

DIAGNOSIS AND TREATMENT OF RUPTURE OF THE UTERUS.<sup>1</sup>

By GEORGE SCHMAUCH, M.D., CHICAGO.

WE wish to define rupture of the uterus as follows: tearing of the uterus above the vaginal portion, occurring spontaneously or by violence during labor. We shall also consider in this definition utero-vaginal tears, excluding, however, according to Koblanck, those common cervical tears, which are the consequence of extraction or abnormal uterine activity before the cervix is completely dilated. Perforation of the uterus resulting from pressure shall not be mentioned as properly belonging to the ruptures.

Next to sepsis and eclampsia rupture of the uterus has the greatest mortality during labor. The varying interpretation makes it appear quite natural that statistics regarding its frequency should vary likewise. It is also influenced by the pathological percentage of cases in the various hospitals. The Berlin Frauenklinik shows a frequency of 1:462 in 37,000 labors. Iwanoff of the Moskau maternité reports 1:961 cases in 118,000 labors. The proportion of home cases is 1:1,428. As a general average the proportion will be 1:1,500. This coincides with the statistics of Ehlers in Berlin, which are based upon death certificates. He gives in 1895, 48,000 labors with 11 ruptures, in 1896, 50,000 labors with 5 ruptures, respectively, 1:4,000 and 1:10,000. Basing these reports upon a mortality of 60 per cent, we do not quite obtain the above-named figure, namely 1:1,500. It has to be taken into consideration, however, that the practitioner rather states the ensuing peritonitis as cause of death, than the rupture.

Cervix tears occur of course more frequently. The complete perforating ruptures are found about four times as often as the incomplete

ones. The mechanism of rupture is but a partially explored territory. Even the post-mortem specimen does not always aid us to differentiate between primary tear and secondary prolongation. Likewise in practice, we often find it difficult to separate spontaneous ruptures from those caused by violence. The force necessary to cause the rupture is reduced to a minimum in a uterus, which is, so to speak, "ready to burst," and may be represented by a careless examination or a sudden change of position.

As to the form of the tear, it makes no difference whether they occur spontaneously or by violence. Indeed, the most severe and irregular tears including, for instance, the bladder, occur spontaneously. Undoubtedly this is caused by the tremendous difference in pressure, a change of highest tension to complete relaxation at the moment rupture occurs. This sudden release produces the same effect as the snapping of a tight cable, followed by the most deleterious results for everything adjacent; for example, rupture of the bladder, total exposure of the colon, detachment of the peritoneum up to the spleen.

The mechanism of the typical tears of the lower uterine segment, expansion-tears, has no opponents to-day. It represents the teaching of Bandl, and the results are the so-called Bandl's tears. The symptoms of overdistention, the ascension of the contraction-ring and its oblique course, the tension of the round ligaments even between the pains, form the trio which enables the obstetrician to forestall or diagnose the rupture.

We can speak of overdistension, assuming the uterine walls to be normal, only after rupture of the membranes and complete

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dilatation and effacement of the os. A maximum tension does not come under consideration as long as the vaginal portion has not become part of the distended lower uterine segment. In case we have unyielding cicatrices of the cervix, the mechanism of the typical tears undergoes deviations. A circular tearing of the portio often follows.

According to Bandl, rupture during labor will occur under the following conditions, namely, when the presenting part meets abnormal resistance, either by its own size, by contraction of the pelvic inlet, by obstruction of the pelvis by tumors, or by malpositions, such as oblique and transverse presentations. Contracted pelvis is by far the most frequent cause. Weidling and Lehmann show that there is one rupture of the uterus to one hundred labors in contracted pelves.

The normal, well-formed uterus, destined by nature to carry and deliver the child, hardly ever tears spontaneously. We find in the literature but a very few cases of spontaneous rupture in primiparæ and these are not entirely free from objection. Kliehn mentioned 5 spontaneous ruptures in primiparæ, among 347 cases, all above 30 years of age. Schmit's report from Shauta's clinic contains no primipara in 28 ruptures. Koblanck cites one rupture in a woman who had borne one child, among 22 spontaneous ruptures.

As far as the normal uterus is concerned we can say: no overdistention, no rupture. The picture changes, however, when nature or human hand has created a predisposition. One previous overdistention causes lasting damage, a persisting reduction of the vitality of the muscle-cells, furnishing a predisposition to rupture. H. W. Freund has shown that overdistention causes deficient involution, this in turn produces a state of atrophy. In studying the statistics you will find rupture frequent in 7 to 15 paræ. Predisposition as a causative factor in rupture, emphasized by Olshausen, Freund, and Fritsch, is now generally recognized. Not every case shows histological changes, nevertheless we must consider it a general rule, that spontaneous rupture of the normal uterus without previous injury must be regarded as an exceedingly rare occurrence.

A previous overdistention of the lower uterine segment during protracted labor is, however, not the only cause of a subsequent rupture. Extensive gynæcological surgery, confident of momentary results, has created a number of predisposing factors. These are: the rupture following fixation of the uterus for correction of mal-position, rupture following cæsarean section, extensive cervical incisions, so-called Duehrssen's incisions, (Hofmeier 2, Labhardt 4 cases), amputation of the portio, (Velde 4 cases), adnexial operations with cuneiform excisions, (v. Fellenberg), the use of Bossi's dilatator, Tarnier's ecraseur, perforations of the uterus by probe and dilatator, and last, but not least, the curettage of the puerperal uterus. Every lesion of the uterine muscles leads to a permanent loss of substance. Repair takes place, not by reformation of muscular, but connective tissue, as shown by Askanazy in 1892, and lately confirmed by Marchand. This process produces a locus minoris resistentiæ.

The typical rupture of Bandl, affecting the lower uterine segment, takes place in the overdistended uterus, before the presenting part has passed the pelvic brim. Those cases where rupture occurs after the head has entered the true pelvis, or even is visible at the vulva, when the largest part of the child has left the uterine cavity, can be explained in this manner only, that the tear occurred in an old scar, or rather represents the final enlargement of a previously existing fissure. The resistance of the pelvic floor furnishes merely the missing link. The participation of the vaginal fornix in spontaneous rupture depends entirely upon the tension of the vault and the tearing force. Utero-vaginal tears are found with comparative frequency in impacted transverse presentations and pathologic anteversions (pendulous abdomen), because here the tension of the vaginal vault is very marked.

Any portion of the uterus having undergone pathological changes may tear at any stage of labor. Localization depends entirely upon the place and kind of pathologic changes, causing the predisposition. In consequence a rupture of the fundus may occur



under these circumstances, although rupture of the fundus occurs as a rule, during pregnancy.

We also see ruptures in the third stage of labor. These are always caused by violence, and are mostly the results of manual detachment of the placenta. Oswald has collected nine cases, which were produced chiefly by midwives. However, even the most skillful operator may meet with this accident. We may encounter such firm adhesions between placenta and uterine muscle, that separation is possible only with considerable loss of substance. Abnormal insertion of the placenta in a naturally less resistant portion of the uterus, for instance, at the tubal openings, or over a scar, operative or inflammatory, or abnormal decidua-formation, so-called decidual metastases, may lead to rupture. These conditions decrease the normal resistance to such a degree, that the tissues may give way spontaneously or to a mild force during manual detachment of the placenta. Rupture has even occurred with a forced Cr  d  , as the case of Schwendner shows. The peculiar arrangement of the muscular fibers of the pregnant uterus in lamell  , their imbrication, the connection of the longitudinal by oblique lamell  , render the occurrence of a tear in a normal corpus almost impossible.

We differentiate between complete and incomplete ruptures; in other words, those with or without opening of the peritoneal cavity. Observations that the peritoneal covering *per se* also may tear, date back as far as 1875. Later observations show that these so-called peritoneal fissures may become external, incomplete tears, involving the greatest part of the musculature down to the intact decidua. This variety may terminate fatally by hemorrhage. This again raises the question, in which zone of the uterus does the typical tear originate. It was the universal belief that the peritoneum tears last, because it is more elastic than the muscle. This opinion requires some modification. A differentiation is essential between those parts of the uterus where the peritoneum is but slightly attached, as the region of the bladder and the parametria, and those parts where the peritoneum is closely adherent to the

underlying muscle; in other words, where the muscle fibers insert directly at the peritoneum, as in the posterior and upper portion of the uterus. Individual variations certainly exist. There is no doubt that the muscle tears first in the former variety. Here the tear, if not occurring too suddenly, produces a h  matoma. It is evident that an incomplete rupture of this variety with formation of a h  matoma may be transformed into a complete one by the joint action of uterine pains and the presence of the accumulated blood. A nice illustration of this is furnished by the cases of Krebs and Goth, where the appearance of a h  matoma in the region of the bladder led to the erroneous assumption of a distended bladder, when the rupture became manifest by the sudden disappearance of the tumor. However, this process is exceptional. The usual modus is rather such, that the h  matoma when it complicates a complete rupture, is of secondary nature, caused by the opening of subperitoneal and parametrical vessels. A spontaneous rupture causing an incomplete tear becomes very rarely complete, for, at the moment rupture has occurred, the principal condition of tearing, namely, overdistension, disappears.

In the second variety, where the tear has its origin above the internal os, in a portion of the uterus, whose external layers are closely united to their peritoneal covering, the peritoneum must tear first. Here formation of a h  matoma is impossible. The fact that with distension of a hollow viscus the outer layers, in this case the serous covering, gives way first rests upon physical foundation. Knauer's four cases of external, incomplete rupture substantiate this theory. In three of those the distension of the uterus was still increased by premature detachment of the placenta. The individual muscle fibers behave in these cases like any overdistended muscle. The tear does not take place in the center, but at the point of insertion, which is represented here by the peritoneal covering. It appears feasible that timely delivery could prevent the completion of such a tear into the cavity of the uterus.

The etiology of uterine rupture should receive a more detailed consideration, because



the conception of the individual symptoms is impossible without it. You will therefore permit me to discuss the value of the classical symptoms of rupture from an etiological standpoint.

The diagnosis of uterine rupture during labor is made when we find that the above-mentioned symptoms of threatening rupture are followed by the symptoms of rupture proper. Bimanual palpation will confirm this diagnosis by the findings. We find the symptoms of threatening rupture only in those cases of spontaneous rupture where a normal uterus has been subjected to labor for an excessively long period of time, as in obstructed labor. The ratio between presence of symptoms of imminent rupture and the number of preceding labors is inverse. The larger the number of previous labors, the shorter the period between occurrence of rupture and onset of labor. The same holds good with ruptures occurring in old cicatrices, no matter what their origin. In multiparæ or woman where an anamnestic possibility of pathological changes of the uterine muscle exist, diagnosis must be based upon the symptoms of rupture proper, in the absence of those of overdistension.

The following symptoms pertain to the child as well as to the mother. To the former belong the suddenly occurring mobility, the retraction of the presenting part, and the palpability of foetal parts outside of the uterine cavity. These are by all means the most striking of all symptoms of rupture of the uterus, if labor has been conducted by one person. The foetal part may deviate if great disproportion between it and the pelvic inlet exists and come to lie in the iliac fossa. An improper posture may lead to a deviated vertex presentation. When, however, the foetal head has entered the pelvic inlet and has been fixed by a number of pains after rupture of the membranes, a retraction will occur only by elimination of the *vis a tergo*; in other words, the contracting uterus. This is possible only by abnormal distension and relaxation of the uterus, produced by accumulation of blood in its cavity, premature detachment of placenta, or by rupture. The natural tonus of the uterus,

present also between pains is absent, likewise the intrauterine pressure is altered in both cases.

Premature detachment of the placenta causes an increase of intrauterine pressure and the foetus becomes movable by the increase of the uterine contents. Rupture of the uterus renders intrauterine pressure negative. In complete rupture mobility of the presenting part is such that it remains in the position placed by the examining hand, without returning to the pelvic inlet.

This symptom is less pronounced in incomplete ruptures, and is seen less often in impacted transverse presentations than in vertex presentations.

The palpation of parts of the foetus external to the uterus is a pathognomic symptom. In woman with thick abdominal walls anæsthesia is often required to elicit it. Palpation of the abdomen of a woman with rupture of the uterus is not always easy, on account of the *défense musculaire*. In other cases the small parts of the child are felt alarmingly plain. The presence of the contracted uterus besides the foetus, facilitates differentiation from a thin-walled uterus.

As soon as rupture has occurred and the child has passed into the abdominal cavity in part or whole, placental circulation is disturbed so seriously, by the change in intrauterine pressure, that as a rule the child dies. If rupture occurs during operative delivery, the child may live.

The surrounding of the child by intestines changes the percussion note to tympany, on top as well as laterally. The detachment of the placenta may lead to a prolapse, if the presenting part permits it. Even experienced obstetricians, called in after occurrence of rupture, have been misled by this detachment of the placenta, and diagnosed placenta previa, or prolapse of the placenta. With a sufficiently dilated cervix the condition of the presenting part will make the diagnosis possible. Not so in rupture of the fundus uteri or in insufficient dilatation of the os. Here diagnosis is either impossible or made too late.

The second cardinal symptom is the hemorrhage. This may be external, sub or intra



peritoneal. Only very sudden and violent tears tend to open large vessels. Rupture in old cicatrices or in defects of the muscular substance occurs very gradually. It begins with a small separation, increasing slowly. The opening is filled by the escaping foetal parts, and there is almost no hemorrhage on account of the anæmic state of the cicatricial tissue.

A 5 para, moderately flat rachitic pelvis, rupture during two last deliveries, first, spontaneous rupture, complete tear of cervix, craniotomy; second, induction of premature labor, high forceps delivery with deep incomplete laceration of the cervix; treatment both times drainage of the tear, good recovery, became pregnant again. Upon examination I advised cæsa-rean section and told her to report every month; she was instructed to enter the hospital as soon as labor began. As her pains started in absence of her husband, she had to wait until he came home. About an hour after the beginning of the pains she knocked at the door of our confinement hall; she had walked to and from the carriage and did not complain. Regular uterine contractions, but not severe, membranes intact. On account of danger of a rupture, preparations for laparotomy were hastened. This proved justified. Opening the abdominal walls we noticed the anterior wall of the uterus to be torn for a distance of twelve cm. From this tear protruded a very peculiar sight, the white shoulder of the child. There was hardly any blood in the abdominal cavity. By enlarging the opening of the tear, a strong and living child was extracted easily. The sterilizing of the patient was naturally indicated, but she kept her uterus, and recovered without complications.

The soft and weakened wall of a uterus of a 12 or 15 para, may tear in a similar manner, without much hemorrhage. The place of tear also influences the hemorrhage; lateral tears with injury to the uterine artery cause a formidable hemorrhage, while the tears of the posterior wall are usually not followed by much bleeding. In tears with irregular edges, hemorrhage ceases soon, whereas torn vessels exposed by the tear bleed excessively. In such cases fatal hemorrhage may occur, often as late as the sixth or seventh day, by detachment of the thrombi.

External hemorrhage is the chief symptom of incomplete rupture. We may find it as a continuous stream, or a mixture of blood and amniotic fluid may gush out upon lifting the head during examination. The mobility of the presenting part is not so pronounced in these cases. Danger of fatal hemorrhage is

relatively greater in incomplete than in complete rupture; 61, 5 per cent; 34, 4 per cent (Kobblank). Aside from placenta previa and hemorrhage resulting from torn foetal vessels within the membranes, premature detachment of the placenta will have to be excluded. The objective findings will guard against error in this respect. The darker color of the blood, its intermittent escape during the pains, and above all the distended uterus speak for a premature detachment of the placenta. As this condition occurs much less frequently, rupture should be considered first and excluded.

In complete tears the external hemorrhage may be associated with marked internal hemorrhage. To prove the presence of free blood in the peritoneal cavity by percussion in various positions will succeed in but few cases. The diagnosis of internal hemorrhage during labor in term is based chiefly on general symptoms. Incomplete tears are often accompanied by subperitoneal hemorrhage, leading to hæmatoma. This may be mistaken for the bladder, as mentioned before. Palpation will reveal a peculiar doughy tumor next to the uterus. As a rule the hæmatoma is formed during labor, but in some few cases it may arise post-partum. Late hemorrhage during the puerperium in connection with hæmatoma furnishes certain proof of incomplete rupture, not recognized during labor. These hemorrhages may be very sudden, surprising the puerpera when she leaves the bed to void urine, as I have personally observed in one case.

The subperitoneal ante-uterine emphysema is of course pathognomonic for rupture. It occurs chiefly in incomplete rupture, but may be present also in complete tears. In case of bladder-involvement, no urine is secreted, and catheterization yields but a few drops of bloody urine.

Another classical symptom is the cessation of pains after rupture. This also has to be taken with a grain of salt. The opinion of former times was, that at the moment of rupture, nature stops the pains as a sort of self defense. At present this view requires modification. All larger tears, especially those of the transverse variety, must as a matter of



course be followed by cessation of pains, as the conditions for regular pains, consisting of a certain intrauterine pressure are not present. Nerve tracts are also interrupted. This does not apply to longitudinal and incomplete tears. The observations are numerous of spontaneous expulsion of the child after rupture. I have reported such a case where after correction of a face presentation, rupture occurred, which was not diagnosed. The child was born spontaneously, the woman died of peritonitis, and only at the autopsy a complete rupture was discovered. In addition, I may remark that regular pains may exist, but are not felt as such by the parturient, from lack of intrauterine pressure.

As a third, we have to mention the general symptoms, the signs of internal hemorrhage, and the statements of the parturient. At times an intelligent parturient will say, that she has felt a piercing pain at the height of a labor pain, that she feels as if something had torn internally. Others state that the child which was already low down has receded. Simultaneously the seat of rupture, excepting those of the posterior wall, which are not accessible to touch, becomes very sensitive to palpation.

More or less pronounced symptoms of collapse are present in every case of rupture. It must be ascribed chiefly to the loss of blood, and secondarily to shock, depending upon how much of the child has escaped into the abdominal cavity. It is wrong, however, to defer the diagnosis of rupture until collapse occurs, because successful treatment will be instituted too late. The pulse changes earliest; without apparent cause it becomes small and frequent. Pallor of the face, coolness of the tip of the nose and extremities, fainting spells, cold perspiration, anxiety, yawning, air hunger, fear of death, in short, the symptoms of a grave acute anæmia, show later. The more sudden these phenomena occur the more striking they become. A sudden collapse in a parturient previously entirely well, will arouse every obstetrician. It is different, however, when a woman has been in labor for days and her general condition is low, or when rupture occurs during anæsthesia. All ruptures due to cicatrices and

defects, or in old multiparæ, take place without any stormy symptoms whatsoever. They have been justly called "latent ruptures" by H. W. Freund. In my own case, cited above, the woman was able to walk to the delivery room without complaint. Kamann reports a case of a 12 para, 37 years old, with a longitudinal tear from the vagina up to the tube. She was apprised of her condition only when she noticed hemorrhage upon urination. Many more cases of this kind could be enumerated.

The value of each symptom is commensurate to the order of my enumeration. Their presence renders the existence of rupture very probable. Positive proof is obtained only by the objective findings on bimanual palpation. Strict asepsis is necessary, sometimes a light anæsthesia required. The findings are simplest in the utero-vaginal tears. The tear is also easily found in cephalic presentations on account of the receding of the head. Obstacles are greater in impacted head and transverse presentations. The examining hand can not pass the forelying part in these cases, hence the diagnosis will have to be based upon the symptom complex. The same applies to rupture of the fundus, with the exception of those cases in which the greater part of the child has left the uterine cavity. In cases of rupture with the presenting part above the inlet, the vagina seems elongated, the lips of the cervix are hanging down relaxed, especially in annular tears. When the vaginal portion is not included in the tear, the os may even collapse.

An absolutely positive diagnosis of complete perforating tear can be made in those cases only in which a greater part of the child is in the abdominal cavity, or where omentum or intestines prolapses through the tear. In the majority of cases the diagnosis of rupture *per se* must suffice, to be followed by immediate delivery. Examination after delivery will reveal the form of the tear and the involvement of the peritoneum. It is very difficult to find one's way among the masses of blood and torn muscles, to which often membranes of the ovum are still adhering. One is easily deceived by the thin peritoneal layer, and imagines he holds the



intestinal loops in his hands, while they are still covered by the elastic peritoneum.

An unexpected hemorrhage during the performance of high forceps, version, or craniotomy makes the event of violent rupture highly probable. During version there are only two ways in which a considerable hemorrhage may be brought on. Either the placenta has been separated in the attempt or we have to deal with a rupture of the uterus. A suddenly appearing mobility of the fœtus points with great certainty to laceration. If during a difficult version a sudden hemorrhage occurs, and turning becomes suddenly easy, rupture is likely to have happened. As rupture may occur without alarming symptoms, and the torn uterus may continue its work, we always have to consider in multiparæ rupture of the uterus as the possible cause of post-partum hemorrhage. Successful treatment during this stage of labor depends solely upon an early diagnosis. The sooner we find the cause of hemorrhage the more hopeful we can be of the outcome of our treatment. Expression of the placenta by Crédé and cessation of the hemorrhage, will alleviate the fears of the obstetrician at once. It is different, however, when hemorrhage continues with a well-contracted uterus. No other possibility remains than rupture, if retention of a placental cotyledon can be excluded. The diagnosis is to be made by digital exploration of the cervix, with rubber gloves. As this procedure is associated with danger of infection, it should not be undertaken before exclusion of all other causes of hemorrhage. Beyond doubt many incomplete tears are never recognized because they produce a temporary hemorrhage only and heal without reaction. Only subsequent labors may cause graver disturbances. On the other hand, a portion of the cases of sudden death after delivery are undoubtedly due to tears, which pass unrecognized. Almost one-third of all deaths in placenta previa are due to hemorrhage from cervix tear. According to the statistics of our Berlin hospital, tears of the cervix after version in placenta previa are six times as frequent after the most careful extraction, than in spontaneous expulsion. In very rare instances disappearance of the

ligated cord within the vagina, as reported by Puppel, leads to the diagnosis of rupture. More often it is the unsuccessful Crédé, which forcing one to manual removal of the placenta in continuous hemorrhage, discloses the presence of a rupture. Rupture of the fundus will be diagnosed post-partum only by digital exploration of the uterus.

In discussion of the treatment of uterine rupture we will casually remark, that a suitable prophylaxis is first and foremost. As to the therapy of existing rupture, Zweifel is undoubtedly right in stating that one-fifth of all cases die of hemorrhage untreated, either on account of wrong diagnosis or insufficient treatment, due to external circumstances. Danger of fatal hemorrhage and sepsis furnish the indications for treatment.

Before active interference in rupture, the parturient must be delivered in a quick but careful manner. Mutilating operations are here first in order. Craniotomy in head presentations and embryotomy in impacted transverse presentations. Forceps as a rule are of no avail, because the non-engagement of the head, which caused the rupture, does not permit their application. Version is indicated, if a foot can be reached easily and only a smaller portion of the child is within the abdominal cavity. Removal by laparotomy is indicated when the child is entirely, or to a greater extent, in the abdominal cavity, likewise in absolutely contracted pelvis or tumors obstructing the pelvic canal. External palpation and the size of the uterine cavity inform us how much of the child has escaped into the abdomen. The placenta is usually detached and may be carried a great distance by the peristalsis. In case it does not follow the extracted child, we have to find it, by using the cord as guide. Craniotomy on such an extremely movable head is at times very difficult. In the presence of considerable difficulty and with a possible occasion of laparotomy, one should desist from further dangerous attempts. With hemorrhage possibly fatal, the nature of the tear becomes second consideration, and prevention of exsanguination stands in the foreground. In a hospital with the facilities for immediate laparotomy, that is within fifteen or twenty



minutes, manual compression of the abdominal aorta, with tying of the thighs, and eventually a temporary tamponade, are usually sufficient to meet momentary danger. In the home we transfer the woman immediately to a table with good illumination. The vaginal portion is exposed by large specula, pulled down by vulsella, and the bleeding branches of the uterine artery clamped when possible by stout forceps. Suture of the wound may follow in uncomplicated tears. A prolonged search is useless. If the bleeding portions are not easily reached, tamponade of the tear should be instituted at once. If the parametrium, the usual source of continuous bleeding, is opened, we must also pack it. Compression of the uterus in anteflexion against the symphysis and the vaginal tampon by means of wads of cotton and bandaging will prove a valuable adjunct in anterior tears; in posterior tears fixation in retroflexion is employed.

The further treatment depends upon purely external circumstances. If a hospital is within reasonable distance, transfer after packing is to be insisted upon because of secondary hemorrhage. If skilled aid is of ready access, laparotomy in the home is to be preferred in case of excessive hemorrhage, whenever the surroundings permit it. The danger of transportation of a woman with even a well-tamponed uterine tear is about equal to a laparotomy performed under aggravated circumstances in a home. In the absence of any possibilities for transfer to a hospital or operation at home, the physician will have to deliver by natural route, and be content with tamponade, even if the child has escaped into the abdominal cavity. Very strange occurrences are reported in the literature, as, for instance, where a physician used the cotton of a bedquilt for tamponade, and his patient recovered. Quick and appropriate action gives better results under such circumstances than long, inactive waiting for assistance. The country practitioner cannot be expected to be prepared for laparotomy in every obstetrical case, nor can the knowledge of a perfect technic for such an operation be demanded of him. Tamponade is at present considered equal to laparotomy, if external circumstances

do not allow its performance. In less severe hemorrhage, or its absence in incomplete tears, the physician in private practice or country will choose tamponade for obvious reasons. For tamponade aseptic material should be used, sterilized iodoform or silver gauze. It is to be introduced with the speculum if possible. Hæmatomata should be evacuated, the gauze introduced should fill the tear and eventually the parametrium. A tamponade of the uterus is needed only to the extent it aids the packing of the tear. It should remain 5 to 6 days or longer, and be removed piece by piece. An ice-bag placed upon the abdomen relieves the pain. Absolute rest is indicated to the exclusion of even the slightest movement. Peristalsis is arrested by opiates, and the bladder is emptied by catheterization. Tympanites is often present and annoying, and is combated by strychnine and atropin. Irrigations are indicated in incomplete tears only. These tears frequently heal without special treatment when not infected. The first large collection of rupture of the uterus by Kliehn (347 cases), showed the drainage by rubber tube gave better results than simple gauze tamponade. However, tears producing serious hemorrhage cannot be treated with simple rubber drains. Here hæmostasis is the first duty. Gauze and rubber tube may be used simultaneously at times.

The controversy regarding drainage or operation must at the present time be decided in favor of circumstances governing the action of the physician.

Operations to be mentioned are:

1. Transperitoneal method, with incision parallel to Poupart's ligament, applicable only in incomplete tears.
2. Suture by vagina, only in incomplete and easily accessible tears.
3. Vaginal hysterectomy, used in anterior and posterior tears, and in fundus-rupture. It is well indicated in older multiparæ and infected cases; it is easily performed and well stood by the patient. Unfortunately it can be employed in a small number of cases only. Lateral tears, and those involving the bladder, obscure the field of operation in such a way to such an extent that this operation has to be discarded in favor of laparotomy.
4. Laparotomy is the classical operation for



rupture of the uterus. It is done with less danger of infection than tamponade, and allows of better orientation than any other method; offers the best results in the hands of a conservative surgeon. If early performed, it is the best safeguard against fatal hemorrhage. It is the only method by which the blood accumulated in the abdominal cavity can be removed. Treatment by drainage exposes to danger of decomposition of the blood-clots, although this may not be paramount to sepsis. The sooner laparotomy is performed, the better the results; violent ruptures for this reason give better result than spontaneous, because they are earlier diagnosed. In a well-appointed hospital infection during operation can be avoided nowadays with certainty. The results were different twenty-five or thirty years ago. Karl Schroeder of Berlin, who was about the first to treat rupture of the uterus with the child in the abdominal cavity by laparotomy, had eight deaths with eight cases, and in consequence, instituted treatment by drainage in 1880. He employed rubber T-drains, 30 cm. long, which were introduced far up into the abdomen, and this enabled him to save a few of his patients. The only contra-indication for laparotomy is a manifest infection, and this only in absence of marked hemorrhage. If the latter is present, a laparotomy offers still better chances than tamponade. The presence or absence of infection depends upon the number and experience of the examiners. The infected patient presents a slightly icteric hue, with a pinched expression more marked than that produced by an anæmia. The chief advantage of laparotomy consists in the possibility of complete toilet of the abdominal cavity, and the conservative treatment of the ruptured organ. Painstaking hæmostasis, the removal of all clots and liquid blood with the patient in a horizontal position, or if possible, in half-erect posture, facilitate the recovery.

Some authors favor supravaginal amputation, others total extirpation, on account of its simplicity. Supravaginal amputation preserves the architecture of the pelvic floor, and often permits the woman to menstruate. On the other hand, the sound and non-infected corpus is removed, while the lacerated cervix remains. Hence total extirpation is more serviceable

when the vaginal portion is torn and has to be sutured. Even amongst the champions of operative treatment at present there is noticed a more conservative tendency. If possible, the uterus should be preserved. In circular tears and those with markedly contused edges, this procedure is of no avail. The advice to remove the uterus in case of infection is not very feasible, as we possess no precise signs of this condition. In general we shall resort to total extirpation more readily the longer the time which has elapsed since rupture, while we will favor conservatism in simple wound conditions and "clean" cases; i. e., not examined. Quite commendable seems the proposition of Zweifel, who in markedly anæmic women simply sutures the serosa after hæmostasis. This is doubtless the most simple operation, and may be combined, if necessary, with excision of the tubes and their uterine insertions.

Literature of the last four years shows the report of twelve cases of conservative laparotomy in uterine rupture. They are the cases of Freund, Stroganoff, Leopold, Torngreen, Veit, Kuestner, v. Guerard, Wiener, Kaman. They were all except two primary laparotomies, one of the latter secondary laparotomies died. To this number we may add ten cases of Zweifel, with suture of the serosa and two deaths. Total number, twenty-two cases with three deaths; i. e., 13.6%. Hereby it is proven that conservative surgery with proper selection of "clean" cases gives very good results.

With the question if a case is "clean" or infected, we have to consider drainage. To decide this question one has to be aware of the fact that neither laparotomy, tamponade, nor drainage protects against existing infection. If infection is present, extirpation of the uterus is not equivalent to an absolute elimination of the source of infection. It does not protect against "autoinfection," for sufficient wound surfaces remain for the streptococci to invade. Drainage removes superfluous secretion, prevents its accumulation and subsequent intoxication, but does not bar the spreading of pathogenic micro-organisms by the lymphatics. Drainage of peritoneal cavity after laparotomy is in consequence not absolutely necessary. It is indicated only in doubtful cases or incomplete toilet of the abdominal cavity. Otherwise vaginal



drainage of the superitoneal wound surface will suffice. Large hæmatomata must always be drained after removal of the clot. Peritoneal defects are to be covered by adjacent organs if repair is not otherwise possible. In laparotomy hæmostasis is the first principle, then follows the repair proper.

Mortality rate of uterine rupture is still very high. Incomplete tears certainly give a better prognosis than complete ones. The conclusions in this paper are based upon the result of the large European University hospitals, and especially the Berlin Frauenklinik. You find them collected in Schmit's paper. However, these statistics date back to the year 1880, a time when laparotomy was still a dangerous operation.

There are 246 cases of complete and incomplete rupture:

K. v. Braun, Vienna, 19.....	Recovered	7
Koblanck, N. Berlin, 80.....	"	21
Deckner, Königsberg, 9.....	"	3
Tauffer, Budapest, 43.....	"	17
H. Ludwig, Vienna (Chrobak), 9.	"	4
Schmit (Schauta), 19.....	"	10
To these I have added:		
DeLee, 10 cases.....	"	4
v. Walla, 28.....	"	9
Zweifel, 29.....	"	16

Summary, 246 cases, recovered, 91.

That means a mortality of 63%.

This rate, according to Schmit, is reduced to 58.26%, when those cases are omitted which died without treatment or during operation.

The only modern statistics at present in our hands are those of Schmit, who is an adherent of the tamponade treatment; 19 cases, 1891-1900, with a total result of 47.37% dead, or when the cases which died during operation are deducted, 44%.

Operative mortality, 50%.

Drainage mortality, 38.6%.

A report from Krebs (Toporsky, Posen), of 10 cases of complete rupture, principally all operated, 1898-1904, gives a mortality of 50%.

The individual reports as found in the literature of the last four years, comprise only complete tears.

I found 74 cases, with a mortality of 32.43%.

58 laparotomies, 17 dead = 30%.

16 tamponades, 7 dead = 43.7%.

The question of conservative surgery in rupture of the uterus has so far only been discussed from the point of view of saving time and avoiding infection. Literature of the last few years reveals a number of cases in which the previously ruptured organ, or the uterus subjected to cæsarean section, has suffered from a new laceration during the following labor. There are 29 cases of rupture following cæsarean section to be found in the literature at hand. They are: Kruckenbergh, 21 (most of these were not sewed properly); Olshausen, 2 (1 before Saenger's method of suture was used, and 1 afterwards, out of a number of 180 cases treated this way); Everke, Wagner, Munro Kear, Eckstein, Targett, Meyer, 1.

Spontaneous and traumatic rupture occurring before labor had set in, are not included. No reference is made to those cases in which imminent rupture of the uterus furnished the indication for the second operation. I find reported 34 cases of rupture of a previously torn uterus. Couvelaire, 9 ruptures in 17 cases of labor at term after previous rupture; i. e., 53%; Penham, 4; Labhard, 2; Kriwsky, Peters, Alberts, Dittel, Wenzel, 1 each.

These reports prove distinctly, that cæsarean section as well as tearing in some cases totally destroy the fitness of the uterus for subsequent labor, and in most cases diminish it considerably. Whether the improper method of sewing or a deficient union of the wound surfaces is the cause of tearing after cæsarean section, is difficult to decide. Some reports of repeated cæsarean section show that the serous covering only was united, whereas, in others no sign of the old incision was to be found at all.

However, it would be premature to conclude that the uterus after rupture or cæsarean section is absolutely unfit for labor. We are not justified by these reports in declaring total extirpation of the uterus as the only proper procedure. There are a number of reports made which show that a prematurely induced labor, and even labor at term, were brought to favorable termination for mother and child.

The possibility of a subsequent labor will always depend upon the extension and place of the tear. Especially laceration of the lower uterine segment incline more than others to



rupture. A scar at this site is as shown by H. W. Freund, drawn inside the cavity of the lower uterine segment, and therefore prevents in some way the normal formation and extension of the lower uterine segment, and might keep the head from descending, as observed by Stroganoff, since the cicatricial tissue lacks the normal fixation which the rest of the uterus enjoys.

The same consideration leads to the conception that vaginal cæsarean section, when performed by one incision, is liable to interfere with the function of the lower uterine segment in succeeding labor. At present there are no confirmations of this apprehension.

Furthermore, we will have to conclude that the classical cæsarean section for relative indication, a relatively frequent operation now days, owing to our confidence in asepsis, will have to be more restricted in future, in favor of the more conservative lateral section (pubiotomy), which leaves the bearing organ intact.

Whoever, after rupture of the uterus, intends to save his patient from the possibility of pregnancy and its subsequent perils, should content himself with resection of the tubes and adjacent uterine tissue. Even most complicated tears will heal by conservative treatment as proved by many reports. The decisive factor will always be the presence of infection.

In case a woman becomes pregnant after previous rupture, premature labor, labor at term, and cæsarean section will have to be considered. The condition of the individual case, the form, place, and mobility of cicatrix, the desire of the woman to have more children, will decide our procedure. Abortion is very rarely indicated. When there is any endangering distension present, we will resolve readily upon cæsarean section. Premature labor commonly gives good results in labor after rupture, but we should guard against a too hasty use of overlarge colpeurynters, since they might produce a new laceration. In general we may say, that we will be compelled to draw upon our entire store of obstetrical knowledge and art in

these cases, make the labor as easy as possible for the woman, and deliver her instrumentally as soon as there is a possibility of a harmless delivery, be it by forceps or extraction of the child.

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