

RUPTURE OF THE UTERUS FOLLOWING
CESAREAN SECTION

WITH A STUDY OF THE UTERINE SCAR

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The enlargement of the field of cesarean section marks one of the advances of modern obstetrics. This operation is being performed for other indications than those of contracted pelvis and tumors blocking the pelvic canal. Certain cases of eclampsia and certain cases of placenta praevia, as well as cases which show physiologic incompetence for labor, are being terminated by cesarean section.

Obstetrics has always been a conservative branch of medicine and surgery, in fact, ultraconservative, and it is reluctantly yielding to cesarean section those cases which were formerly treated by high forceps operations, *accouchement forcé*, and version. Does it mean that those operations that have served us so well in the past are to be relegated to the background? If section has been elected and the case is a clean one, the obstetrician rarely regrets that cesarean section was decided on, whereas only too often he feels humiliated for having done the other thing. In most instances the immediate results are good. The child is sound, healthy and free from birth-pressure; while the mother soon convalesces, her birth-canal intact, free from trauma and lacerations—with one exception, the uterine incision.

With these facts before us, we are accumulating in our midst a number of cesareanized women—some with contracted pelvis, others with normal pelvis—who are going about with scars in their uteri. The consensus of opinion of most obstetricians is that these women need not be sterilized. If this be true, how about subsequent pregnancies? If the woman has a contracted pelvis there is no question as to the management; she is again sectioned. If the pelvis is normal, however, how should the case be managed? With this question in mind, I wish to report the following case.

Previous History.—Mrs. N., at the age of 17, had a cesarean section performed at term, March 29, 1909, although measurements of pelvis were normal because a large hematoma blocked the pelvic canal. The records are as follows: A longitudinal incision, 10 cm. long, was made in the anterior wall of the uterus. The membranes were ruptured artificially and the child was delivered. Placenta and membranes were removed manually. The myometrium was drawn together with twenty-

day chrome catgut. Sutures were interrupted and did not pass through the serosa or the endometrium. Serosa was closed with a continuous suture of twenty-day chrome catgut and reinforced with a continuous suture of the same material. On the third day the temperature rose to 38.8 C. (101.8 F.), and on the fifth day a profuse purulent discharge from the vagina made its appearance. On the eighth day the temperature was 39.2 C. (102.5 F.), and on removal of the abdominal stitches a stitch-abscess was discovered and drained. Gradually the temperature dropped and from the fourteenth day remained normal. Patient was discharged on the twenty-sixth day in the following condition: perineum firm, uterus anteverted and anteflexed, movable, slightly tender; external os closed. In January, 1911 this woman became pregnant, made application to the San Francisco Maternity Hospital, and came into my service about June 1, 1911. Pregnancy was uneventful. She was delivered spontaneously through the vaginal route, Oct. 29, 1911. Mother and child did well. Puerperium was not complicated by fever or hemorrhage, and both were discharged on the tenth day in very good condition.

Last Pregnancy.—This patient was again admitted to my service at the University of California Hospital, April 8, 1913. She had flowed last, July 29, 1912, which would bring her date of expectancy about May 5, 1913. That she was pregnant again was not known to my service; we first learned of her condition when we were summoned to her home. When the woman was recognized she was ordered to the hospital at once. On admission the patient did not feel as though there was anything radically wrong with her. She complained of indefinite irregular pains, not strong in character. Her abdomen was distended and she looked as though she were at term. Temperature was 37.6 C. (99.4 F.), pulse 100, respiration 24. There was no nausea, no evidence of hemorrhage, and she was free from shock. Abdominal examination was not satisfactory. I could not map out the position nor could I get the fetal heart. The patient said she had felt life until the evening of April 7, when what she thought were labor pains set in. After twenty-four hours in the hospital her bowels were moved, followed by the expulsion of much gas. The patient felt more comfortable, got out of bed, walked to and from the toilet and sat up in a chair. Her walk, however, was peculiar. She would bend over and hold the lower part of her abdomen with both hands, contrary to the attitude assumed by the normally pregnant women at this particular time.

Examinations.—A careful abdominal examination made at this time gave the following data: Breech above, back anterior and to the left, small parts could not be felt, head was below, above the brim, movable, and a suggestion of crepitus of the bones of the fetal head was obtained. No fetal heart-beat audible. On account of the presence of a dead fetus and these indefinite pains, we decided to bring on labor. Heretofore we had purposely avoided making vaginal examinations as the possibility of a cesarean section had to be considered. Under the most careful aseptic technic, however, a vaginal examination was made. I found the vulva of multiparous character. The vagina was roomy and free from blood. The cervix was thick, not soft, and the cervical canal was not obliterated. The external os would barely admit one finger. With a little pressure I introduced my index finger into the lower uterine segment and to my surprise found it empty. Then only did I realize that I was dealing with a case of rupture of the uterus. The patient was sent to the operating-room where, with Dr. Pope, I opened the abdomen.

Operation and Result.—A left rectus incision about 15 cm. in length was made with the umbilicus in the center. On opening the peritoneum the intact bag of waters containing the fetus was seen free in the abdominal cavity, lying in the left occipito-anterior position. The membranes were ruptured and the dead baby was delivered. Following the umbilical cord, we came to the placenta, lying on the external anterior surface of the uterus. This was removed manually. The uterus was fairly well contracted. After separating two omental uterine bands of adhesions, the uterus was examined and the

rupture was seen to have taken place in the old cesarean section scar, extending from the internal os to within 1 or 2 cm. of the fundus. There was no free blood in the abdominal cavity. A black clot was seen lying on the left broad ligament; this was removed. A supravaginal hysterectomy was performed. The left ovary was left behind and the cervical stump, covered with peritoneum, was suspended to the round ligaments. The abdomen was closed, leaving a drain at the lower end of the incision. At midnight the temperature was 38.4 C. (100.1 F.), but in the morning it had returned to normal and stayed there. The postoperative condition was uneventful. The patient was up on the fifteenth and was discharged on the nineteenth day.

Pathologic Report.—Gross Description: Specimen is a puerperal uterus, 5 by 4 by 2.5 inches. The right tube and ovary are attached; the left are absent. Round ligaments are readily identified. Anterior surface of uterus presents a longitudinal groove. The hysterectomy was done in the region of the internal os. On the right side the os has a normal appearance, while on the left the anterior margin of the internal os is destroyed. Just above where the anterior margin should be is a ragged edge, probably the seat of rupture. On the anterior surface above, 1 inch from a line joining the tubes, 1½ inches from the median line, is an adhesion ¼ inch thick. A similar adhesion on the left side is 1½ inches from the median line and arises from the fundus. This adhesion has the appearance of omentum. The former one seems fibrous. Posterior surface of the uterus is normal.

Microscopic Examination: Sections from the edge of the rupture show, in many places, intense leukocytic infiltration. For the most part this is confined to the superficial portion of the decidua, but thrombosed veins also occur in the upper part of the uterine muscle. The decidua around the upper portion of the rent corresponds in appearance to the decidua vera. It is made up of glands between which lie typical decidual cells and there is no invasion of trophoblastic elements. The decidua covering the median and lower portions of the edges of the rupture corresponds to the decidua serotina. Many trophoblastic elements are present here, and for the most part consist of syncytial masses, though isolated cells also are found. The muscle beneath the decidua is extensively invaded by trophoblastic elements. The invasion, however, is limited to the muscle immediately beneath the decidua and does not differ from the normal appearance of this region. The musculature in the deeper portion of the section toward the peritoneal surface is normal in appearance except for the fact that the lymph-channels are distended and in some instances filled with small round cells.

From this case we see that a cesareanized woman may have a subsequent pregnancy terminated in one of two ways if left to herself, namely, she may deliver herself spontaneously through the vaginal route, or she may terminate with rupture of the uterus. Neither of these is the usual course. Some of the cases miscarry, but the majority have to be delivered by repeated cesarean section. True, rupture of the uterus following section is rare, but it is not so rare that men doing cesarean section can overlook the probability of its occurrence. In 1908 Broadhead¹ of New York collected nineteen cases from the literature and added one of his own. Up to date, I have found forty-one cases in the literature, my own² making forty-two. I want to emphasize the statement that rupture of the uterus following cesarean section is not so rare as Olshausen³ would lead us to believe. Vasseur estimated that rupture occurred in 2 per cent. of cases. Von Leuwen's figures are, if anything, higher.

Where does the rupture take place? Generally in the scar, but not necessarily so. In Lihotzky's case, five

years after section, the rupture did not occur in the old scar, but in the uterine muscle some distance from the scar. In the Dresden clinic a case occurred in a patient who had been delivered by section two years previously for eclampsia. In a second pregnancy induced labor was undertaken outside of the clinic, and the patient was brought into the hospital with symptoms of peritonitis. On performing section the child and placenta were found in the abdominal cavity, and the uterus had ruptured through the right cornu, but not in the scar. Mason and Williams⁴ of Boston, in 1910, made an experimental study of the strength of scars in the uteri of pregnant guinea-pigs. They excised areas of muscle-wall containing the old scar and stretched the tissue to the point of tearing. On examination of the lacerations thus produced they proved to their satisfaction that the tissue gave way not at the scar but through normal muscle-fibers. As a result of this fact they have drawn this conclusion: "A carefully sutured and well-united scar will stand any strain which can be endured by the uterine muscle." James A. Harrar⁵ of New York cites a "case of rupture occurring after three cesareans. The rupture took place with the onset of labor in a uterus already distended by an overtime child; the rent taking place in the narrow segment of apparently normal muscle tissue isolated between two closely approximated parallel scars, this strip of tissue being intrinsically weaker on account of previous section of its blood- and nerve-supply."

Men who are doing repeated cesarean sections are in a position to give us much valuable information as to the condition of the uterine scar of former sections. McPherson⁶ of the New York Lying-In Hospital reports on fifty cases of multiple cesarean sections. In forty-two cases the scar, as observed at subsequent sections, was either not to be seen or was described as solid, with no apparent thinning or stretching. Harrar says that in four instances in which he had occasion to perform repeated cesarean sections, the scar in the uterus has been represented merely by a slightly depressed linear whitening of the visceral peritoneum. Such scars heal by first intention in the absence of infection. If a section of the uterine muscle containing such a scar is examined microscopically, one would see no connective tissue present, or very little; but what is more important would be noted—that the muscle-fibers have completely regenerated themselves and show a normal structure.

Where healing of the uterine wound takes place by second intention, the picture is entirely different. These scars are often thin as a result of gaping of the inner layers of the wound, or as a result of sloughing of the uterine tissue. Sections show that the muscle-tissues of both margins of the original incision are separated, having healed by granulation. I have seen scars that consist merely of the serosa and subserous layer. Certain scars have healed partly by primary union and partly by granulation. These scars are just as apt to give as those that have healed improperly throughout their entire extent. Jolly⁷ of the Frauerklinik of the University of Berlin cites just such a case. His patient had a rachitic pelvis. Her third pregnancy was terminated by cesarean section. She had fever for eight

1. Broadhead: Am. Jour. Obstet., 1908, lvii, 650.
2. The author would be glad to send a list of these cases to anyone interested.
3. Olshausen: Ztschr. f. Geburtsh. u. Gynäk., 1905, liv, 309; iv, 415.

4. Mason and Williams: Boston Med. and Surg. Jour., Jan. 20, 1910, p. 65.
5. Harrar: Am. Jour. Obstet., 1912, lxx, 808.
6. McPherson: Bull. New York Lying-In Hospital, vii, No. 4, p. 181.
7. Jolly: Arch. f. Gynäk., 1912, xc, No. 2.

days after the operation, but was discharged well with her child on the twenty-second day. At the end of her following pregnancy, she entered the hospital to be delivered by section. Labor pains began soon after her entrance and became vigorous. While the patient was in transit from the ward to the operating-room, uterine rupture took place. Section was quickly performed. The child and placenta were found in the abdominal cavity; the child was living and was immediately delivered. The uterus had ruptured in the previous scar. Hysterectomy was performed, leaving the ovaries. Mother and child left the hospital well on the twentieth day. On examination of the uterus, it was found that the scar had separated through half its extent; the remaining half was firm and could be detected only by the white line in the overlying serosa.

One can readily understand how a uterus containing a scar, the result of improper healing, could rupture if it were overdistended as in excessive liquor amnii, twin-pregnancy, or as the result of intra-uterine manipulation. Another factor that may weaken a scar that has healed by granulation is the implantation of the placenta on it. A study of sections taken from the edges of the uterine wound demonstrated the fact that in my case the implantation of the placenta on the scar certainly weakened it so that with the first contractions the increased tension caused the uterus to rupture.

How does the implantation of the placenta on the scar weaken it? Starting in with an infected uterine wound, the scar that results contains granulation tissue, no matter how slight. This soft connective tissue soon becomes covered with endometrium and the uterine glands penetrate it. As pregnancy ensues the endometrium is converted into decidua which forms a looser and softer tissue. Trophoblastic tissue and chorionic villi, with their burrowing and penetrating properties, invade the loosened and softened scar and weaken it so that it is a question whether or not it can stand the strain and stress of labor.

A peculiar feature about my case was the comparative absence of symptoms and the mildness of those present. As a rule, one can generally obtain a history of a sharp, shooting pain in the abdomen followed by a sensation as if something had given way. In some instances the patient may collapse as a result of shock, but this was not true in my case. Hemorrhage was also absent. The only symptoms of which the patient complained were (1) slight bearing-down pain, irregular and indefinite in character; (2), a feeling of weight in the lower abdomen, more marked on standing. The signs that I secured on examination were: a slightly distended abdomen with a history of constipation, absence of nausea and vomiting; no fever. Abdominal palpation gave very few data. I mapped out the fetus as if it occupied the left occipito-anterior position, and when we opened the abdomen, there it was, wedged in in that position. I am repeating these symptoms to show how insignificant they were, while the patient was going about with the child and secundines in her abdominal cavity. Williams⁸ of Johns Hopkins, says that "in some cases the patient merely complains of malaise, grave symptoms only occurring later as the result of infection or putrefaction of the fetus. Thus, in one of my cases, two weeks elapsed before the appearance of alarming symptoms." Hartman⁹ has drawn similar conclusions; he says: "These cases seem peculiar in that the

patients complain of very little pain at time of rupture and seem much less disturbed than in cases in which rupture had occurred without section." The fact that vaginally I could not feel the presenting part was conclusive evidence to me that the uterus had ruptured and that the fetus had escaped into the abdominal cavity.

Just a word as to the operative treatment. Each case is a case *per se*. If the rent is a partial one, or one the margins of which are not jagged, the operator can resect the scar tissue, freshen the edges and sew up the wound; on the other hand, if the tear is extensive and irregular, it is far better to do a supravaginal amputation. In case the mother has two children or more, and the uterus is left behind, I would certainly sterilize her unless the parties concerned object.

CONCLUSIONS

1. A cesareanized woman who gives a history of an infection with a purulent vaginal discharge in the puerperium is a good candidate for rupture of uterus in one of her subsequent pregnancies.

2. The mere fact that a cesareanized woman has delivered herself spontaneously is no reason for believing that she is free from the danger of rupture of the uterus with her future pregnancies.

3. Rupture of a cesarean-section scar generally takes place in a scar resulting from improper wound-healing in the presence of infection.

4. The implantation of the placenta on the site of the scar may so weaken the uterine tissue that it may rupture under the strain and stress of labor.

5. I firmly believe that cesarean section should be limited to those cases in which it is strictly necessary. If there is any possible chance for the uterine wound to become infected, some operative measure for sterilizing the patient should be employed.

6. A cesareanized woman should be in a maternity hospital during the last month of her subsequent pregnancies so as to be under constant medical supervision.

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8. Williams: Obstetrics, New York, D. Appleton & Co., p. 861.

9. Hartman: Ztschr. f. Geburtsh. u. Gynäk., 1908, No. 62.