The American Journal of Obstetrics and Gynecology

VOL. IV.

ST. LOUIS, OCTOBER, 1922

NO. 4

Original Communications

THE UTERUS AFTER CESAREAN SECTION*

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AS CESAREAN section has become established as one of the standard and important operations of obstetric surgery, we have come to the stage of studying, not only the best method of performing the operation, but also the after-history of patients upon whom the operation has been done. Not only must the patient recover from the operation if we are to be successful and her child also survive, but she must be left in such a condition that if her pelvis is of sufficient size, she may give spontaneous birth after a subsequent pregnancy. Another problem which enters the field of cesarean section is the question of birth control. Cesarean section is often performed for conditions which make spontaneous labor on the part of the patient impossible if a living child is to be secured. Unless the pregnancy for which the first operation is done is to be the last, each succeeding pregnancy means additional danger. Must each cesarean operation terminate in sterilization, or has the patient a fair prospect if the pelvis is sufficiently large, of being successful in spontaneous labor in subsequent pregnancies? In addition to this problem, birth control presents itself in another phase. The obstetrician is often called upon to treat multiparæ who are near the final limit of healthy child-bearing. Many of these are women in straitened circumstances, who have as many and some of them more children than they can properly rear. Many have reached the stage of physical degeneration where future pregnancies will become progressively dangerous. Under these

*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, May 1 to 3, 1922.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

conditions, may not the performance of cesarean delivery be followed by sterilization? This is to be so done as to remove practically all of the pelvic generative organs, hasten a menopause and relieve the woman of the dangers of disease which often arise after the age of child-bearing. The condition of the uterus in these patients is an important factor in deciding these questions. Where sterilization is not effected and the patient elects a possible future pregnancy the method of suture of the uterus is of paramount importance. The writer's paper is based upon his experience in these matters, and he would endeavor to show the actual condition of the uterine muscle after cesarean operation.

Much attention has recently been called to the danger of rupture of the uterine scar after cesarean section. We are now familiar with the statistics of Holland and with the review which British obstetricians have given to the subject of cesarean section. From this contribution to the literature of the subject it may be concluded that where catgut is used to close the uterine muscle in cesarean section, that there is danger of rupture in subsequent pregnancy of about 4 per cent. This is true in cases where the classic celiohysterotomy has been done. Where silk has been used the danger of rupture is less, while it is thought that the ideal suture material would be silk-worm gut.

To understand the causes which lead to rupture of the uterine scar after cesarean section, one must revert to the conditions normally present after the uterus is emptied. By autolysis the uterus undergoes rapid diminution in size, bulk and area. Intermittent contraction and retraction of the uterine muscle is essential. If to this activity there be added the destructive agency of bacteria, greater in number than those normally found in the uterus, and if these bacteria gain unusual access to the placental site, an infective process is added to autolysis. The result of these processes is to soften the uterine muscle, cause its more or less rapid absorption, and where infection is present, to have bacteria reproducing these constantly, and finding their way along lymphatics to adjacent tissues. The resistance of these tissues results in the formation of adhesions, and if the infective process bursts through these, fistulae may develop.

A suture material placed in such an organ as the uterus will disappear through the action of cellular elements, unless it be impervious and resisting. Hence if the uteri be examined where silk has been used in closing and infection has not developed, no trace of the silk may be found. Catgut disappears much more rapidly with the unfortunate addition of the rapid loosening of the knot in the suture. From this cause fatal postpartum hemorrhage has developed. Where infection occurs the natural absorption is prevented, the stitchknot becomes a foreign body, and as bacteria make their way through the

tissues, a fistula is formed through which the foreign body may be expelled.

While the choice of suture material is important, we know that in the classic operation the efficient and accurate closure of the uterine muscle is indispensable; while methods of operation may differ, this must be accomplished.

It is a general principle of surgery that rapid and complete union in wounds is not to be expected in patients whose general condition and power of resistance are greatly vitiated. This holds good in cesarean section, and the obstetrician may be called upon to effect delivery in cases where the general condition of the patient is so bad that it is unsafe to suture the uterus and allow it to remain. This would limit the choice of operation to embryotomy or hysterectomy. Not only could prompt and successful union not be expected but should a subsequent pregnancy develop such a condition renders any form of delivery especially dangerous. Rupture of the uterus may occur during embryotomy, version or any manipulation where the membranes have long been ruptured, and the uterus has contracted and retracted upon the body of the child.

Cesarean section by incision through the lower uterine segment is said by those who practice it to be less dangerous for subsequent pregnancy. Our experience is not up to the present time sufficient with this operation to justify accurate comparison with the older and classic section. So far as the experience of the writer is concerned, he has on several occasions operated upon patients upon whom the operation by the low incision had previously been done. In two of these cases adhesions had formed so dense and resisting as to render the action of the uterus in labor inefficient and delayed, preventing a proper presentation and making inevitable the second delivery by section. It is greatly to be hoped that this method of operating may ultimately prove of definite advantage, both at the time of operation and in the patient's subsequent history.

The writer has had several opportunities to examine the uterine scar after the classic cesarean section. The second delivery of these patients was accompanied by hysterectomy; and hence the body of the uterus was available for study. All of these patients had been operated upon by the same method, namely, the turning out of the uterus from the abdominal cavity, incision through the expulsive segment, the emptying of the uterus and, in suspected cases, packing of the cavity. Uterine muscle was closed by buried silk sutures, the peritoneal covering of the uterus with catgut. In none of these cases had septic infection developed after the first operation. In those who are allowed to remain in the Maternity sufficiently long, a very fair degree of convalescence has been obtained. These five patients were married Caucasian women, the wives of artisans, caring for

their children and doing the housework. They belong to that class of persons in the community upon whom the burden of life falls especially heavily. In none of them was there evidence of syphilis, alcoholism or other especially complicating features. The cases are as follows:

CASE 1.—White, aged 30. Cesarean section eight years previously by myself, by the method described. The child lived for six months, dying from some cause not clearly stated. Five years after this the patient had twins by spontaneous labor. She was admitted to the Philadelphia General Hospital in the service of Dr. E. A. Schumann and found to be pregnant about eight months. Blood pressure 154-68, pulse 122. Pelvic measurements practically normal but patient was very obese and examination was difficult. There was no engagement of the presenting part. Urine showed albumin and casts, and there was marked swelling of the legs. The membranes ruptured early and a feeble attempt at labor developed with the head presenting. Supravaginal hysterectomy was performed by Dr. Schumann and very extensive adhesions found between bowel, omentum and anterior uterine surface. The child did well after birth. The patient's convalescence was complicated by nephritis and superficial wound infection.

On examining the body of the uterus removed there was a poorly defined furrow on the anterior fundal surface marking the line of incision at the first cesarean section. Microscopic examination of this area showed in the line of the scar, loose connective tissue and a highly vascular condition with widely dilated blood vessels. In the uterine muscle adjacent to the scar the muscle bundles were placed irregularly in the vicinity of the scar. The scar, however, was sound and was holding firmly.

CASE 2.—Aged 41, married at 19, who had had nine pregnancies, two of which ended in abortion. In 1914 the writer had performed section upon this patient and since then she had one child born by forceps. A section was done for placenta previa and followed by uninterrupted and normal recovery. The patient had come to the Clinic of the Jefferson Hospital complaining of malaise and showing old lacerations and relaxations. She had been fairly nourished but had suffered from more or less privation and poverty. Dr. Anspach performed trachelorrhaphy, anterior and posterior colporrhaphy, excision of the adherent omentum, release of adhesions and supravaginal hysterectomy. The body of the uterus taken from this patient was apparently normal. There was a moderate degree of subinvolution and on microscopic examination sections taken transversely across the anterior surface of the uterus and across the scar, showed everywhere a muscle wall practically normal in appearance. There was some slight hypertrophy of the muscular tissues. Blood vessels were large and numerous, but at no place could scar tissue be seen. The endometrium showed in some portions cystic endometritis and one small area of decidual tissue was seen. The specimen gave no evidence of an operative scar. This case illustrates the fact that a multipara, under worse than average conditions of nutrition and hygiene, subjected to abdominal cesarean section for placenta previa, made a complete anatomical and physiological recovery, giving birth subsequently to a child with the help of forceps and required operation only to repair the lacerations and injuries following delivery through the vagina.

CASE 3.—Multipara, aged 29, who previously had five labors including one forceps delivery and one cesarean section for placenta previa. This patient was

Fig. 1.—Case 1. Mrs. S. Section from cesarean uterus taken transversely across anterior surface, showing myometrium practically normal, numerical hypertrophy of slight degree and blood vessels large and numerous; no trace of scar.

Fig. 2.—Case 1. Mrs. S. Cesarean uterus with normal uterine muscle and no trace of scar.

in the out-patient service under the care of senior students and instructors. She went into spontaneous labor and continued for a short time when progress ceased. There was a breech presentation but the condition seemed favorable for spontaneous birth. She became unduly restless with difficulty in breathing but without shock. She had vague abdominal pain without bleeding. On palpating the abdomen it

Fig. 3.—Case 2. Mrs. V. Section through uterine scar showing a group of widely dilated blood vessels.

Fig. 4.—Case 2. Mrs. V. Section through uterine scar showing irregular placing of muscle bundles with increased muscularity.

seemed as if a portion of the child could be felt with unusual ease through the abdominal wall, it was suspected that rupture of the uterus was developing. The patient was brought by ambulance to the Maternity and abdomen opened as soon as possible. There were no adhesions but at the upper extremity of the scar the tissue of the uterine fundus had ruptured. The head of the fetus was protruding and the shoulders had partially emerged from the uterus. Membranes

Fig. 5.—Case 3. Mrs. C. Section at edge of uterine rupture showing thinned out and torn muscle fibers.

Fig. 6.—Case 3. Mrs. C. Section near line of rupture of uterus, showing thinned out muscular bundles with several small hemorrhages.

were unruptured. The child, a female, weighing seven pounds was dead. Hysterectomy was performed with dropped stump without drainage, the mother making a good recovery and leaving the Maternity in twenty days.

It is interesting in this case to note that rupture did not occur through the scar, but beginning at the upper extremity of the scar the rupture extended through the fundus. Evidently a process of autolysis had developed which had greatly

Fig. 7.—Case 4. Mrs. M. O. H. Rupture of cesarean uterus in beginning labor, marked fatty degeneration and atrophy of uterine wall.

Fig. 8.—Case 4. Mrs. M. O. H. Ruptured cesarean uterus, marked fatty degeneration with atrophy of uterine muscle and occlusion of vessels.

softened the uterine muscle at this point, possibly the pressure of the fetal head had something to do with this result. So, far from the scar being the weakest place in the uterus, it was evidently stronger than the tissues at the fundus. Microscopic examination showed thinned out and torn muscle fibers with several small hemorrhages into the muscle substance.

Fig. 9.—Case 4. Mrs. M. O. H. Rupture of cesarean uterus in beginning labor from fatty degeneration of uterine muscle. Vessels occluded, "moth eaten" appearance.

Fig. 10.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fibrosis and atrophy of uterine muscle.

CASE 4.—A Polish woman who had lost several children in difficult labors and had been delivered by abdominal cesarean section because of disproportion and failure of mechanism in labor. She was brought in after a number of hours of labor with examinations made by others than the Staff of the Maternity. During her convalescence from section she had some elevation of temperature but nothing

Fig. 11.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, thickening of blood vessels, fibrosis and atrophy.

Fig. 12.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fatty degeneration of uterine muscle.

which indicated a severe septic process. She had reached the last week of her convalescence when her husband insisted upon taking her home against the advice of the medical staff. About two years afterward she returned in the pregnant condition in very bad physical state. She had been habitually overworked and underfed and although ordinarily a stout woman, her tissues were exceedingly flabby and lacking in tone. She was told that she must come into the Maternity

Fig. 13.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, infiltration of leucocytes at junction of placenta and uterine wall.

Fig. 14.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, marked thickening of blood vessels.

early in the last month of her pregnancy to receive appropriate treatment with the hope of avoiding further operation. This the patient promised to do but her husband prevented her from coming as he wished her to do the house work at home. She was brought to the Maternity by a physician who had been called to attend her. The patient had been taken in labor and after a few pains developed serious

Fig. 15.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, infiltration of leucocytes at junction of uterus and placenta.

Fig. 16.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, uterus and placenta, cellular infiltration.

shock with some hemorrhage. The physician who saw her at the house diagnosed rupture of the uterus and brought her immediately to the hospital. On examination the patient was profoundly shocked, fetus could be clearly made out in the abdomen. An emergency section was done as soon as possible, so desperate was the patient's condition, that all that could be done was extract the fetus and

Fig. 17.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, placenta showing fibroblastic proliferation.

Fig. 18.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, placenta showing occlusion of vessels, fibroblastic changes.

appendages when the patient died, the child was dead. Examination of the uterine body showed fibrosis uteri, atrophy of the uterine muscle with marked fatty degeneration.

CASE 5.—A multipara aged about 43, who had given birth to several children spontaneously and had been the main support for some years of her family. Her

Fig. 19.—Case 5. Mrs. M. I. T. Cesarean section, placenta showing marked fibrous change.

Fig. 20.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fetal liver normal.

husband had been in ill health and she had succeeded in rearing her children well and caring for the family. A section had been done several years previous for placenta previa followed by complete recovery. The patient came to the Maternity in a highly toxic condition, the urine showed albumin and casts, blood pressure abnormal. The patient was poorly nourished and she and her husband requested that with the delivery of the child sterilization should be performed. She was accordingly delivered by elective section without labor, followed by supra-

vaginal hysterectomy, removal of the tubes and ovaries and appendix. During the operation the patient received an intravenous saline transfusion and passed through the operation in very fair condition. About eight hours after she was taken with sudden and severe dyspnea with great distress, from which she rallied under stimulation. Immediately following the right arm and hand became swollen, dark in color and cold, external heat was at once applied but dry gangrene developed in the thumb, index and portions of the second finger of the right hand. The patient went through a tedious but very fair recovery. She was seen in consultation by a surgeon and by an anatomist. The circulation in the arm became re-established and in the greater portion of the hand. She was transferred to the surgical department where the gangrenous portions of the thumb and fingers were amputated. Although crippled by the condition of the hand the patient is able to be about and do considerable work. The pelvic condition is good. Her child did not long survive delivery and died apparently from inanition.

The specimen in this case was sent to the pathologist without diagnosis and no clinical history was appended and this point is of interest as will later become apparent.

On microscopic examination of the tissues fibrosis uteri with atrophy of muscle bundles was found but the blood vessels in the uterus and in the placenta and the tissues at the junction of the placenta and uterus showed great thickening in the walls, and a very abundant infiltration with round cells.

The pathological condition was that of marked toxemia and the pathologist knowing nothing of the previous history, strongly suspected syphilis. Accordingly a very thorough search was made for the spirochaeta and this search was unsuccessful. The Wassermann reaction in the patient had been negative. The case is a most interesting example of the condition of the uterus in advanced toxemia. Grafted upon the fibrosis uteri and atrophy of muscle bundles which develops in poorly nourished multiparae, we have the evidence of occlusion of blood vessels and extensive round cell infiltration. The liver of the fetus was normal and there was no reason whatever to suspect a specific element in the case.

These cases illustrate the following facts of considerable clinical importance:

The method of performing cesarean section in the first operation on these patients consisted in closing the uterine muscle with silk and peritoneal tissue with catgut. Cases that had been examined outside of hospital, had been long in labor and brought in as emergency cases, were further treated by packing the uterus with iodoform gauze with the hope of averting serious hemorrhage and infection. This method was successful.

So far as rupture of the uterus in subsequent labor is concerned, in one case the uterine muscle ruptured but the scar remained firm and was stronger than the uterine muscle. In the second case, the uterus was the site of such fatty degeneration, that extensive rupture occurred as soon as labor began. This patient was given no opportunity to recover from her previous section and she was denied the benefit of hospital care during the last month of her pregnancy.

In all of these multiparae the degenerative processes which inevi-

tably occur in multiparae without proper care in their pregnancies and labors was present, namely, fibrosis uteri and atrophy to some extent of muscular tissues. In the patient toxic at the time of operation, fibrosis and atrophy were present but in addition we have the occlusion of blood vessels by emboli and thrombi and marked round cell infiltration at the junction of the placenta and uterus. The multiple embolism in the case of a toxemic patient is an unusual but natural illustration of the pathology of toxemia.

The writer believes that in this class of cases the evidence he presents strengthens the arguments for birth control by elective hysterectomy at term. These women had born children with difficulty and had done their utmost to rear these children at the expense of their own health and in one instance at the expense of life. Under these conditions and circumstances, the writer believes that such patients should be spared the dangers of further parturition by elective hysterectomy, no more practical application of birth control can be suggested. It should be the aim of obstetric science to relieve a mother who has done at least her share, from danger to her own life and also the risk of possible degenerative disease in the genital tract.

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(For discussion, see p. 415.)

THE EXTENT OF THE RENAL LESION IN THE TOXEMIAS OF PREGNANCY*

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A METHOD has recently been developed at the Stanford School of Medicine which measures the amount of actively functioning renal tissue in the living kidney.¹ The method is based on the observation that under certain special conditions the function of the kidney is limited by, and becomes a measure of, the quantity of effective tissue it contains.

These conditions comprise: first, the application of strain, so that all the functioning tissue present is called upon to exercise its maximum capacity; and second, a constancy in the environment of the organ, so that various factors which have a specific stimulating or inhibiting effect on the functioning tissue, are excluded. Strain is applied by administering by mouth large amounts of urea and water. The second requirement is met by abstention from food and by delay-

*Read at the Forty-Seventh annual meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.