Laparoscopic surgery for inflammatory bowel disease

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Laparoscopic surgery for inflammatory bowel disease is an expanding field, which has physical benefits to the patient and economic benefits to the trust and community.

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Although laparoscopic surgery has gained much publicity in the last two decades, it has been performed for over a century. A brief summary of the history of laparoscopy is shown in *Table 1*.

Initial complications of laparoscopy such as thermal, bowel and vascular injury posed significant problems, but these reduced as technology improved. Cosmesis is one advantage of laparoscopic surgery, which is attractive to patients and shown in *Figure 1*. The advantages and disadvantages of laparoscopic surgery are listed in *Table 2*.

ASSESSMENT

Contraindications

Absolute contraindications are colonic perforation, severe sepsis, and severe cardiovascular or pulmonary disease. Relative contraindications are pregnancy, coagulopathy, portal hypertension, multiple laparotomies, toxic megacolon and a complex Crohn's mass or fistula.

Preparation

Patients are generally referred from gastroenterologists, and are fully investigated (including whole gut imaging with barium meal and colonoscopy) and on maximal therapy. Patients are prepared for theatre as for open surgery (*Table 3*). It is important to assess nutrition with any patient with inflammatory bowel disease likely to require surgery and begin dietary supplementation preoperatively if required and possible. Patients are informed of the possibility of a stoma and possibility of conversion to an open procedure. Conversion rates range from 0–40% (Schmidt et al, 2000; Francombe et al, 2001).

TABLE 1.
History of laparoscopic surgery

1901	Kelling performed first laparoscopy (Kelling, 1902)
1910	First laparoscopy on humans (Jacobeus, 1911)
1929	Kalk, who some call the ' father of modern laparoscopic surgery', developed sophisticated lens system (Gunning and Rosenzweig, 1991)
1983	First laparoscopic appendicectomy (Semm, 1983)
1991	First laparoscopically-assisted colectomy (Jacobs et al, 1991; Schlinkert, 1999)

PROCEDURE

The operation is performed under general anaesthesia with the patient in the supine position; legs abducted and flattened, hips and knees flexed to a maximum of 15° (right). This allows free movement of instruments. They are prepared and draped as for open surgery.

Port access

The authors recommend open insertion of the first trocar (Hassan technique). Using a 12 mm infraumbilical incision the umbilical stalk is identified and incised, then by blunt dissection the peritoneal cavity is entered. A 10/12 mm port is inserted, pressure confirmed (<8 mmHg) and insufflation initiated. Further ports are sited according to the procedure to be performed.

The incidence of visceral injury during blind insertion of a Verres needle ranges from 0.05 to 0.2% (Crist and Gadacz, 1993), hence the authors' lack of enthusiasm for this technique.

Insertion of any port can cause haemorrhage and is performed under direct vision following insertion of the laparoscope. The incidence of hernias is 0.1–0.3% (Crist and Gadacz, 1993), so fascial defects of 10 mm or more are closed.

Pneumoperitoneum: This is the basis of laparoscopic surgery. Carbon dioxide (CO_2) is insufflated into the peritoneal cavity. Once this is complete a laparoscopy is performed, inspecting the abdominal viscera, and additional ports are then inserted. CO_2 is used because it is readily dissolvable and easily removed via the pulmonary

system unlike nitrogen. The pressure of CO_2 raises intra-abdominal pressure with resultant detrimental respiratory, cardiovascular and renal effects. A pressure >20 mmHg results in inferior vena cava compression and reduction in renal function and urine output, so the authors recommend insufflating to a maximum of 15 mmHg. Insufflation is potentially complicated by arrhythmias, subcutaneous emphysema, venous gas embolism, pneumomediastinum, pnemopericardium and pneumothorax (Kent, 1991; Cunningham, 1994).

Patient position: The use of gravity to move tissues and obtain reasonable views necessitates a head-down position (Trendelenburg) for lower abdominal surgery and head up (reverse Trendelenburg) for upper abdominal surgery.

CROHN'S DISEASE

These patients are likely to need more operations than those with ulcerative colitis (UC), the commonest being laparoscopic resection of the terminal ileum, caecum and part of the ascending colon (ileocolectomy). Other laparoscopic procedures are stricturoplasty, faecal diversion, small bowel resection, segmental colonic resection and total/subtotal colectomy.

Ileocolectomy

Laparoscopic-assisted colectomy has been shown to be safe in a large series and randomized trial (Ortega et al, 1995; Milsom et al, 2001).

Procedure: The patient is prepared as described above and theatre arranged as shown in *Figure 2*. The ports are inserted as shown in *Figures 1* and *3*. The bowel is mobilized, starting with the caecum and ascending colon. With sharp dissection the peritoneum is incised and the defect extended to the hepatic flexure. The ileum is then mobilized; if the specimen easily reaches the midline then mobilization is adequate. The bowel is delivered through a 4–5 cm incision and the ileocolic vessels ligated.

Resection and anastomosis is performed extracorporally (*Figures 4* and *5*). Anastomoses should be widely patent to prevent recurrence, hence end-

Figure 1. Distribution of scars following laparoscopic ileocolectomy.

TABLE 2.
Advantages and disadvantages of laparoscopic surgery

Advantages	Reduced blood loss
	Reduced pain
	Reduced analgesic requirement
	Reduced pulmonary complications
	Reduced morbidity
	Quicker recovery
	Shorter stay in hospital
	Reduced overall cost
	Cosmesis
	Minimal wound complications
	Reduced impairment of immune response
Disadvantages	Elaborate procedure
	Prolonged operating time
	Increased surgical expense
	Difficult learning curve

From Hershman and Francombe (2003)

TABLE 3.
Preparation before surgery

Serum biochemistry (including albumin), full blood count, cross match
Electrocardiogram and chest X-ray if required
Deep vein thrombosis prophylaxis with low molecular weight heparin, thromboembolic deterrent stockings and pneumatic compression boots
Bowel preparation is recommended for ileocolectomies but is not required for stricturoplasty
Prophylactic broad-spectrum antibiotics

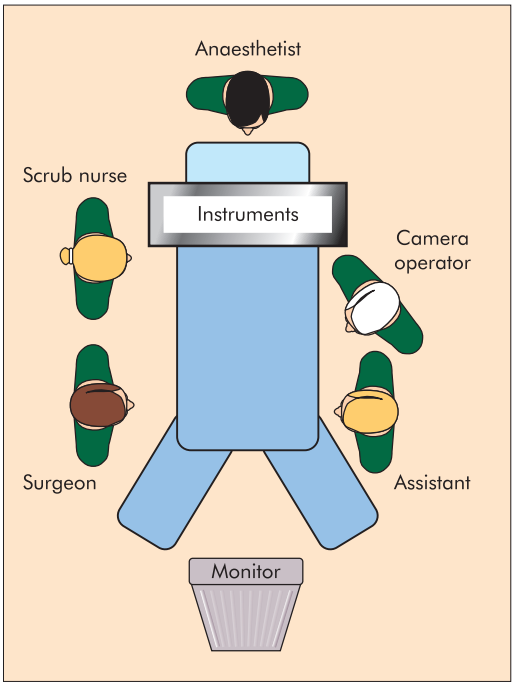

Figure 2. Position of equipment in theatre.

to-side or side-to-side anastomoses are used rather than the narrower end-to-end anastomosis. Excise all diseased tissue plus 10 cm of normal bowel on each side and record the length of bowel resected.

A totally laparoscopic procedure has been performed but specimen delivery requires the incision to be enlarged and the operation takes considerably longer with little advantage (Wexner, 1999). Recurrence rates vary between 14.3 and 48% (Tabet et al, 2001; Willis et al, 2001), similar to the open procedure (Tabet et al, 2001).

Laparoscopic colectomy

Crohn's disease (CD) may affect a part of or the whole colon, necessitating segmental or total colectomy. If the rectum is spared the patient may undergo ileorectal anastomosis as a one- or two-stage procedure. All these procedures can be performed laparoscopically.

Procedure: Preparation is as for an ileocolectomy. Begin as with ileocolectomy but on reaching the hepatic flexure divide the gastrocolic omentum, enter the lesser sac, expose and divide the right and middle colic vessels at their origin. The patient is then placed with the right side down (steep Trendelenburg) and division of the gastrocolic omentum continued. The splenic flexure is mobilized; if this is not possible begin with the sigmoid and descending colon along its lateral line of peritoneal fusion (white line of Toldt). The left ureter and gonadal vessels are identified and preserved. If difficulty was encountered mobilizing the splenic flexure the added weight of the colon gives optimal views. Having mobilized the colon the inferior mesenteric vessels are ligated and divided.

The specimen is delivered through a small Pfannenstiel incision after transection using a stapling device at the rectosigmoid junction and terminal ileum. Continuity is restored with a circular stapling device in the usual method or using a laparoscopic technique once the incision is closed. If total colectomy is required the rectum can be mobilized through the Pfannensteil incision or laparoscopically following closure of the wound.

Hand-port assisted colectomy: This allows insertion of the surgeon's non-dominant hand during surgery, which retains an element of tactility but at the expense of a larger scar. The procedure is currently under evaluation.

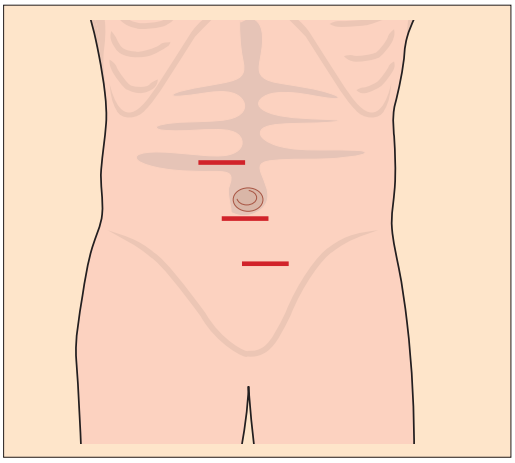

Figure 3. Sites for port insertion in ileocolectomy.

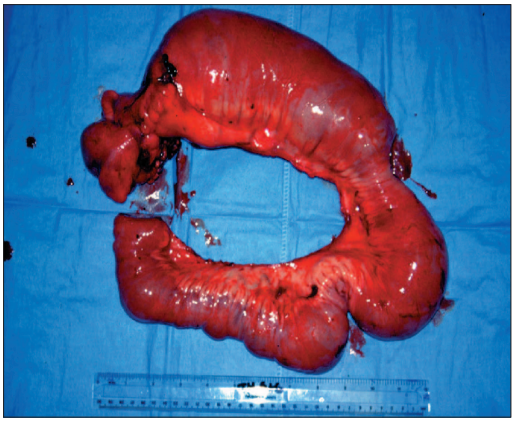

Figure 4. Bowel resected in ileocolectomy.

Figure 5. Bowel following anastomosis.

Stricturoplasty

Patients will have had a barium meal; the difficulty arises in identifying strictures distal to proximal strictures. Distal strictures must be excluded in theatre.

Procedure: Preparation is as for ileocolectomy except patients need clear fluids for 24 hours before theatre, not full bowel preparation. Ports are sited as per ileocolectomy and the whole bowel examined systematically with atraumatic graspers. Suspicious bowel is examined and returned if normal. Abnormal bowel is excised or stricturoplasty performed via a right or left iliac fossa incision.

Laparoscopic stoma formation

Severe perianal CD usually requires faecal diversion, either an ileostomy or colostomy (*Figure 6*). The advantage of laparoscopy is the small incision, well away from the stoma site, with the ability to examine bowel and perform enterolysis.

Procedure: Preparation is identical to ileocolectomy but does not need bowel preparation. The port sites are identical; terminal ileum is mobilized and brought out via a right iliac fossa incision.

ULCERATIVE COLITIS

The role of laparoscopic surgery in UC is more controversial. A variety of studies have looked at laparoscopic surgery in colitis (Dunker et al, 2000; Brown et al, 2001), which show longer operative times, similar morbidity but enhanced cosmesis.

Total colectomy with end ileostomy

The total colectomy involves excision of colon and rectum as described in the section on laparoscopic colectomy for CD.

Sub-total colectomy with end ileostomy

This is indicated for acute severe UC not responding to medical therapy. If toxic megacolon is suspected an open procedure should be performed.

Procedure: The operation is identical to that described previously except the distal resection margin is at the rectosigmoid junction and the inferior mesenteric vessels are not ligated.

Ileal pouch-anal anastomosis

A study of 40 patients divided equally between laparoscopic and open procedures demonstrated reduced hospital stays and time for bowel function to return to normal with no significant increase in complications (Marcello et al, 2000).

Procedure: As per the colectomy described for CD. Rectal dissection is performed through the Pfannensteil incision using a lighted St Mark's retractor. The pouch is created using 40 cm of terminal ileum and a linear stapling device. It is anastomosed anally using a circular stapling device and checked by insufflation with air via a rigid sigmoidoscope when the pelvis is filled with water. The pouch may be routinely defunctioned.

CONCLUSIONS

The use of laparoscopy in inflammatory bowel disease is controversial. There are definite advantages for some procedures, e.g. laparoscopic ileocolectomy and laparoscopic colostomy. Initial results with laparoscopic surgery for UC were discouraging with either no reduction or increased morbidity and length of stay despite increased cost of theatre equipment and longer operating times (Schmitt et al, 1994). However, more recent studies have shown a benefit and perhaps this should be re-evaluated (Marcello et al, 2000). HM

Conflict of interest: none.

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Figure 6. Laparoscopic stoma.

KEY POINTS

- Laparoscopic surgery has enhanced cosmesis, reduced morbidity and reduced total costs to the trust with economic benefits to the community.
- Laparoscopic ileocolectomies, stricturoplasty, faecal diversion and colectomy are safe and share these benefits.
- The only absolute contraindications to laparoscopic surgery are severe sepsis, colonic perforation or severe cardiopulmonary disease.