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THE INNER SURFACE OF THE UTERUS AFTER PARTURITION.¹

BY LEONARD WHEELER, M. D., OF WORCESTER.

THE time which I propose to occupy will not allow of lengthy discussions or citations, and I shall therefore endeavor to draw a definite picture, agreeing, as far as possible, with the present state of knowledge upon my subject.

Within five years the study of the anatomical relations of embryo, foetus, and mother seems to have been earnestly taken up anew; for the first time it has been studied with all the arts and appliances of modern microscopy, especially from thin sections. During this time, the work of several persevering investigators has resulted in some definite additions to our knowledge of a subject upon which comparatively little had hitherto been definitively known, and upon which many prevalent ideas were false. The subject is interesting in any aspect, but specially and practically so as helping to an understanding of another, upon which there has been even more discussion and less agreement, namely, puerperal fever.

The little advance we now boast is the first for just a century; for, apart from the microscopical details in which this advance consists, the descriptions of William Hunter "may be justly characterized as all true and containing all the truth." John Hunter advanced incorrect views of his own after his brother's death, views which his great name propelled through all the medical literature of more than half a century, and even into the text-books of the present decade. His was the coagulable-lymph theory. William Hunter's level was not again reached till the present generation. After the publication of Cruveilhier's *Pathological Anatomy*, the opinion therein expressed was law for the world till Virchow appeared. Cruveilhier said that the inner surface of the uterus after parturition was clean muscle, and compared it to a stump after amputation. Twenty-five years ago Virchow renewed the theory of William Hunter. About the same time the French school set forth the opinion that a new mucous membrane began to be devel-

¹ Read at the Annual Meeting of the Massachusetts Medical Society, June 8, 1875.

oped under the old during pregnancy, so early even as the fourth month, and this opinion was supported by Priestley in his *Lectures on the Development of the Gravid Uterus*, published in 1860. The opinion of Cruveilhier has also found recent supporters, as Kölliker and others. Matthews Duncan long ago earnestly maintained the theory of Hunter and Virchow, now universally acknowledged, that the muscle is never exposed.

The origin of the new epithelial covering of the involuted uterus was always a vexed question. It had been accounted for, on the one hand, by derivation from connective-tissue cells, and, on the other, by rapid proliferation from the cervical mucous membrane.

The first thorough microscopical observations were reported by Friedländer in 1870, the latest in a long article by Engelmann, of St. Louis, in a recent number of the *American Journal of Obstetrics*. This latter, the common work of Kundrat, in Vienna, and Engelmann, is a valuable addition to the English literature of the subject, and so comprehensive that had it appeared in season I should have allowed it to absorb the place of this paper; still I hope my briefer and differently handled statement will also have its value.

In health the mucous membrane of the adult uterus consists of an outer layer, lying next to the muscle, and composed of connective tissue with fibre cells; it supports an inner coat of ciliated epithelium, which sends numerous single and bifurcated glandular prolongations through the outer layer down to the muscle. During pregnancy it is much changed; in the first weeks the connective-tissue layer increases enormously, becoming five or six times as thick as in health, and, at its junction with the cervical mucous membrane, it bulges down over the latter; toward the inner surface it loses its fibrous character, and becomes more and more richly cellular. The epithelial covering mostly disappears. The glands lengthen, and the lower ends branch.

A transverse section shows the membrane so much changed that two layers are now distinguishable: an inner, toward the uterine cavity, consisting almost entirely of round cells, with a small amount of intercellular substance (the cells resembling epithelium, though derived probably from connective tissue), and an outer, made up of spindle-shaped cells and gland cavities lined with epithelium. Later, with the rapid increase in size of the uterus, the whole membrane becomes thinner, but the connective tissue seems to have overwhelmed the epithelial layer, which, as a layer, disappears, the only epithelium left adherent to the uterus being that lining the glands.

The ovum, issuing from the Fallopian tube upon this membrane, finds a nidus in one of its folds, which soon enwraps it in the misnamed decidua reflexa. The villi of its chorion become gently adherent by a mucous mucilage, and the formation of a placenta begins, not, as has

always been held, by the villi plunging deep into the glands, but by a general reception of the villi into the substance of the mucosa, the mucous membrane growing up about them. Where the villi happen to lodge at the mouth of a gland, the decidual tissue is piled up around them the same as elsewhere, and so for a short distance they are within the gland, but as a rule the villi are not inclosed in glandular epithelium. The union of placenta and decidua does not become inseparably firm till during the third month.

And here our settled knowledge of the maternal parts ceases, for there is no unanimity of opinion upon the character of the maternal framework which supports the foetal villi. In the fully-formed placenta the amount of this maternal portion is found to be comparatively small, forming an irregular framework for the villi. According to Winkler, who seems to have made very successful sections, it is a prolongation of the intercellular substance of the cell layer of the decidua, which forms a loose mesh, the framework of the whole placenta, the trellis upon and in which the villi are supported. It is covered with endothelium, and the villi are either imbedded in it entirely or only for a part of their circumference, while a few hang loosely in its sinuses. The villi are covered with epithelium, except where in contact with the maternal structure; here intercellular substance unites with intercellular substance, and a way unbarred by epithelium or endothelium exists between maternal and foetal parts — an unprotected way for the transmission of hereditary virtue or vice.

By others the sinus-system is regarded as merely an extension and dilatation of the inner coat of the maternal vessels. But even the existence of a sinus-system has been disputed by such men as Velpeau and Ramsbotham, and, in a recent long paper, by Braxton Hicks.

To recapitulate, then, we have from without inward (1) muscular layer of the uterus with its sinuses, (2) gland layer of the decidua, (3) cell layer of same, (4) maternal framework of intercellular matter supporting the foetal villi, (5) chorion, (6) amnion.

Now where is the line of separation of the decidua at the time of parturition? With an understanding of the anatomy of the pregnant uterus, a further knowledge of the microscopic appearances of the outer surface of the delivered placenta, and of the inner surface of the uterus after expulsion of the ovum, would demonstrate the line of separation. The expelled ovum particularly has been examined by many observers, and opinions as to the histological formation of its maternal surface are pretty well agreed; the appearances described correspond excellently with those of the inner, cell-layer of the decidua, *i. e.*, judging from this, the whole gland layer, at least, must be left within the uterus.

That this is in reality the case was first proved by Friedländer;

but though all honor is due him, the same view was stated with sufficient distinctness, as long ago as 1854, by Chisholm, who, in describing the post-mortem appearances of the uterine mucous membrane in the case of a woman who died on the seventh day after delivery, says, "There were numbers of minute oval and circular depressions studded very regularly over the internal surface. They were distinctly visible to the naked eye, and the largest of them might have admitted the head of a pin. Little more concerning these depressions could be made out with the microscope, but we have found similar appearances constantly presented by the mucous membrane of pregnant uteri among the lower mammalia, and no one can for a moment doubt that they are the openings of the follicles of the mucous membrane."

I have had a single opportunity of testing the truth of this. The patient, a woman at full term with her first child, died suddenly after a few weeks of acute kidney trouble. The membranes and placenta were lightly adherent over the whole inner surface of the cavity of the uterus, so lightly that only the slightest traction was necessary to separate them. The divided layers were rough, and yellowish red in color. Pieces of the uterus being hardened and sections made, the inside layer was found a line or two in thickness, and apparently covered the muscle everywhere. It was made up of two layers: a continuous internal one of small cells, and an external one with more intercellular substance and fibre cells, and interrupted by numerous elongated cavities. Over the placental site, where in this case there were, of course, no thrombi, this layer seemed to be thinner and the glands scarcer; indeed, it was often wanting, so that the muscle was left exposed, though I could not be sure this was not an effect of my manipulation.

We have, therefore, over the whole inside of the uterus (except the cervix, which retains its whole mucous membrane), not the naked muscle, but the outer layer of the mucous membrane. There is no coating of epithelium over it; there has been a solution of continuity, and the whole is a wounded surface composed of connective tissue, a surface well fitted, apparently, for resorption of different substances into the blood or lymph systems. Under the present circumstances, however, there is no necessity of having recourse to connective tissue, or to the epithelium of the cervix even, for the source of a new epithelial layer. Epithelium is lacking on the surface, but there are plenty of deposits below in the gland-cavities of the outer layer of the mucous membrane, which still remains undisturbed in the uterus.

This question of the process of renewal of the epithelial covering is a difficult one. It must necessarily be determined from fine sections of the part at particular times, and it is very hard to get proper material from healthy uteri at these times, since the puerperal woman, if she

dies, succumbs generally to a disease involving exactly that part which it is desired to examine. Further, the study of the subject on animals leads to no competent result, since the conditions are very different. In animals, when the epithelial covering does not remain entire, there is, at most, a very small wound at the placental seat. The guinea-pig, for instance, may conceive a few hours after parturition, so slight is the influence of pregnancy on the state of the organs.

The process as now explained is as follows: during the first week after parturition the surface of the uterus is covered with a soft, dirty, dark-red sheet of variable thickness, which is easily washed away by a gentle stream of water, the gradually degenerating part of the cell-layer of the decidua. Washed away, it leaves a dark-red, ragged, still living, but fast exfoliating surface. The placental site is distinguished by the greater unevenness of surface, caused by the projecting thrombi of the veins. Under the microscope, the soft sheet which can be washed off is found to consist principally of large round cells filled with fat, and some few spindle-shaped cells, some epithelium, red and white blood corpuscles, and much free fat; in other words, the altered constituents of the cell-layer of the decidua. In fine transverse sections the following condition is found: on the muscle lies the whole of the gland-layer, and, inside of this, toward the cavity of the uterus, a part of the cell-layer already in the midst of a process of rapid degeneration; both these layers are infiltrated with blood corpuscles. The cell-layer is much reduced in thickness, and, even in the first week, is sometimes entirely absent in spots, leaving at points the epithelium of the gland-cavities of the layer beneath exposed.

In the second week, the fluid covering the inner surface is thinner and less red, while the real inner surface is less ragged and has more consistency; it is no longer possible to wash away portions of it with a stream of water. The thrombi of the placental seat are gray in color and less prominent. Microscopically, the fluid covering has less of the other constituents, but more pus and epithelium. On section, it is found that the cell-layer of the decidua has almost entirely disappeared, leaving the gland-layer exposed; not only that, but the connective tissue around the epithelium-clothed cavities is fast undergoing fatty degeneration, and the epithelium has been exposed in many spots, so that we have innumerable points, skin grafts as it were, spread over the whole surface.

In the third week the surface is nearly smooth, and is now entirely covered with cylinder epithelium which dips down here and there, leaving a wide opening into epithelium-lined cavities—the ends of the glands which have been buried during pregnancy. On the placental seat alone little spaces remain uncovered by epithelium, that is, the projecting thrombi; still these are much reduced in size. Otherwise

the placental seat is like the rest of the surface. A little of the purulent fluid remains, which disappears finally at about the fourth week. After this time the changes are merely an increasing thickness of the mucous membrane and consequent lengthening of the glands, while the epithelium receives a fringe of cilia.

The process is then as follows: the line of division between placenta and uterus runs through the cell-layer of the decidua. The portion of this layer left in the uterus is infiltrated with blood; it goes through the process of fatty degeneration, and its degenerated remains form a large part of the lochia. By this process the gland-layer is brought nearer the surface, and the glands are laid open. Innumerable little islets of epithelium are gradually presented over the surface. The tissue between these continues to degenerate; the whole uterus grows smaller, and the patches of epithelium are thus brought nearer and nearer together, till the space remaining to be covered is extremely small; and finally, this is filled by a new growth of epithelial cells.

UMBILICAL HERNIA; ACCIDENTAL RUPTURE OF THE TUMOR.

BY CHARLES O'LEARY, M. D., OF PROVIDENCE, R. I.

EARLY on Sunday morning, May 30th, I was called to see a patient on the outskirts of this city. Not being apprised of the urgency of the case, I did not reach the patient's house until ten o'clock A. M. On entering the room, I found a woman lying in bed in her dress; she was quite calm and composed. Being asked what the trouble was, she told me her bowels were all out, and directed me to examine and see. Raising her clothing, I beheld an enormous tumor in the left iliac region, with intestines (probably thirty inches of the large bowel and some portion of the small) protruding from it. The tumor was of cylindrical form; it measured eighteen inches in circumference at its base, and nine inches in height. It had on its upper surface three pouches, nearly of the shape and size of an average-sized lemon; one of them proved to be the umbilicus. When the tumor was dependent this umbilical pouch reached to the middle third of the thigh. In the longer diameter of the tumor was a rent between two and three inches in extent, through which the intestines protruded.

The history of the patient, as given by herself, was as follows: She was fifty-four years of age, married, and had had two children, the younger fourteen years of age; she had always had good health. Six years ago she noticed a swelling at the navel; as this enlarged she con-