The perforated uterus

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Accepted on 15 June 2013

Key content

• Uterine perforation is an uncommon but potentially serious complication of uterine manipulation, evacuation of retained products of conception or termination of pregnancy (TOP), hysteroscopic procedures and during coil insertion.
• Factors that increase the risk of uterine perforation include uterine anomalies, infection, recent pregnancy and postmenopause. TOP is the most common procedure associated with uterine perforation.
• Prevention of uterine perforation is favoured, although if it occurs, initial recognition together with immediate and ongoing management is key to reducing morbidity, mortality and long-term consequences.
• It is important that surgeons performing surgical TOP are adequately trained. The experience of the surgeon results not only in fewer perforations but also in the early recognition of uterine injury.
• Uterine perforation is a complication that is well recognised by all gynaecologists, although subsequent assessment and management needs to be standardised.

Learning objectives

• To be aware of the incidence of uterine perforation and the potential serious complications that can result.
• To identify the risk factors of uterine perforation, the mechanism of injury and how to potentially prevent it from occurring.
• To increase awareness of this complication and to propose a standardised management protocol if a uterine perforation occurs, together with risk management issues.

Ethical issues

• Are women at increased risk of uterine perforation counselled adequately about the complications and consequences?
• Are women at increased risk given the full range of alternative treatment options?

Keywords: complications / prevention / risk factors / risk management points / uterine perforation

Introduction

Uterine perforation is an uncommon but potentially serious complication of uterine manipulation, evacuation of retained products of conception (ERPC), termination of pregnancy (TOP), hysteroscopic procedures and during coil insertion.

Factors that increase the risk of uterine perforation include uterine anomalies, infection, recent pregnancy and postmenopause. TOP is the most common procedure associated with uterine perforation.1

Uterine perforation can cause severe morbidity and even mortality, however, prompt recognition and management can improve clinical outcomes. It is a complication that is well recognised by all gynaecologists, although subsequent assessment and management needs to be standardised.

Incidence and potential sequelae

Guidance from the Royal College of Obstetricians and Gynaecologists (RCOG) on best practice in outpatient hysteroscopy2 suggests an average incidence of perforation of 0.002–1.7%. With hysteroscopic surgery the incidence of uterine perforation has been reported at 1.6%.3

Most perforations are in the body of the uterus and are often small, tending to cause relatively little haemorrhage. However, perforations at the internal cervical os and lower part of the uterus are more serious as they are often lateral and can involve branches of the uterine vessels. This can lead to haematoma formation in the broad ligament or serious intra-peritoneal haemorrhage.

There is a danger with all perforations that instruments may have passed through the perforation and damaged an
abdominal organ such as the intestines, ureter, urinary bladder or a major blood vessel. Up to 15% of uterine perforations caused by the fitting of an intrauterine device will involve abdominal or pelvic visera. In the event of a uterine perforation while fitting an intrauterine device, bowel injury has been reported to range between 3% and 7.5%.

In the USA, 9% of women who had a clinically recognised perforation, following a TOP, had a hysterectomy. This was a rate of seven per 100 000 terminations of pregnancy. Reliable information is lacking because serious uterine injury is so uncommon and long-term follow-up is difficult to achieve.

Women should be warned of the possibility of uterine rupture in a future pregnancy and told to tell their obstetrician that the uterus was perforated during a procedure. Knowledge of the uterine scar will make an obstetrician more likely to recommend a caesarean section if a future labour proves to be slower than average. A case reported uterine rupture at 27 weeks of gestation with no history of pre-term labour, following a previous perforation and repair. History such as a prior perforation should therefore be sought early on in a pregnancy, as any severe abdominal pain antenatally may represent a uterine dehiscence or rupture.

Cases of uterine rupture in labour have also been reported. A majority of the cases that resulted in rupture had their initial perforation caused by operative hysteroscopic procedures for division of adhesions and had used monopolar electrosurgery. Midwives and obstetricians should be alert for signs and symptoms of uterine rupture in such women, both in the second half pregnancy and in labour.

Recognition
As already alluded to, early recognition and subsequent management will significantly reduce morbidity, long-term sequelae and possible mortality.

Initially an injury can be suspected if extension of the instrument goes beyond the limitation of the uterus. Furthermore, loss of resistance with further instrumentation is highly indicative of a uterine perforation. Sudden loss of vision during hysteroscopic procedures due to collapse of the uterus and bleeding together with a large deficit of the distension medium is highly suggestive. Finally, direct visualisation of the perforation site, omentum or bowel is diagnostic.

The site of perforation that is most common is the anterior wall of the uterus. Table 1 shows the common sites of perforation together with their likelihood. Table 2 shows the incidence of perforation with the use of various instruments.

Risk factors
Risk factors for uterine perforation can be divided in to uterine, cervical, surgical and surgeon dependent.

<table>
<thead>
<tr>
<th>Site of perforation</th>
<th>Incidence%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior wall</td>
<td>40</td>
</tr>
<tr>
<td>Cervical canal</td>
<td>36</td>
</tr>
<tr>
<td>Right lateral wall</td>
<td>21</td>
</tr>
<tr>
<td>Left lateral wall</td>
<td>17</td>
</tr>
<tr>
<td>Posterior wall</td>
<td>13</td>
</tr>
<tr>
<td>Fundus</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Incidence of perforation%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction cannula</td>
<td>51.3</td>
</tr>
<tr>
<td>Hegar dilator</td>
<td>24.4</td>
</tr>
<tr>
<td>Curette</td>
<td>16.2</td>
</tr>
</tbody>
</table>

High risk uterus and cervix
Perforation is more common during surgical TOP. Perforation increases with gestation and is about twice as frequent in the second trimester as in the first trimester. Accurate estimation of gestational age is therefore vital. Perforation may equally complicate ERPC following incomplete or missed miscarriage.

Other independent risk factors for causing a uterine perforation include procedures on a small postmenopausal uterus or tight cervix, which can be particularly difficult to negotiate with a dilator, curette or hysteroscope and splitting of the cervix into the broad ligament can occur. Perforation is also more likely in cases where the uterus is retroverted, acutely anteverted or retroflexed. Box 1 shows other possible independent risk factors.

| Box 1 Uterine and cervical factors that increase the risk of perforation |
|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Advanced gestation when TOP is performed | ERPC for postpartum haemorrhage | Parous uterus | Recent pregnancy in the past 6 months | Small postmenopausal uterus | Tight postmenopausal cervix | Uterine cavity distorted by fibroids | Intrauterine synechiae or adhesions | Pyometra | Infection | Position and attitude of the uterus | Retroverted, acutely anteverted or retroflexed uterus | Uterine anomalies | The scarred uterus (previous uterine surgery) |

ERPC = evacuation of retained products of conception, TOP = termination of pregnancy

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High risk surgery
Particular surgical cases that increase the risk of uterine perforation include ERPC for postpartum haemorrhage (PPH), cases where intrauterine adhesions exist and cases to investigate postmenopausal bleeding. Studies report a range of incidence of uterine perforation in various procedures. Due to PPH, 5.10\(^{12}\)–5.70%\(^{10}\) of cases have been associated with uterine perforation. Cases that are being performed for division of intrauterine adhesions have a 0.07\(^{11}\)–1.80\(^{12}\)% risk of perforation. Elective termination of pregnancy and postmenopausal bleed investigation with hysteroscopy have a 0.40\(^{12}\)–0.52%\(^{13}\) and 0.20\(^{12}\)–2.00%\(^{14}\) risk of perforation respectively.

High risk surgeon
There can only be a handful of gynaecologists who have not perforated a uterus during a procedure. Although trainees are more likely to perforate the uterus compared with experienced operators.

Several reports have suggested increased perforation rates by junior trainees. In the USA a five-fold increase rate of perforation has been reported by junior staff. Additionally, it was found that experience also results in the early recognition of uterine injury so there is less risk of the dangerous use of suction cannula or grasping forceps in the abdominal cavity.\(^5\) Surgeons performing surgical TOP must, therefore, be adequately trained.

Similar results were found in Singapore where 82.5% of perforations were caused by junior staff.\(^{15}\) Although it is not mentioned in this paper exactly how many procedures were performed by each grade of surgeon, the authors express that junior staff performed the majority. In the UK, reports have suggested that the grade of operating surgeon is a significant factor affecting the outcome of surgical TOP. This is in terms of complications (uterine perforation included), even when the number of procedures performed by each grade of surgeon has been taken into account.\(^{16}\)

Prevention
Prevention of uterine perforation initially involves risk assessment and adequate preparation. The option of medical TOP would reduce the risk of perforation in the second trimester. This involves accurate estimation of gestational age. Correct equipment and bimanual assessment correctly identifying the size, position and attitude of the uterus together with an experienced operator all reduce the risk of uterine perforation.

As per RCOG guidelines\(^7\) on best practice in outpatient hysteroscopy, cervical preparation with prostaglandins or misoprostol is associated with a reduction in cervical resistance and need for cervical dilatation in premenopausal women compared with placebo, although no such benefit is noted in postmenopausal women.\(^{17–19}\)

The advantages of prostaglandin administration prior to surgical TOP are well established, with significant reductions in dilatation force, haemorrhage and uterine or cervical trauma. However, there are no randomised controlled trials to guide practice in cases of first-trimester miscarriage, particularly in the presence of an intact sac. Therefore, the RCOG advises that practitioners consider oral or vaginal cervical preparation based on individual patient circumstances.\(^{20}\)

Adequate and gradual cervical dilatation, avoiding excessive force and the use of half-size dilators again reduces the risk of perforation.

Reports have also suggested that the use of a tapered Hawkins-Ambler dilator requires less force to achieve cervical dilatation than the parallel-sided Hegar dilators that are used in many NHS units in the UK.\(^{21}\)

Additionally, ultrasound guidance in experienced hands can reduce the risk of perforation, as can laparoscopic guidance if an abdominal procedure is being carried out on the patient at the same time.

Management
Management of uterine perforation will depend on the procedure being carried out and on the instruments used. If a perforation occurs when using a dilator, up to 5 mm hysteroscope, curette, during coil insertion, or polyp forceps, then antibiotics, observation and explanation to the patient is all that is necessary. If larger diameter instruments are used, tissues grasped and avulsion attempted, or if there is significant revealed bleeding from a uterine tear, then laparoscopy should be performed.

A perforation that has been identified and made during the use of an activated resection loop or laser fiber or during a TOP or ERPC should prompt a laparoscopy. In these cases consultation with a general surgeon should be considered, as bowel injury may be a possibility.

If a laparoscopy is to be performed, then a urinary catheter should be sited. This will help to identify if there is shock due to haemorrhage, correctly monitor fluid balance and may alert to possible bladder injury if haematuria is present.

Small perforations with little associated bleeding do not require repair. Cauterisation with diathermy during laparoscopy can also be considered for haemostasis in a small perforation. If the original procedure remained incomplete an assistant can monitor the perforation through the laparoscope while the other experienced operator can complete the procedure, with direct visualisation to ensure that no further damage occurs.

A laparotomy should be considered when during a laparoscopy, continual haemorrhage occurs or if there is an...
enlarging broad ligament haematoma. If a uterine perforation is large enough to require suturing, this should be performed laparoscopically. If the surgeon is unable to do this themselves, then they should seek help from a laparoscopic surgeon. A laparotomy may have to be performed if the surgeon is unable to suture laparoscopically and is unable to find a colleague who can. Early assistance should be sought from a general/colorectal surgeon or urologist if suspected bowel or urinary tract injury has occurred. They, in turn, may decide to perform a laparoscopy or laparotomy depending on the extent of the suspected injury.

Gynaecologists will generally repair the defect in the uterus caused by the perforation and several suture materials can be used according to individual preference. However, in a few cases the injury will be so severe that hysterectomy is necessary. Hysterectomy is more likely if the surgeon was inexperienced and if there was a delay in performing a laparoscopy or laparotomy. This is generally because traumatised tissues rapidly become edematous with dissection being impeded by extensive expanding haematoma. In addition, the condition of the patient has generally deteriorated by now because of inadequate blood volume replacement.

Women whose injury occurred in a day unit or small independent sector hospital should be assessed, resuscitated and transferred for specialist care rather than undergo a laparoscopy on site. It is therefore vital that all units have arrangements in place for immediate consultant advice and transfer to hospital when such emergencies occur.

Following a uterine perforation and any associated injuries, admittance to hospital, intravenous antibiotics and close observation is necessary. Over the following 24 hours, temperature, blood pressure and bowel sounds must be monitored. Bowel sounds may initially still be present with bowel injury, peritonitis can take days to reveal itself clinically. Patients should be discharged after 24 hours if asymptomatic with instructions to return if any symptoms develop.
Risk management

Prior to any operation it is key that the intended procedure and potential complications are discussed and documented in the patient's notes. A valid legible consent form with clear documentation must be used.

Following a perforation, alerting all members of the team is vital. Communication with the anaesthetist must be made as the operation will take longer, and senior anaesthetic or surgical support may be required. It is important to administer muscle relaxant and antibiotics to the patient and formal endotracheal intubation may be required if not done so. The scrub nurse and theatre staff may need to prepare a laparoscopy or laparotomy set and will help to inform other senior colleagues if required.

All aspects of the procedure must be clearly documented in the operative notes and a clear postoperative plan of care made. Following this the consultant assigned to the patient must be informed if not directly involved and an incident form submitted. The patient must be seen for follow-up after discharge and a critical analysis of the situation made. The patient's general practitioner must be made aware of the complication and a risk management investigation made.

Additional, presenting the case in an educational meeting is important for learning purposes and may help to formulate local guidelines and protocols to manage patients appropriately in the event of a perforation.

Figure 1 shows the authors' proposed protocol for managing perforations in different situations.

Ethical issues

As discussed, uterine perforation can be catastrophic to the patient if not promptly recognised or managed appropriately. It is therefore very important to counsel women thoroughly and to explain potential complications and consequences in depth. A simple hysteroscopy or coil insertion can lead to laparotomy with visceral or blood vessel injury in worst-case scenarios. Knowledge of this may make a patient think twice about having a particular procedure especially if there is an alternative.

All alternatives must therefore be clearly explained to patients preoperatively which could be relayed in the form of leaflets or hospital information sheets.

The operating surgeon should see the patient and her notes and confirm the consent prior to the operation. This is within the good medical practice regulations set by the GMC. Performing emergency out of hours procedures on patients without seeing them may result in unexpected difficulties at surgery, that could be avoided or reduced by involving staff with appropriate levels of experience and seniority. Moreover, subsequent complaints and litigations can be reduced if the patient is familiar with her surgeon prior to the procedure.

Conclusion

Uterine perforation is a rare complication but can have potentially catastrophic consequences for women. It can be associated with severe morbidity. Appropriate training with supervision, assessment of risk factors and the use of cervical preparation can all help to reduce the risk of perforation.

Exercising caution in high risk cases should be compulsory and seeking help from senior gynaecologists as well as other specialties in a timely manner can not only help to decrease morbidity but also prevent any long-term sequelae. Standardisation of management is vital as considerable variation between operators currently exists.

Disclosure of interests

None declared.

References


