Complications of laparoscopic surgery

Oliver P O'Donovan

Arvind Vashisht

Abstract

General principles in the prevention, recognition, management and follow-up of common laparoscopic complications are illustrated using three example cases. The examples given are of major vessel, urinary tract and bowel injuries, but also provide a framework on which to hang discussion of other relevant issues such as key surgical principles, team work, laparoscopic equipment and devices, consent, risk management and duty of candour and patient communication.

Keywords intraoperative complications; laparoscopy; postoperative complications

Introduction

Once the realm of only specialist surgeons, laparoscopic operating is now practised widely by virtually all gynaecologists. This transition has occurred in the large part due to the clear benefits, technological advances, and improvement in both acquisition and teaching of the necessary skills. As a result the number and complexity of laparoscopic gynaecological procedures increases year on year. All surgical procedures carry risk and laparoscopy is no exception; on the contrary it brings a host of its own specific complications. Through the use of case examples we will summarise and highlight the prevention, recognition and management of major risks particularly pertinent to laparoscopy.

Complications can be categorised by severity, incidence, timing (immediate, early or late) and by the body system or organ affected. Awareness, anticipation, prevention and correction are the cornerstones of minimising their occurrence and morbidity.

Fortunately severe complications are rare, but this means that we rarely practice their management and, as the time of the incident is likely to be stressful, we would do well to think about how one would manage situations ahead of their occurrence. This might include practising relevant skills or techniques and writing protocols for potential adverse circumstances. Obstetricians regularly carry out simulations or drills to practice optimal management of emergency situations, but as yet this has not taken-off in gynaecology. There is no reason why it should not and there are programs and courses available which aim to do exactly this.

Oliver P O'Donovan *BSc MBBS MRCOG is an ST 7 Trainee in Advanced Laparoscopic Surgery at University College London Hospital, UK. Conflicts of interest: none declared.*

Arvind Vashisht *MA MD MRCOG is a Consultant Obstetrician and Gynaecologist at University College London Hospital, UK. Conflicts of interest: none declared.*

Case 1

Lucy was a 28-year-old teacher with dysmennorhoea and dyspareunia. Her BMI was 16 and she had no relevant medical or surgical history. She was admitted for laparoscopic treatment of suspected mild endometriosis. A routine pneumoperitoneum was achieved with Veress entry via the umbilicus. Palmer's test was normal and initial gas pressures were between 4 and 6 mmHg. An umbilical trocar was inserted without difficulty.

When comparing the risks of laparoscopic versus open surgery, the largest increase in risk is seen at the time of entry of either Veress needle or of trocar. The RCOG/British Society for Gynaecological Endoscopy (BSGE) guideline "Preventing entry-related gynaecological laparoscopic injuries" (formerly RCOG Green Top Guideline No. 49) details the incidence of complications and techniques to minimise them. Based on large multicentre trials of tens of thousands of women, it suggests the risk of major complication is between 1.4 and 5.7 in 1000, with bowel injury being about twice as common as urological injury and six times as common as vessel injury.

The guideline above gives a clear summary of recommended techniques and repetition is not necessary here, but in this case entry appears to have been routine and the correct tests performed. It is common but not exclusive practice to empty the bladder (to minimise risk of injury to a distended bladder), and a three stage check of correct Veress placement should be performed before the gas flow and pressure are turned-up (see Box 1). The technique chosen may vary depending on history and physical characteristics.

The BSGE/RCOG guideline recommend a Hasson (open) or Palmer's entry in women "who are very thin" due to the narrow distance between the skin and the aorta, and also in the morbidly obese as even a slight deviation from the base of the umbilicus may result in a large distance from the skin to the peritoneum

The three-stage check for correct Veress needle entry

Palmer's test—Attach a saline filled 10 ml syringe to the Veress needle. First aspirate; if the Veress is in the bowel or a blood vessel you may see bowel contents or blood. Next inject; if you are not in a space it may be difficult. Finally either remove the syringe from the needle or the plunger from the syringe, and the meniscus should drop freely if the end of the needle is unobstructed.

Gas pressure test—When the Veress is correctly placed within the peritoneal cavity the starting gas pressure should be less than 8—10 mmHg.

Abdominal examination—The abdomen should be seen to fill symmetrically. If not there is concern that it is filling a localised structure such as the bowel or stomach. Surgical emphysema suggests the needle is extraperitoneal. The abdomen should be percussed to demonstrate a resonant sound and loss of liver dullness in the right upper quadrant.

NB. These are not evidence based checks, but considered best practice.

Box 1

Please cite this article in press as: O'Donovan OP, Vashisht A, Complications of laparoscopic surgery, Obstetrics, Gynaecology and Reproductive Medicine (2017), http://dx.doi.org/10.1016/j.ogrm.2017.04.004

and difficult or failed entry. Entry at Palmer's point (3 cm below the left costal margin in the mid-clavicular line) is safest in those at significant risk of umbilical adhesions, unless there is history of surgery in the left upper quadrant or splenomegaly. The stomach must be emptied (by means of a temporary oro- or nasogastric tube) beforehand to avoid gastric injury. Threshold for the use of Palmer's point should be low as umbilical adhesions may occur in up to 50% of those with previous midline incisions and 23% of transverse incisions. Although the incidence of relevant adhesions following Caesarean section is not known, it is thought to be less than other surgery and there are wide-ranging hypotheses as to why this might be.

A 2015 Cochrane review included 46 RCTs examining 13 different entry techniques. Overall the conclusion was, "that there was insufficient evidence to recommend the use of one entry technique over another". The evidence was noted as being of generally very low quality, but there was a statistically significant decrease in failed entry in the open versus closed groups, and decreased vascular injury and failed entry with direct trocar entry versus Veress technique. It has been estimated that trials involving upwards of 800,000 patients would be required to demonstrate a reliable difference in the safety of entry techniques.

On 360 degree review of the abdominal cavity significant blood and a rapidly expanding retroperitoneal mass were noted. A major vascular injury was immediately diagnosed and a midline laparotomy performed without delay, the on-call vascular surgeon fast-bleeped to attend and the major haemorrhage protocol initiated. At laparotomy it was difficult to visualise the anatomy as the abdomen kept welling up with blood, so constant pressure was applied against the aorta and the expanding pelvic swelling, until the arrival of the vascular team. The vascular team arrived ten minutes later and diagnosed a tear in the inferior vena cava. They repaired the tear and were satisfied with the result. Two large drains were left in-situ.

There is no argument that in the event of major vessel injury immediate (midline) laparotomy is required with control of bleeding until a suitably trained, preferably vascular, surgeon arrives. Both the aorta and vena cava are retroperitoneal and it is difficult or impossible to clamp or tie them without significant dissection. Initial actions therefore should be application of pressure, volume replacement, and triggering of a major haemorrhage protocol. Senior expert assistance should be sought, which may include several specialties such as gynaecology, obstetrics (who are familiar with massive blood loss), anaesthetics, haematology, and general surgery (especially in units where vascular support is not on site). Ideally a vascular surgeon should attend to repair the damage by suturing or patching the defect or using endovascular prostheses.

There may be debate over the best way to manage laparoscopic injury of small to medium sized blood vessels, and the method chosen will depend heavily on the experience, skills and confidence of the operating surgeon and the equipment and support available to them. Methods to control bleeding laparoscopically include direct pressure, clamping the vessel with a laparoscopic instrument, laparoscopic suturing, the use of bipolar energy or other sealing devices and the use of clotting agents. Turning up the gas pressure to 20–25 mmHg may additionally assist haemostasis in low-pressure bleeding. It is however important to note that if control is not rapidly achieved laparotomy as described above should not be delayed.

In cases resulting in clotting abnormality or large raw areas of tissue, the insertion of a drain should be considered. They provide a "window" into the abdomen to warn of ongoing blood loss and help to reduce the risk of collections. They should be removed as soon as there is confidence there is no ongoing bleeding in order to reduce patient discomfort, encourage mobility and because they can become sites of infection.

Meanwhile the anaesthetic team fluid resuscitated the patient, first with crystalloids and colloids and then O negative blood and cross-matched blood when it became available (all given through a rapid infuser and warmer). Fresh frozen plasma (FFP) was given at a 1:1 ratio with each unit of blood after the first 2 units. Tranexamic acid 1 g IV was given. The anaesthetic team inserted central and arterial lines and spoke to the on-call intensive care doctor to inform them of the need for a bed on the intensive care unit (ITU). Although the haemocue at one point showed a haemoglobin of 67 g/dl, the patient remained relatively stable and clotting results were normal, so on the advice of the consultant haematologist no cryoprecipitate or platelets were given.

Resuscitation of the patient is the realm of the anaesthetist but it is important that the surgeon has a good understanding so they can support their colleague and participate in informed decision making. Volume replacement should start quickly and be predictive so as not to "get behind". All hospitals should have a major haemorrhage protocol that can be initiated and result in the expedient arrival of blood products and expert support. Cell salvage equipment should be set-up as autologous transfusion is preferable, but there must not be a delay in transfusion. O negative blood should be given at a low threshold whilst awaiting autologous, group specific or fully cross matched blood. Bedside tests such as haemocue and blood gas results can be used to guide red cell replacement. In major haemorrhage clotting factors are used up and lost quickly and must be replaced to maintain clotting function and prevent disseminated intravascular coagulation. Coagulation function should be monitored by laboratory and bedside testing (e.g., thromboelastograph) and replacement guided by the haematologists. Where there is no time to await results, battle field experience and large civilian prospective trials have shown a ratio of 1 unit of FFP to every unit of blood improves outcome, and this should be started "blind". The randomised controlled CRASH-2 trial included more than 20,000 major haemorrhage patients in 40 countries and showed a 10% decrease in mortality in those patients given the anti-fibrinolytic tranexamic acid compared to those given placebo, with earlier administration having a greater effect.

Lucy was extubated later that day and after 48 hours on ITU was transferred to the vascular ward where she made a good recovery. All the teams involved fully debriefed Lucy and her family as to the events which had occurred. The lead surgeon had an honest and candid discussion with them and apologised. A serious untoward incident investigation was carried out by the risk management team, and although it was felt to be a known complication of the procedure, it was commented that in patients with a low BMI (and children) consideration should be given to open (Hasson) entry for pneumoperitoneum. This learning point was disseminated to all surgeons and trainees.

Please cite this article in press as: O'Donovan OP, Vashisht A, Complications of laparoscopic surgery, Obstetrics, Gynaecology and Reproductive Medicine (2017), http://dx.doi.org/10.1016/j.ogrm.2017.04.004