

# Complications of laparoscopic surgery

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## Abstract

Minimally invasive surgery is widely accepted as the gold standard for many gynaecological surgical procedures. The benefits to the woman, the surgeon and health care providers are well documented; however unique complications from patient positioning, abdominal entry and specific instrumentation and electrosurgery pose challenges that the surgeon must always keep in mind and address when they occur. This article presents different scenarios of complications related to laparoscopic surgery in both the immediate and post-operative times, with discussion of the management of such complications.

**Keywords** complication; gynaecology; laparoscopy; neurological injury; urological injury

## Introduction

Laparoscopic surgery offers many advantages to patients, such as reduced recovery time, shorter hospitalisation and improved cosmesis. With an increasing range of laparoscopic equipment and surgical expertise, a large number of gynaecological conditions may be managed laparoscopically.

Laparoscopic surgery offers many potential challenges to the surgeon, ranging from difficulty obtaining access to impeded surgical views from adhesions or pelvic pathology. Complications may arise from injury sustained during entry, or intra-operatively from dissection, retraction or use of electrosurgery. Although laparoscopic complications are uncommon, damage to visceral or vascular structures has the potential to cause serious morbidity or mortality. Additionally, the unique positioning of the patient in laparoscopic surgery has the potential to cause neurological injury, which may lead to long-term motor or sensory deficits.

This review gives three scenarios of laparoscopic complications to illustrate techniques to minimise the chance of an injury occurring, and if an injury does occur, strategies for early recognition and appropriate management of the complication.

### Scenario 1: delayed presentation of a bowel injury

*A 30-year-old woman undergoes a laparoscopic ovarian cystectomy for a dermoid cyst. She has previously had a caesarean delivery via pfannenstiel incision and laparoscopic appendicectomy. 3 days after her operation, she presents to the emergency*

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*department, with symptoms of increasing abdominal pain, shortness of breath and feeling generally unwell. The operation notes show an uncomplicated ovarian cystectomy performed with Veress needle entry at the umbilicus. She is seen in the emergency department and diagnosed with a urinary tract infection and is sent home on oral antibiotics. She returns the next day pale, sweating, hypotensive and tachypnoeic with a fever of 38 degrees, distended abdomen with rebound tenderness. A bowel injury is suspected.*

Any patient representing after laparoscopic surgery requires careful review. Unrecognised bowel injury is a serious complication of laparoscopic surgery with high morbidity, and mortality rates of up to 3.6% are reported. With a delayed presentation of bowel injury, symptoms are variable, ranging from low-grade fever and abdominal pain to peritonitis, septicaemia and shock. Respiratory symptoms such as tachypnoea may be misdiagnosed for other illnesses such as pneumonia or atelectasis. Clinicians should have a low threshold for admission for observation and investigation for any patient representing after laparoscopic surgery, especially if symptoms are vague and difficult to attribute to a specific cause.

Although extremely serious, bowel injury is an uncommon complication of laparoscopic surgery, with figures of 1–2 cases per 1000 operations. It has been estimated that half of all intestinal injuries are entry related, and only 30–50% of injuries are recognised during the primary surgery. Studies comparing direct entry with Veress needle entry have not determined a difference in organ injury rate, however, there is a reduction of extraperitoneal insufflation and failed entry. Reduced risk of extraperitoneal insufflation was also reported in comparisons between radially expanding trocars and standard direct trocar entry. Other aspects of entry that are reported to impact safety for laparoscopic entry include the site of insertion of the Veress needle (transumbilical, infraumbilical, 'Palmer's' point and suprapubic); lifting the abdominal wall before needle insertion; patient positioning and various tests to ensure correct placement of the Veress needle prior to insufflation. With all of these variants, the same constraints regarding proof of safety arise as with the primary entry method.

The possible causes of bowel injury in this situation apart from entry with the Veress needle is injury sustained during the operation. Causes of intraoperative injury include use of instruments on the bowel during retraction and dissection, or indirect thermal injury to the bowel. A Richter's hernia is another potential cause for bowel injury, and occurs when bowel herniates through port sites.

The major risk factor for bowel injury is adhesions from prior surgery. If extensive adhesions are suspected, Palmer's point entry should be used. A 360 degree inspection of the abdomen and bowel surrounding the entry point should be undertaken after every entry to the abdomen. Type 1 bowel injuries (those that arise when the bowel is correctly positioned in the abdominal cavity) are rare complications of entry if the correct technique is followed. Type 2 injuries (those that arise when the bowel is abnormally positioned) are difficult to avoid with any entry technique, so recognition at the time is important. Immediate signs of intestinal injury range from obvious faecal contamination within the peritoneal cavity, to more subtle signs such as a haematoma of the bowel wall.

It is difficult in this case to know whether the bowel injury was sustained from entry or during the cystectomy. Adequate documentation in the surgical notes is essential for any surgical procedure. The notes should reflect any difficulty encountered during entry to the peritoneal cavity or during the surgery. If division of bowel adhesions is required, the use of electro-surgical energy near the bowel should be avoided and this should be documented in the notes.

Having a high index of suspicion for bowel injury and initiating prompt management is a priority in any patient who is unwell after a laparoscopic procedure. Management involves administration of broad spectrum antibiotics, rehydrating the patient with IV fluids, insertion of a nasogastric tube and keeping the patient nil by mouth until a diagnosis is established. The surgical team should be involved early in the management of any patient with suspected bowel injury. A colostomy may be required in the management of a bowel injury, and counselling for this should ideally take place prior to any further surgery.

Investigations that may be considered for an unwell patient with suspected bowel injury include procalcitonin, CRP and radiology such as erect chest X-ray, ultrasound and abdominal CT with contrast. Studies suggest that procalcitonin is a better marker for sepsis than CRP, but both markers have sensitivity and specificity less than 90%. Pneumoperitoneum is one of the most reliable markers of bowel perforation, and CT is more sensitive than ultrasound or X-ray at detecting this. After laparoscopic surgery, pneumoperitoneum is to be expected initially, but this should resolve within 72 hours.

Other CT findings suggestive of bowel injury include mesenteric infiltration, bowel wall thickening and extravasation of contrast. Ultrasound is less reliable at detecting the presence of free air, but may be useful in detecting fluid collections. Imaging may be non-diagnostic, and attention should be given to the patient's clinical status to avoid deterioration in the patient's clinical state while awaiting pathology or radiology results. A repeat laparoscopy should be considered, especially if the diagnosis remains uncertain. If, at a repeat operation, a bowel injury is confirmed, a thorough peritoneal washout should be undertaken, and resection of the damaged section of bowel may be required, which may then necessitate formation of a stoma.

## Case 2: neurological complication from laparoscopic surgery

*A 25-year-old woman undergoes laparoscopic excision of endometriosis. The operative time is 2 hours, and there are no intra-operative complications. In recovery after waking from anaesthesia, the woman complains of impaired sensation on her left upper thigh.*

This woman presents with symptoms of a neurological injury sustained from her laparoscopic surgery. Nerve injuries are uncommon complications of laparoscopic surgery. Mechanisms of nerve injury include transection, compression, stretching or entrapment.

Attention to proper patient positioning during any laparoscopic procedure is critical. A woman's arms should always be positioned next to the body, in a neutral position with the thumb pointing up. Fully supportive stirrups such as Yellowfin™ or Ultrafins® should always be used for her legs in preference to Allen stirrups that place an undue amount of pressure on the foot and common peroneal nerve. Recommendations for patient

positioning include hip flexion of 60–170 degrees, knee flexion of 90–120 degrees, hip abduction of less than 90 degrees (measured from inner thigh to inner thigh), and minimal external rotation of the hip. Such positioning facilitates movement of the legs from high to low lithotomy, and minimises the strain on the nerves of the lower extremities.

A major risk factor for neurological injury is the length of the procedure, with every hour in lithotomy increasing the risk of lower limb neuropathy 100 fold. Other risk factors include low BMI and systemic diseases such as diabetes.

Brachial plexus injury from laparoscopic surgery has an incidence of 0.16%. Injury may result from steep Trendelenburg position in association with the patient's arm extended at 90 degrees on an arm board. The mechanism of injury is usually from stretching of the C5-7 roots of the brachial plexus. Shoulder devices used to prevent the patient sliding can increase the risk of brachial plexus injury, and should be avoided especially if the arm is extended, as injury may result from compression of the brachial plexus between the shoulder brace and first rib. Symptoms of brachial nerve injury include sensory deficits of the forearm and hand. More serious injuries include muscular weakness, with injury to C5-6 resulting in Erb's palsy and injury to C7-T1 resulting in Klumpke's paralysis. To avoid neurological injury to the upper limb, it is recommended that the patient's arm are always tucked adjacent to her sides.

Laparoscopic gynaecological procedures have also been associated with injury to the lower extremity nerves; femoral, obturator, lateral femoral cutaneous, sciatic and common peroneal. Sensory nerve deficits have been reported at a rate of 1.5%, with persistent motor disability reported at 0.03%. An increased incidence of injury to the common peroneal nerve has been associated with use of the Allen (hanging candy cane) stirrup, and therefore using the boot stirrup for all patients in lithotomy position is always preferred.

The lower extremity nerves may be injured as a result of prolonged hip flexion, abduction or external rotation. The femoral nerve may be injured as a result of prolonged stretching under the inguinal ligament. Injury may manifest as loss of sensation over the upper thigh, and motor injury may result in deficits to the quadriceps, with the inability to extend the knee.

The lateral femoral cutaneous nerve runs a similar course to the femoral nerve and may be injured by similar mechanisms. The lateral femoral cutaneous nerve has no motor component and symptoms of injury include pain and numbness on the proximal–lateral aspect of the thigh.

The obturator nerve may be injured from prolonged stretching of the nerve at the obturator foramen. Sensory deficits will result in numbness in the medial thigh, and motor deficit may result in weakness of the adductor muscles. Although sensory deficits from the obturator nerve are one of the more common forms of neurological injury from the lithotomy position, motor deficits are rare.

Injury to the sciatic nerve is rare, but may occur from prolonged hip flexion, especially if the knee is extended. Severe injury can affect the hamstring muscles, with inability to flex the knee.

The common peroneal nerve is one of the most commonly injured nerves from lithotomy position. Injury may be minimised by avoiding hanging stirrups, which increase the risk of pressure on the nerve. Injury may also occur by prolonged flexion of the knee. 'Foot drop' is a severe sequelae of common peroneal nerve injury.

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