CRITICAL REVIEW

CÆSAREAN SECTION: ITS INDICATIONS AND TECHNIQUE.

By J. W. BALLANTYNE, M.D., F.R.C.P.E., Lecturer on Midwifery and Gynecology (to Women Students) in the University of Edinburgh.

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Technique of the Cæsarean Section.

A few modifications of the technique of the classical conservative Cæsarean section have been suggested during recent years, mostly with the purpose of lessening the risks in infected or presumably infected cases, or of increasing the stability of the uterine scar. In order to ensure the reliability of the scar in future pregnancies, Arnold Jones proposes to make the uterine incision in a new way. Making use of the fact that the musculature of the pregnant uterus is arranged in layers, he incises first the external layer of transverse fibres by means of a transverse incision “just below the centre of the body in front and 2 inches above Bandl’s ring,” after having first separated this layer from the underlying one by blunt scissors; then with gauze he peels off this superficial layer from the middle layer below and pushes it up towards the fundus; next, after ligaturing any bleeding points, he incises the middle and internal muscular layers longitudinally in or near the middle line. The extraction of the child is then performed as usual, and the longitudinal incision is closed by a continuous No. 4 catgut suture, the outer layer is pulled down into position, and the transverse incision is closed in the same way. Jones has used this method eight times and thinks it will give a firmer scar. His suggestion is worthy of consideration, but at first sight its adoption would apparently mean the spending of more time over the uterine incision than is usually given to it; it may, however, have counterbalancing advantages.

A good deal of discussion has taken place as to the best material which sutures should consist of in order to ensure a strong uterine cicatrix. There has been difference of opinion both as regards material and the method of passing the sutures. For instance, Skeel closes the uterus with a continuous suture of No. 2 chromic gut for the deep layer and plain catgut for the peritoneum, whilst Beck, using the same material, passes the sutures interruptedly. R. C. Cochrane also uses chromic catgut (No. 1) interruptedly for the deep layer and continuous for the peritoneum. Ley employed Pagenstecker thread sutures, but a pyosalpinx developed later.
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Lapthorn Smith\textsuperscript{99} chooses catgut for the wall and fine silk for the peritoneum. Vanverts and Paucot\textsuperscript{106} used either silk or catgut, but they preferred catgut; in order to increase the solidity of the scar they passed the sutures in a double circle (see Fig.). Holland,\textsuperscript{46, 47} who has made a special study of the suture material, decides in favour of silk-worm gut as the best, with silk as the second best, and he condemns catgut. The reviewer has always made use of silk passed interruptedly for the deep suture of the uterine wall, and catgut passed continuously for the bringing together of the peritoneum; in one instance, in which he did a second Cæsarean some eighteen months later, he could discover no trace of the silk.

With regard, however, to absorption, opinions and facts also seem to differ, for Maclean\textsuperscript{70} in four months found the sutures present, and Clifford White\textsuperscript{108} discovered silk and thread unabsorbed and giving rise to trouble.

In order to keep the uterine incision free from infection, some modifications in technique have recently been suggested. One of these, referred to by Jefferson of Rochdale,\textsuperscript{54} is very simple and may well be adopted without question; it consists in putting on a fresh pair of sterilised gloves immediately after the placenta and membranes have been extracted from the uterus, and before the stitching up of the incision is commenced. The reason for the change is that the interior of the membranes may have become infected by way of the cervix, and so the hands which touch the interior of the sac of the membranes may become infected. Jefferson further recommends the swabbing of the interior of the uterus and of the edges of the incision twice with iodine and the changing of the sterilised towels round the operation area. For the same purpose some operators (e.g. Delle Chiaje\textsuperscript{18}) always remove the uterus.
from the abdomen before opening it, but all are not of one mind about this "exteriorisation" of the uterus, and certainly it requires a much longer abdominal incision. In septic cases requiring Cæsarean section, Dr Charles L. Ill strongly recommends the use of the alcohol drain, which is the adoption in the technique of the section of the so-called Carossa method employed by his brother, Dr Edward J. Ill, in puerperal endometritis. The plan consists in introducing into the uterus through the vagina (the abdomen having been closed and dressed) 4 inches of a rubber tube about 2 feet in length and with a funnel-shaped attachment. Around the tube a strip of iodoform gauze (10 per cent.) 2 inches in width is lightly packed, and the vagina is packed with the same material. Two ounces of a 25 per cent. solution of alcohol in water are allowed to flow slowly through the tube and moisten the gauze in the uterus and vagina. This is done every two hours, day and night for four days. In the discussion which followed the reading of Dr Ill's paper, Dr Edward A. Weiss suggested the employment of the Dakin tube to carry out the drainage. Of course, it is under exceptional circumstances that the conservative Cæsarean section will be performed in so distinctly infected cases as Dr Ill presupposes; generally the operator will do a hysterectomy.

The acknowledged difficulty of dealing safely with a "handled" and presumably infected case is the fertile cause of many suggested alterations in technique, for it is everywhere admitted that the present rate of maternal mortality even in the hands of expert obstetricians is too high to justify the ordinary conservative high operation. Some have sought for a way out of the difficulty by making the incision low down in the uterus, the cervical or lower-segment operation. A number of advantages (which are enumerated by Eardley Holland,46, 47) are claimed for the low incision: the wound is in an inactive area of the uterus and heals more quickly; the wall is thinner and suturing is more efficient; it is a less vascular area and bleeding during the operation is less; adhesions cannot occur for the wound is covered by the bladder; for this reason also infection of the peritoneum is less likely; there is less disturbance in the general abdominal cavity; and the uterine scar forms in a safer area of the uterus so far as future pregnancy and the risk of rupture are concerned. On the other hand the operation has a more difficult technique; there is sometimes difficulty in the extraction of the child, and there is a risk of haemorrhage (according to some operators). Skeel67 thinks that an additional advantage attaching to the low incision is that the pelvic peritoneum has greater resistance to infection than the abdominal.

The cervical Cæsarean has considerable vogue in Germany, and Lichtenstein65 has recorded 143 such operations. In 106 of these
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cases he performed the intraperitoneal operation, and in the others a form of the extraperitoneal or of the transperitoneal method was employed (in 3 cases it was Frank's, in 11 Sellheim's, in 11 Latzko's, and in 12 Latzko-Zweifel's). The true extraperitoneal plan is much less heard of now than formerly; the difficulty of reflecting the peritoneum from the bladder without buttonholing, and the fact that in many cases prevention of peritoneal infection is only achieved at the expense of infection of the cellular tissue, have militated against its general adoption. M'Glinn 71 carefully weighs the advantages and disadvantages of both the true extraperitoneal and the transperitoneal methods, and he is doubtful whether either of them really prevents infection. He thinks advantages are rather outweighed by disadvantages, and he finds much that is satisfactory in the ordinary conservative Caesarean section as done by Sänger. It ought to be remembered that many operations described as extraperitoneal (e.g., Brodhead's 11 and Langrock's 59) are little removed in reality from transperitoneal, and that not a few of the transperitoneal are truly intraperitoneal. Whilst the genuine extraperitoneal plan has probably ceased to be of practical importance, many obstetricians (e.g., Gaifami 39) will not agree with M'Glinn that the transperitoneal methods do not warrant further investigation and trial; indeed, M'Glinn himself finds good points in Beck's operation (a modification of Krönig's). Beck 7 described his procedure in 1919, and he amplified the description in 1921 8; T. S. Welton 107 has also used the method in eleven instances and thinks it is the operation of choice in all potentially infected cases. It has been termed "the two-flap low incision Caesarean section," and it is carried out as follows. The abdomen is opened by a vertical incision slightly to one side of the middle line from the symphysis to nearly the level of the umbilicus; but Beck has no objection to a transverse one. The loose peritoneum in the region of the bladder reflection is cut transversely; the peritoneum on the lower side of the incision along with the bladder are stripped off the anterior surface of the uterus as in a sub-total hysterectomy. Then the peritoneum on the upper side of the transverse incision is carefully separated from the underlying uterus by a pair of probe pointed (Mayo) scissors thus producing a superior flap about 1½ inches long. The lower and upper peritoneal flaps are retracted until a sufficient area of the anterior uterine surface is exposed to make an ample incision. At this stage Dr Beck's assistant gives a hypodermic injection of pituitrin; and the uterus is pressed well into the abdominal incision to wall off the peritoneal cavity. Next a stab wound is made in the mid-line of the uterus and this is quickly enlarged by scissors. The operator then passes his hand into the uterine cavity and using it like a lever presses the presenting
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part out, his assistant aiding the manœuvre by downward pressure on the fundus. If necessary, forceps may be used to extract the head. Before separating and removing the placenta and membranes deep traction catgut sutures are passed through the uterine wall above and below the upper and lower ends of the uterine incision; these fix the incision, prevent its lower end passing out of reach down into the pelvis, and greatly facilitate the closing of it. The placenta and membranes are then either extracted through the wound or pushed down into the vagina through the cervix. A second hypodermic injection of pituitrin is now given. The wound in the uterine musculature is next closed by two series of interrupted chromic catgut sutures, deep and more superficial. They along with the traction sutures are now tied, and the closed incision drops to some extent into the pelvis. Next, the upper peritoneal flap is brought down over the upper part of the incision and anchored to the uterus by interrupted plain catgut sutures; the lower peritoneal flap with the bladder reflection is then pulled up and made slightly to overlap the upper flap and fixed in position with interrupted superficial plain catgut sutures. In this way the peritoneal cavity is completely sealed off from the closed uterine wound. Beck in 37 cases done by this method lost one mother probably from eclampsia. In a later communication Beck reported on 83 Caesarean sections done by himself and others in which this technique was used; there were three maternal deaths (3.6 per cent.), and as only 12 of the operations were elective procedures (the remaining 71 being all "potentially infected" cases), the writer is justified in recommending his plan in such handled subjects. To facilitate the rather difficult technique especially in the making of the two peritoneal flaps, the author recommends the Trendelenburg position. There would seem to be a risk, even with this technique, of spilling amniotic fluid into the peritoneal cavity, unless the assistant is indeed expert in walling off the cavity by bringing the uterine surface into the abdominal wound. Suture infection, however, seems to be as surely avoided as one can well imagine.

Whether the great problem of doing Caesarean section on potentially infected cases with safety to the mother has been solved by one or other of the "low" operations of a transperitoneal kind cannot yet be definitely decided; but it should not be long before one will be in a position to tell. Meanwhile, some operators rely rather on removal of the uterus to save the mother from the septic peritonitis which so often follows the performance of Caesarean section in a patient who has been "handled" (e.g. by many vaginal examinations, attempts at forceps-delivery, etc.). The extreme degree of this form of operative interference is found in Reymond's procedure of
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hysterectomy without previous opening of the uterus. In 1914 (Edin. Med. Journ.) the reviewer described and commented upon the three cases operated upon by Reymond and Casalis and by Casalis and Lecoq in which delivery by hysterectomy was achieved. The indications were placenta prævia, cancer of the cervix, and impending uterine rupture in a handled case of pelvic contraction. In each instance a panhysterectomy was performed and the whole uterus unopened and containing the living child was removed from the body; immediately thereafter the organ was opened by an assistant, and the infant extracted and resuscitated. The three mothers were saved, and by almost unexpected good fortune so were the infants. Obviously the risk to the foetus must be considerable for the arteries supplying the uterus, and therefore of necessity the placenta must be clamped before the hysterectomy can be done. Reymond got over this risk in part by leaving the right uterine artery unclamped till the second before the uterus was separated and lifted out of the abdomen. Of necessity great skill and very rapid action were called for at this critical moment, qualifications possessed only by the expert hysterectomist. Lecoq now reports five cases in which delivery by hysterectomy was performed; one mother died on the fourth day from general peritonitis, the others lived, as did all the babies. The technique is that of panhysterectomy for a large fibroid: this entails a large abdominal incision (10 inches long) to allow the removal of the unopened uterus, complete knowledge of the technique of a panhysterectomy, expert speed in controlling the blood supply of the uterus and in removing the organ, and the presence of a skilled assistant to cut the child out of the uterus after its removal from the body. One cannot but think that the operators were fortunate above expectation in saving all the children, although of course one knows that the child may survive the death of the mother for a minute or two, and may therefore live for a short time after the separation of the uterus from the mother. Lecoq thinks it specially suitable for the following groups of cases: (1) Probable infection of the uterus when delivery cannot be safely performed by the natural passages; (2) fibroids or cancer complicating a pregnancy; (3) impending uterine rupture; (4) complete uterine inertia coming on when Caesarean section is about to be done; (5) some cases of placenta prævia; and (6) osteomalacia. Professor Schickelé doubts whether panhysterectomy without previous hysterotomy can always be done in the conditions named by Lecoq, and instances a fibroid growth of the cervix as an insurmountable difficulty; he did the operation once for cancer of the cervix, the child being already dead. There is one formidable objection to all hysterectomy operations superadded to Caesarean section, and that is the compulsory
sterilisation of the patient which is involved; this may matter little in some instances, but in others, such as primiparas in which the section is being done for an indication not likely to recur, this consideration is far from negligible.

Instead of doing a panhysterectomy of the unopened uterus in potentially infected cases one may of course endeavour so to modify the hysterectomy after the extraction of the child as to make the risks of peritonitis less. It is for this purpose that Schumann after making the usual vertical abdominal incision turns the unopened uterus out of the abdomen, covers it with a hot moist towel, and has it held well forward by an assistant; he then closes the cardinal layers of the abdominal parietes by sutures stopping only at the posterior border of the eventrated uterus; next he caulks with a gauze sponge the opening round the cervix through which the uterus projects to prevent leakage back into the abdomen; then he opens the uterus by the fundal incision of Fritsch and extracts the child; the ovarian and uterine vessels are ligatured, the broad ligaments are cut, and the uterus is amputated at the cervix leaving an ample stump; this cervical stump is now drawn together by continuous or interrupted sutures and the openings in the broad ligaments are closed; the gauze packing round the cervix is removed, the parietal peritoneum is sewn round the closed off uterine stump, leaving it entirely extraperitoneal; and finally, the closure of the abdominal incision is completed, the skin and muscle covering the cervical remnant. This operation may be regarded as a sort of Old Porro with modern refinements of technique, and is worthy of trial.

At the present time, therefore, there are three plans of dealing with the potentially infected uterus by abdominal section. There is first the employment of the conservative Cæsarean section, making the incision in the uterus high, but, in addition, endeavouring by various refinements of technique to prevent peritoneal spilling of the infected liquor amnii and to make impossible any leakage from the uterine interior through the closed incision. Not a few obstetricians (and the reviewer is one of them) think that in this way the best plan will be discovered. In other words, potential infection of the uterine cavity shall not be regarded as a complete bar to the doing of an ordinary Cæsarean section. Certain safeguards will be adopted such as the opening of the uterus outside the abdomen, the changing of gloves after the removal of the membranes and placenta, the careful sponging of the edges of the incisions, the walling off of the peritoneal cavity, etc. There is, second, the adoption of the low uterine incision along with the so-called extraperitoneal or transperitoneal method of performing the Cæsarean section. Theoretically, success ought to come along this path, but in actual practice there has been some
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disappointment with the results. Difficulty in technique ought not to be, and will not be, a bar to the obstetrician testing thoroughly these plans; but it cannot be affirmed that the ideal operation has yet been devised, although Beck’s method has much to commend it. In the third place, there is the plan of hysterectomy, the uterus being removed either unopened (as recommended by Lecoq) or after extraction of the child (as by other obstetricians). The chief criticism of this plan is its non-conservative character. In some cases, as in second or third Cæsarean sections, it may, indeed, be accepted as a convenient plan of sterilising the patient, but in other instances, as in the primipara with, say, placenta praevia, it is not beyond reproach. Of course, if by no other form of section can the potentially infected woman be delivered with safety, then it will be necessary to add hysterectomy in one form or another to the hysterotomy; but in the meantime obstetric ingenuity has not reached finality in other directions.

It remains to be said that in recent literature several papers have appeared in which local anaesthesia is recommended in Cæsarean section. Trout, for instance, has employed it in 18 Cæsarean sections, infiltrating successively skin, fascia, and peritoneum. W. Mortimer Brown has used it in cases of advanced cardiac disease, of severe toxæmia and impending eclampsia, and of pulmonary tuberculosis; but he gives no details of the manner in which the local anaesthesia is secured. Irving combines the local anaesthesia with the injection of morphine and scopolamime, and recommends the plan in the graver complications of pregnancy associated with the necessity for doing Cæsarean section.

Among the comparatively little known and less practised complementary operations associated with the conservative Cæsarean section, one must surely reckon resection of the sacro-vertebral angle. Fossati describes the operation, which may be done either purely as a prophylactic measure in the non-pregnant woman or (with more difficulty) at the same time as the Cæsarean section. The reviewer has furnished details of the technique in the Encyclopædia Medica (2nd Edition, 1921, vol. vii., p. 582).

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