Complications of operative hysteroscopy: an anaesthetist’s perspective

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Operative hysteroscopy has revolutionised the management of gynaecological diseases. There were 71,000 hysteroscopies performed in England in 2019–2020, of which almost half were therapeutic. They are minimally invasive, cost and time effective and can spare patients major surgery. They are seen as low-risk procedures often performed in patients who are otherwise fit (ASA Grade 1 or 2), but complications in operative hysteroscopy can be immediate, severe and life-threatening. Over the past decade, multiple near-fatal and fatal events have been reported.1–3 This article aims to increase awareness of those complications, provide guidance on preventative measures and outline the immediate management of such events.

Surgical classification

Hysteroscopic surgery needs access through the cervix with a hysteroscope or a resectoscope, distension of the uterus with a fluid or a gas to visualise and the use of energy to coagulate or excise tissue. The Royal College of Obstetricians and Gynaecologists classifies operative hysteroscopy into three levels for training purposes:4

(i) Level 1: diagnostic hysteroscopy with a target biopsy or removal of simple polyps.
(ii) Level 2: proximal fallopian tube cannulation, removal of pedunculated fibroid or large polyp.
(iii) Level 3: resection of the uterine septum, endometrial resection or ablation, resection of submucous fibroids and repeat endometrial ablation or resection.

Despite the advanced surgical training and the high level of expertise required, there can still be challenges for the surgeon in dilating the cervix or obtaining a good view, which leads to a higher incidence of complications.

Complications

The reported incidence of complications varies widely, but a large prospective study found an overall incidence of 0.95%.5 The most frequently reported complications are haemorrhage (2.4%), uterine perforation (1.5%) and cervical laceration (1–11%). Complications are likely with complex procedures, especially if associated with cervical stenosis, uterine malposition, difficult uterine distension or obscuring blood.

Immediate and early complications

These complications occur during surgery or in the early postoperative period and the anaesthetist is likely to be involved in their management. They are mainly caused by cervical dilatation, distension media or surgical technique.

(i) Arrhythmias.
(ii) Uterine perforation.
Fluid overload during hysteroscopic surgery is generally low or cervical lacerations. Although the reported incidence of depth of tumour penetration and the presence of false tracks procedure, the pressure of irrigation fluid, the tumour size and factors increasing the absorption include duration of the mechanical and electrosurgical instruments. Fluid absorption distension media complications

During hysteroscopy, the uterine cavity needs to be distended, and this is achieved with either fluid or carbon dioxide. Carbon dioxide is used mainly in diagnostic hysteroscopy and fluid for operative procedures. Fluid allows continuous irrigation, provides a clearer picture and enables the use of both mechanical and electrosurgical instruments. Fluid absorption happens through exposed venous sinuses and fallopian tubes. Factors increasing the absorption include duration of the procedure, the pressure of irrigation fluid, the tumour size and depth of tumour penetration and the presence of false tracks or cervical lacerations. Although the reported incidence of fluid overload during hysteroscopic surgery is generally low (<5%), the consequences can be serious, especially in high-risk patients. Complications vary depending on the type of fluid used. In the case of the most common, isotonic fluid, fluid overload can occur when fluid deficit exceeds 2,500 ml in otherwise healthy patients or 1,000 ml in high-risk patients (e.g. those with heart failure). If a hypotonic solution is used, severe hyponatraemia and a syndrome similar to TURP syndrome, with or without fluid overload, are described. Glycine toxicity has also been reported. The British Society for Gynaecological Endoscopy and the European Society for Gynaecological Endoscopy guidelines recommend the following preventive measures:

- The use of sodium chloride 0.9% as irrigation fluid.
- Monitoring the inflow/outflow of fluid during the procedure.
- Calculation of fluid deficit.
- Informing other members of the team, particularly the anaesthetist, if the fluid deficit reaches 1500 ml in the case of sodium chloride 0.9% or 750 ml for glycine 1.5%, and stopping the procedure.
- Restricting i.v. fluids.
- Maintaining a normal MAP.
- The use of local anaesthesia (paracervical block) with sedation may reduce fluid absorption.

**Complications of operative hysteroscopy**

**Late complications**

Late complications occur weeks, months or even years after the procedure.

(i) Intrauterine adhesions.
(ii) Infection and pelvic inflammatory disease.
(iii) Complications in subsequent pregnancies (e.g. uterine rupture).
(iv) Haematometra.
(v) Post-ablation sterilisation syndrome.

**Management of immediate severe complications**

**Bleeding and uterine perforation**

Uterine perforation is one of the most common complications of operative hysteroscopy with an incidence of 0.8–1.5%. Uterine perforation can happen during cervical dilation or during insertion of the hysteroscope. Such a perforation may be recognised when an instrument passes beyond a depth of the uterine fundus, when there is a sudden loss of visualisation, when omentum or bowel or peritoneal structures can be visualised at the uterine fundus or when there is a sudden increase in the fluid deficit. The fluid deficit is the difference between irrigation inflow and outflow volumes.

Uterine perforation can lead to vaginal bleeding, visceral injury and, rarely, concealed intra-abdominal haemorrhage. If a perforation is suspected, the procedure should be stopped, the haemodynamic status of the patient assessed and urgent laparotomy considered if internal haemorrhage is suspected.

**Distension media complications**

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**Table 1 Prevention and management of venous gas embolism in operative hysteroscopy. CVC, central venous catheter; VGE, venous gas embolism**

<table>
<thead>
<tr>
<th>Prevention</th>
<th>Early detection</th>
<th>Prevent further entrainment</th>
<th>Resuscitation (massive VGE)</th>
<th>Consider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid exaggerated Trendelenburg positions</td>
<td>A sudden decrease in P€CO₂</td>
<td>Stop the surgery</td>
<td>Immediate call for help and escalation</td>
<td>Aspirate from CVC</td>
</tr>
<tr>
<td>Height of irrigation fluid restricted to &lt;1 m above the patient</td>
<td>Hypotension or hypoxia or bronchospasm</td>
<td>Immediate supine position</td>
<td>Cardiopulmonary resuscitation if indicated</td>
<td>Left lateral position (Durant position)</td>
</tr>
<tr>
<td>Automated fluid irrigation pumps</td>
<td>Classic ‘null-wheel’ murmur on auscultation</td>
<td>Disconnect the distension medium and check irrigation lines</td>
<td>Tracheal intubation, CVC and inotropes</td>
<td>Hyperbaric oxygen</td>
</tr>
<tr>
<td>Limit uterine distension pressures to &lt;100 mmHg</td>
<td>Dyspnoea and chest pain if awake</td>
<td>Deflate the uterus and occlude the cervix with wet guaze</td>
<td>Consider lengthy cardiopulmonary resuscitation (automated chest compression if available)</td>
<td>Precordial thump/chest compressions</td>
</tr>
<tr>
<td>Maintain normal MAP</td>
<td>Wide Paco₂/P€CO₂ gap</td>
<td>FIO₂ 1.0 and stop nitrous oxide if used</td>
<td>Echocardiography or abdominal ultrasound to confirm the diagnosis</td>
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<tr>
<td></td>
<td>Targeted ultrasound of the inferior vena cava or echocardiography can be used</td>
<td>Aim for higher MAP (fluids or vasopressors)</td>
<td>Consider extracorporeal membrane oxygenation if feasible</td>
<td></td>
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<td>to confirm the diagnosis</td>
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Venous gas embolism

Gas embolism is the most serious complication of operative hysteroscopy and is the main cause of fatal and non-fatal events reported in the literature. In one study, using transoesophageal echocardiography to detect gas embolism in operative hysteroscopy, gas emboli were detected in 49 out of 50 patients; in 40% of these patients, the amount of gas was considered significant. In another study of 150 patients, evidence of continuous air emboli was found in 34% of patients. Despite the high incidence of air emboli, serious consequences are considered rare: one in 1,140 in one study.

The pathophysiology involves the passage of gas into the exposed vessels caused by cervical laceration or venous sinuses within the uterus. Gas present around vessels can be air, gaseous products of electrocoagulation or carbon dioxide if used as the distension medium. A pressure gradient as a consequence of Trendelenburg position or high infusion pressures will drive gas into the vessels. In operative hysteroscopic procedures, the source of the gas is either from electrocoagulation (hydrogen, carbon monoxide and carbon dioxide) or from room air. Multiple reinsertions of the instruments during a difficult cervical dilation and prolonged exposure of a lacerated cervix to room air are major risk factors.

Strategies to prevent and manage venous gas embolism are shown in Table 1.

Conclusion

Most studies report a high degree of safety, effectiveness and patient satisfaction with operative hysteroscopy. However, serious complications, such as venous gas embolism, may occur and potentially lead to mortality in otherwise healthy women. The most common complications are preventable if risk factors are considered and precautionary measures taken.

Declaration of interests

The authors declare that they have no conflicts of interest.

References