Diagnosis and management of bowel injury during laparoscopic surgery

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Laparoscopic bowel injury is a rare but potentially devastating complication of keyhole surgery. Consideration of this complication and a high level of suspicion of its occurrence are critical, not only by the surgical team involved, but also by the doctors and nurses looking after the patient in the community.

We describe an unfortunate chain of events that befell one of the authors of this article (FA; see 'The case') and outline the important lessons that may be learned. These can be subdivided into:
- case selection and informed consent
- operative technique
- recognition of the problem and its prompt management
- dealing with the aftermath of the complication.

THE CASE

FA suffered a serious adverse event as a result of small-bowel perforations, which occurred during an elective laparoscopic mesh repair of a midline incisional hernia in an NHS hospital. The hernia was related to a previous sigmoid colectomy for a diverticular stricture, performed elsewhere seven years previously. It is not certain that the perforation could have been picked up intraoperatively, but it should have been possible to diagnose it within 48 hours. Unfortunately, he was incorrectly reassured by junior staff that the residual intraperitoneal free gas visible on X-rays was a result of residual insufflated CO2; that his pyrexia and tachycardia were the result of a basal pneumonia; and that the obvious peri-umbilical cellulitis was caused by a mesh infection.

The consultant concerned did not perform a clinical examination until day four – and then only repeated the mistaken reassurance. He eventually requested a contrast computed tomography (CT) scan, leading to an emergency laparotomy, where the perforation was exteriorised as a loop ileostomy and an incisional laparostomy created. The patient was then ventilated for over a week. A few days and one cardiac arrest later, a junior doctor performed a ‘second-look’ laparotomy and repaired a second perforation, which may have been caused by the difficult dissection of friable bowel rather than a pre-existing fistula. During this and a further subsequent washout, a section of abdominal wall was excised.

After weaning from the ventilator, recovery was further delayed by a large subphrenic abscess, which had to be drained percutaneously, and early closure of what turned out to be a very proximal jejunostomy, which had resulted in persistent weight loss and electrolyte disturbances.

Although he now has the abdominal profile of a seven-month pregnancy, the patient feels the most distressing residuum of the affair was the poor communication and lack of an apology, which eventually led him to seek legal advice (and pursue a successful claim).
CASE SELECTION AND INFORMED CONSENT
Most bowel injuries that occur during laparoscopic surgery arise as a result of pre-existing intra-abdominal adhesions. These may result in bowel injury during initial laparoscopic access or subsequent adhesionolysis. If adhesions are suspected, an alternative open or extraperitoneal approach should be considered to reduce the risk of bowel injury. Before surgery all patients, especially those who have undergone previous laparotomy, should be informed of the risk of rare complications, including bowel injury, and this hazard should be specifically included in the consent form.

OPERATIVE TECHNIQUE
Because most complications occur during the access phase of laparoscopy, a number of abdominal approaches to the creation of the pneumoperitoneum have been proposed. Proponents of the open technique argue its superiority over blind entry with the insufflation needle (Veress needle). During the open technique, a mini-laparotomy is created. The skin, rectus sheath and peritoneum are all incised under direct vision and a blunt trocar and cannula inserted, with subsequent creation of a pneumoperitoneum.

There are data from prospective trials suggesting that open entry may be safer, although it is slower and results in more gas leakage around the port site. However, there is insufficient evidence to conclude that one technique is superior to another. In fact, in a survey conducted by Jansen and colleagues, no statistical difference was noted between open and closed entry with respect to vascular injuries, although the number of patients was limited. A randomised study comparing blind Veress needle insertion and the open technique reported a longer insufflation time with the Veress needle and a longer preparation time with the open technique. However, no difference in complication rates was observed.

Trauma to the large or small bowel may occur during either the creation of the pneumoperitoneum or the operative portion of laparoscopy, often during initial adhesiolysis. Both types of injury are more frequent in the event of previous surgery and/or infection, which can result in the fixation of the bowel to other structures by adhesions, particularly the anterior abdominal wall. Almost half of all bowel injuries are access-related and occur with the insufflation needle or with one of the port-site trocars.

The incidence of laparoscopically induced gastrointestinal injury has been reported to be 0.13 per cent by van der Voort and colleagues. In their review, the most common location of injury was the small bowel (55.8 per cent), followed by the large intestine (38.6 per cent) and, less commonly, the stomach (3.9 per cent). Common signs that a bowel injury has occurred include the detection of foul-smelling gas or visible bowel contents, high insufflation pressures and asymmetric distension. Early diagnosis is critical because the morbidity and mortality associated with bowel injuries appear significantly affected by the time at which the insult is identified. One simple step to preclude delay in diagnosis is to view the initial trocar site through a lateral port if there is concern about anterior wall adhesions.

Injury to the gastrointestinal tract may occur during the operative portion of any form of laparoscopic surgery. In the review by van der Voort and colleagues of 273 bowel injuries, three (1.1 per cent) and two (0.7 per cent) occurred with the grasping forceps and scissors, respectively. In contrast, 70 (25.6 per cent) thermal injuries were reported and occurred with either a coagulating instrument or the laser. In addition, both electrothermal bipolar vessel sealers and ultrasonic coagulating shears (eg the Harmonic Scalpel, Ethicon Endo-Surgery, Cincinnati, OH, USA) appear to be superior in achieving haemostasis when compared with older monopolar and bipolar electrocoagulation devices. They also appear to be safer, in that lateral thermal injury is more common in monopolar and bipolar instruments. However, lateral thermal injury is possible with any method of coagulation and perforation may be delayed several days following an ischaemic injury to the bowel. Clearly, careful training, mentoring and supervision of trainees and consultants in laparoscopic techniques are vital, especially given limited vision and control of the operative field compared with open surgery.

RECOGNITION OF THE PROBLEM
Early bowel perforation develops during or directly after surgery, whereas a late perforation may manifest itself several days or even weeks following the surgery. As patients are now discharged from hospital rapidly after laparoscopic surgery, the diagnosis may need to be made in a primary care setting.

Clinical suspicion of the problem is key, as clinical signs can be subtle (Box 1). If the diagnosis of a full-thickness perforation is delayed, peritonitis, severe sepsis, multi-organ failure and even death may occur.

BOX 1. Physical signs of bowel injury following laparoscopy

- Increasing or persistent abdominal pain
- Abdominal distension or tenderness
- Continued or increasing opiate requirements
- Nausea, poor appetite
- Reluctance or inability to mobilise
- Rigors, fevers or persistent pyrexia
- Inflammation or discharge around the port sites (Figure 1)
- Tachycardia or any arrhythmia (eg atrial fibrillation)
- Poor urine output
- Excessive drainage of blood or contents of small or large bowel
- Raised inflammatory markers
- Respiratory complications, especially basal septic effusion
Superficial thermal injuries to the bowel can sometimes be repaired by a purse-string suture, which is placed beyond the thermally affected tissues. In the event of complete perforation, unless there was direct visualisation of the site of injury at the time of occurrence, the surgeon should consider proceeding to a laparotomy to explore the abdomen adequately and make sure that further perforations have not been missed, as delayed diagnosis can be catastrophic. In this context it should be remembered that bowel injury can result inadvertently from the actions of the assistant, such as when passing a needle or retracting too vigorously during the division of adhesions – these are often out of the view of the camera.

Any patient who develops unexplained abdominal pain, fever or a raised white cell count and/or an increase in serum C-reactive protein levels after a laparoscopic procedure should undergo early CT scanning with contrast, and there should be a low threshold for repeat laparoscopy or laparotomy.

DEALING WITH THE AFTERMATH

After any serious adverse event, but especially after a delayed diagnosis of a laparoscopic bowel injury, the timing and manner in which the patient and his relatives are communicated with are critical. The first step is to acknowledge the problem, openly admit that an error has occurred, and apologise for the problem. Most patients are forgiving of an error freely admitted and honestly explained. The second step is to investigate fully and document the detailed nature of the serious adverse event, and to consider the lessons that can be learned from it. Protocols and training routines need to be established to ensure that similar mistakes are avoided in the future. Unfortunately, the existing complaint procedures in many hospitals are laborious and unwieldy, and, as in the case described above, this may lead to anger, frustration and eventually to litigation.

Meanwhile, the cost to the NHS of litigation continues to spiral upwards at a time of increasing financial difficulties. The cost of no-win, no-fee legal claims has risen 16-fold over five years. The cost of clinical negligence cases settled by the NHS under ‘conditional fee arrangements’, in which the solicitors get paid only if they win a case – in costs and damages – has risen from £6.5 million in 2004–5 to £108 million last year. The NHS Litigation Authority reported a significant increase in the number of claims received last year. Clinical claims rose by more than 11 per cent and non-clinical claims by 10 per cent. The amount paid out for all clinical negligence claims rose from £661 million to £807 million, of which the lawyers themselves took some 38 per cent. Since 2001, the overall bill for successful claims against the NHS has doubled to £8 billion, and in many cases the lawyers receive larger pay-outs than the victims they represent.

CONCLUSIONS

Laparoscopic bowel injury is a rare but potentially devastating complication of keyhole surgery. Consideration of this complication and a high level of suspicion of its occurrence are critical, not only by the surgical team involved, but also by the doctors and nurses looking after the patient in the community. Symptoms and signs of the problem are often subtle, and CT scanning with contrast is the best way to confirm the diagnosis. Urgent surgery is required to deal with the problem and prompt action is vital, as multi-organ failure may swiftly ensue. Poor communication and a lack of a frank apology during the management at this stage will often increase the risk of subsequent litigation.

REFERENCES


![Figure 1. Port sites used for robot-assisted radical prostatectomy](image)