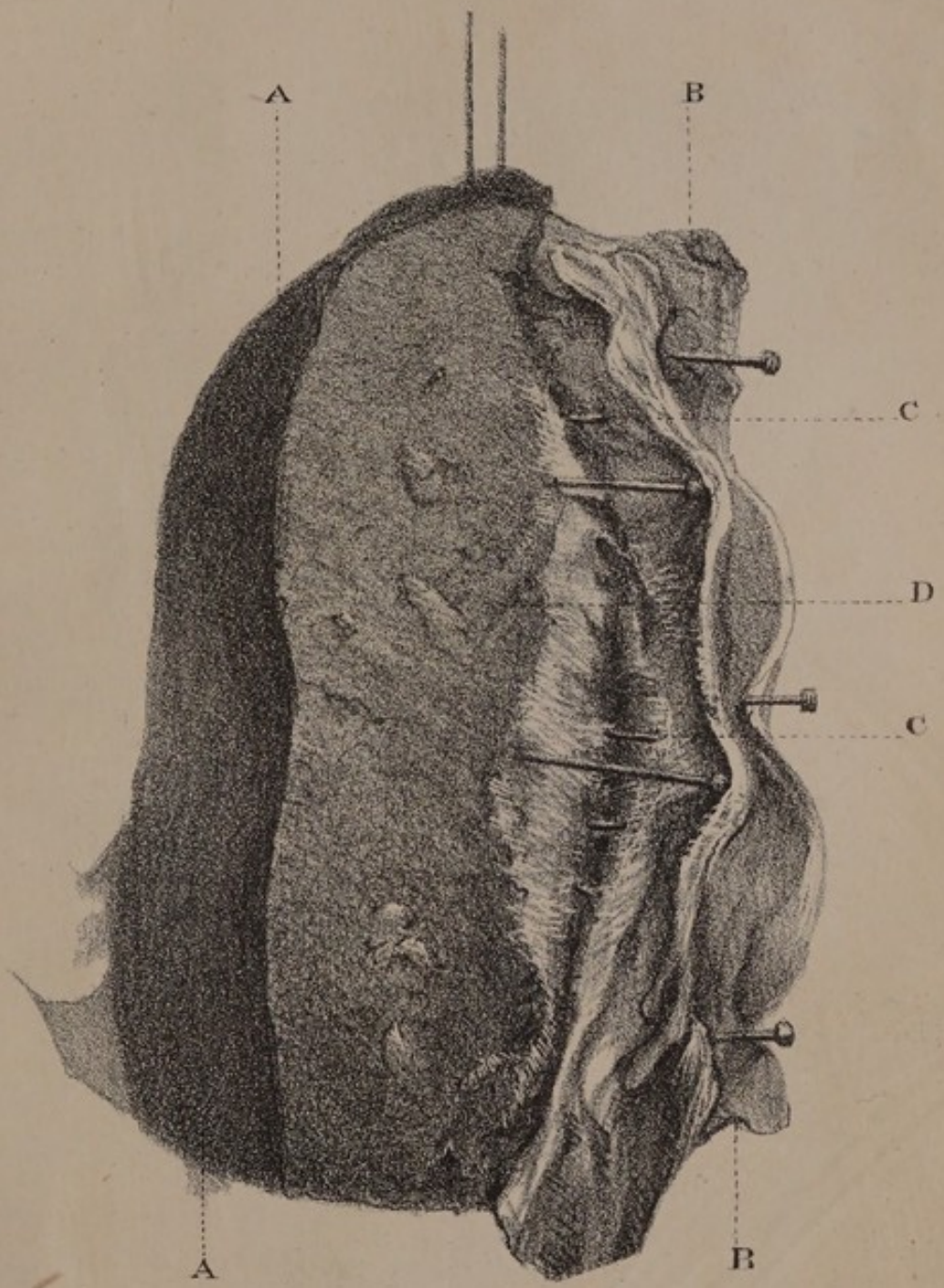
N. B.—This last figure was taken from a plate, contained in Dr. Lee's paper, in the Phil. Trans. for 1832.

PLATE I.



T. Physick Lith. King St. Manc.r

PLATE II.



T. Physick Lith. King St. Manc.r

PLATE III.

Fig. 1.

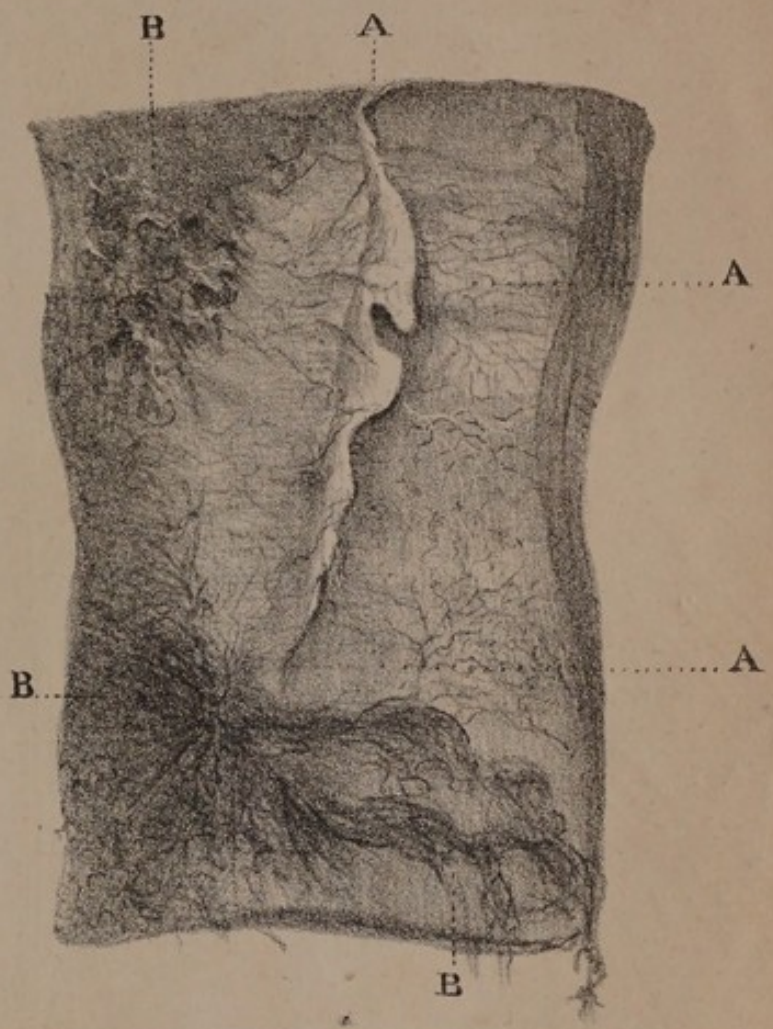


Fig. 2.

Fig. 3.