REVIEW ARTICLE

UTERINE INVERSION REVISITED

Boet Dommisse

'This Case should be a Caution to all Practitioners how they attempt to bring away the Placenta and not to pull the String too rudely, lest they invert and draw out the Uterus, by which the Woman dies a Martyr to their temerity and ignorance, as was too plainly the Case in the precedent Observation.' So wrote Mr William Giffard, surgeon and man-midwife (London, 1734).[1] Fig. 1 is reproduced from a treatise published in 1861 (Mauriceau[2]).

Uterine inversion is a rare but dramatic and life-threatening complication of the third stage of labour. Because of its infrequency, probably fewer than 1 in 5 000 pregnancies, any prospective epidemiological research is not possible and management is based on anecdotal experience, which has been passed on from one textbook to the next.

A fascinating and complete description of uterine inversion, which includes causes and management, was published in 1814.[3] Modern obstetric practice has little to add to this classic description.

The doctor or midwife confronted with a sudden inversion of the uterus must have a reasonable approach to immediate management and should also be aware of precipitating and possibly avoidable causes of uterine inversion.

Shared experiences and standard texts throw some light on both the causes and the practical management of this condition.

CLASSIFICATION

Acute inversion may be complete, with the inverted uterus and usually the attached placenta prolapsed outside the vaginal introitus, or incomplete, where the inverted uterus is partly or entirely within the vagina (Fig. 2).

Subacute inversion refers to cases where diagnosis or treatment has been delayed or unsuccessful and a lower uterine or 'cervical' constriction ring has formed.

Chronic inversion is seldom seen, but has been described in older texts as occurring when a patient has survived an undiagnosed or untreated inversion and presents more than 4 weeks later with a vaginal prolapsing mass.

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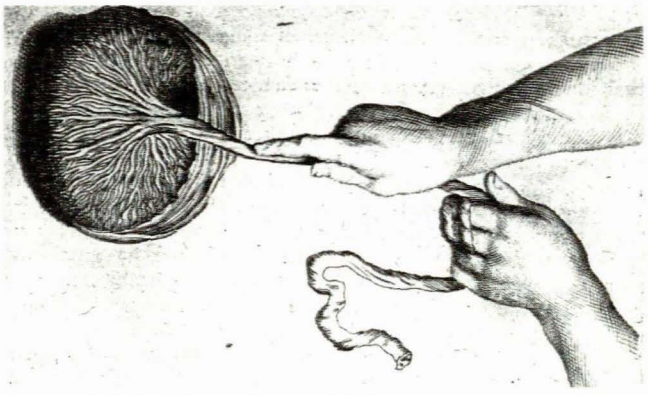

Fig. 1. Method of placental removal (Mauriceau[2]).

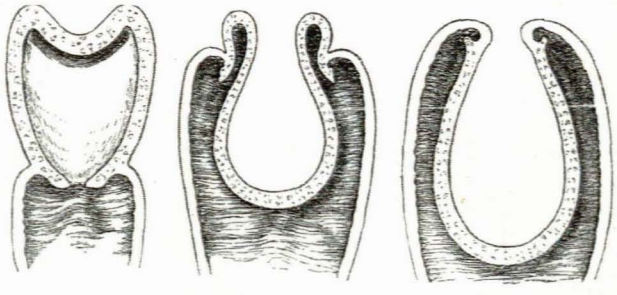

Fig. 2. Successive stages of inversio uteri (Leishman[4]).

ACUTE UTERINE INVERSION

Incidence. Uterine inversion is an extremely rare complication and no reliable epidemiological data are available. The Groote Schuur High-Risk Maternity Centre provides tertiary care for the Peninsula Maternal and Neonatal Service, which delivers 28 000 patients per year and manages 2 or 3 cases of uterine inversion annually. *Williams Obstetrics*[5] quotes two reports: Shah-Hosseini and Evrard,[6] who documented an incidence of 1 in 6 400 deliveries, and Platt and Druzin,[7] who reported an incidence of 1 in 2 100 in patients receiving magnesium sulphate, which is a uterine relaxant. According to Oxorn[8] the reported incidence ranges from 1 in 100 000 to 1 in 5 000 deliveries but no reference details are given to substantiate these estimates. Evidently Hippocrates (460 - 370 BC) recognised uterine inversion and early textbooks contain vivid descriptions of this catastrophe.

Two interesting and perhaps not generally known facts emerge from these reports. The first is that uterine inversion is more common in primigravid patients[9] although Watson *et al.*,[10] who reviewed 18 successfully managed cases, thought that this simply reflected the normal distribution of primigravidas. The second is that there is a significant recurrence rate. Oxorn[8] states that the reported recurrence rate is over 40%, and in a follow-up of 56 cases Miller[11] recorded an overall recurrence rate of 33% in subsequent pregnancies. These observations led to some speculation about the aetiology of uterine inversion.

Aetiology. While this is uncertain and probably multifactorial, there appear to be some accepted common or

precipitating factors: (*i*) a relaxed or non-contracting uterus at the time of placental delivery; (*ii*) a fundal insertion of the placenta which is adherent to the uterus — the placenta seldom separates spontaneously and usually has to be removed manually from the uterus; (*iii*) traction from below or excess maternal or manual pressure from above.

All the above factors are relatively common and yet inversion is extremely rare. In addition these factors do not explain the high incidence of recurrent uterine inversion in subsequent pregnancies or the higher prevalence in primigravid patients.

It would therefore seem reasonable to suppose that there is some underlying congenital or functional defect and that the above factors are precipitating rather than causal. Fundal insertion of the placenta is fairly uncommon, the placenta usually being situated on the anterior or posterior wall of the uterus. The uterus is formed by the midline fusion of the two Mullerian ducts. The resulting midline septum disappears as a result of resorption or apoptosis. Persistence of the septum in varying degrees results in the formation of a septate, subseptate or arcuate uterus. These anomalies are quite commonly seen on hysterographic examination.

An arcuate uterus has a broad fundus which may increase the probability of fundal insertion of the placenta. It is also functionally the weak point of Mullerian duct fusion and septal resorption, which could possibly be the point at which uterine inversion begins. While the above is hypothetical, and would be difficult to prove, it could explain the rarity of inversion, the higher incidence in primigravidas and the tendency to recurrence.

Possible precipitating factors. As discussed these do not adequately explain the aetiology of inversion. However, they are important because some are avoidable and therefore at least some cases of inversion may be prevented by appropriate obstetric management:

1. Manual removal of the placenta. This may produce acute inversion after vaginal delivery or at caesarean section if performed without complete placental separation.
2. Sudden increase in abdominal pressure as a result of coughing, sneezing or pushing.
3. Mismanagement of the third stage of labour: (*i*) improper fundal pressure, including the outdated Crede's manoeuvre; and (*ii*) traction on the cord before uterine contraction has been confirmed and without gentle suprapubic upward counter-pressure.

Other factors that have been suggested are a short umbilical cord, which would cause traction on the placenta before separation, an adherent placenta and a uterine neoplasm.[5]

Pathophysiology

Inversion of the uterus causes severe traction on the adnexa and the pelvic peritoneum as these are pulled down into the inverted uterine fundus. This produces severe pain and the immediate onset of neurogenic shock with hypotension and tachycardia, although in some cases a bradycardia may occur.

The placenta usually remains attached to the inverted uterus, but when this separates either spontaneously or manually, severe postpartum haemorrhage with ensuing hypovolaemic shock occurs. Separation is sometimes only partial, and the placenta remains partially adherent; this compounds the problem.

Unless the inversion is rapidly corrected the lower uterine segment forms a constriction ring around the inverted uterus, making correction extremely difficult. The maternal mortality rate varies between 0% and 18% depending on diagnosis and management.[6]

Diagnosis

Early diagnosis is crucial and depends on knowledge of the condition and a high index of suspicion in cases of unexplained postpartum shock. In cases of complete inversion the diagnosis is usually obvious, as the inverted uterus with attached placenta manifests itself as a large prolapsed purple mass; the patient complains of severe pain and is obviously shocked. The diagnosis can be confirmed by abdominal palpation, where no uterine fundus is palpable.

In cases where the inverted uterus is still partly or wholly in the vagina the diagnosis can be more difficult. Abdominal examination may again be helpful but a vaginal examination should confirm the diagnosis. Vaginal examination will also determine whether there is a constriction ring around the inverted uterus.

Management

Immediate treatment is more likely to succeed than delayed replacement. Unfortunately, because this is such a rare complication, few midwives and inexperienced doctors even attempt immediate replacement. It has been suggested that the shock be corrected and an intravenous infusion commenced before replacement is attempted. This would, however, allow a constriction ring to form and in any case the neurogenic shock would persist until reduction had been achieved. Therefore the sooner reduction is attempted, the more likely it is to succeed.

In my opinion and experience, no attempt should be made to remove the attached placenta as this invariably precipitates excessive haemorrhage. Arguments that this reduces the bulk to be replaced are not valid. In addition the presence of the placenta on the fundus provides some protection from uterine perforation or rupture during the replacement procedure. Planned manual removal after reduction of the inversion is a simple procedure.

Initial reduction is by simple steady but gentle upward pressure, using the fist or hand on the inverted fundus, while the other hand palpates the lower abdomen. A technique involving insertion of a hand alongside each side of the uterus and pressing upwards into the vaginal fornices has also been

described. The elevation of the fornices stretches the round ligaments which pull up the inverted fundus.

If this does not succeed, it is likely that a constriction ring has formed. Consideration should be given to administering an intravenous tocolytic such as hexoprenaline (unless the patient is hypovolaemic due to haemorrhage) and repeating the manoeuvre. The dose of hexoprenaline is 10 µg intravenously.

If immediate reduction has failed the patient must receive supportive treatment for both neurogenic and hypovolaemic shock. Effective analgesia is essential and morphine is preferable to pethidine as the latter may aggravate the hypotension. An intravenous infusion of an electrolyte solution such as Ringer's lactate should be commenced and 1 litre rapidly infused. An indwelling urinary catheter should be inserted. Blood should be crossmatched.

An oxytocic, such as ergometrine or oxytocin, should not be given before the inversion has been reduced, unless attempts at reduction have failed and bleeding is excessive. However, the inverted uterus may not contract effectively in response to oxytocics.

Further treatment of uterine inversion that is in the subacute stage due to the formation of a constriction ring varies considerably. At the Groote Schuur Maternity Centre we have almost invariably had success utilising O'Sullivan's hydrostatic procedure.[12] This is initially done without anaesthesia but can be repeated in theatre if necessary. This technique depends on a rapid flow of fluid into the vagina under some pressure. This 'balloons' the vagina which 'gives way' at its weakest point, thus restoring the uterus to the abdominal cavity with immediate and dramatic relief of the pain and shock. The placenta is then manually removed, preferably under anaesthetic, and ergometrine is given to ensure uterine contraction.

O'Sullivan's hydrostatic procedure

1. The patient is placed in the lithotomy position.
2. After the uterus has been replaced in the vagina, a hand holding the end of a douche nozzle or a 5 - 10 mm diameter tube (such as that used to administer oxygen) is inserted into the vagina.
3. An assistant holds the labia around the wrist of the operator to prevent the return flow of the fluid as far as possible.
4. The tubing is connected to a douche can, a funnel or, preferably, a 3-litre bag of saline solution as used in urological procedures.
5. This is elevated 1 m above the patient and 2 - 3 litres of saline are rapidly run into the occluded vagina.
6. A large volume of fluid leaks out onto the operator, assistants and spectators.
7. Reduction of the inversion is confirmed by abdominal palpation and the relief of symptoms.
8. Arrangements are made for manual removal of the placenta.

Alternative and further management depends on the facilities and the expertise available. Simple pressure reduction under general anaesthesia, with or without the use of a tocolytic drug or halothane, is advocated. If this fails an invasive surgical procedure should be considered but this requires considerable surgical expertise.

In a recent case report, Ogueh and Ayida[13] describe a modification of O'Sullivan's method whereby the silicone cup of a Ventouse is inserted into the vagina and the saline is run into the vagina through this. Apparently, this effectively stopped leakage of the fluid out of the distended vagina.

Oxorn[8] advises that surgery be delayed for 48 hours while supportive treatment for shock and possible infection is given, maintaining that surgery is easier at this stage. I think, however, that the majority of obstetricians would proceed to more immediate surgery, as catastrophic haemorrhage is always a possibility.

Surgical procedures

The following are some of the operative procedures described. In all of these care must be taken not to perforate the friable uterus and to avoid damaging adjacent structures such as the ureters.

Huntington's operation pulls up the inverted fundus from above with repeatedly applied clamps, while an assistant elevates the inversion from below. If this does not succeed the constriction ring is incised. Haultain's operation incises the constriction ring posteriorly, while the Spinelli procedure cuts this anteriorly. Vaginal incision of the ring has been described but is not recommended.

Conclusion

Uterine inversion complicates approximately 1 in 5 000 deliveries. There is probably an underlying structural or functional weakness of the uterus, but incorrect management of the third stage of labour may be a factor in some cases. Immediate replacement is advocated but if a constriction ring has formed the shock should be treated and replacement attempted utilising O'Sullivan's hydrostatic procedure. The cautious administration of intravenous hexoprenaline may relax the constriction ring, so assisting reduction. Where possible the placenta should not be removed before reduction of the inversion. Surgical correction requires considerable care and expertise.

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