

Laparoscopic repair/peritoneal toilet of perforated duodenal ulcer

Leslie K. Nathanson, David W. Easter, and Alfred Cuschieri

Department of Surgery, Ninewells Hospital and Medical School, University of Dundee, Dundee DD1 9SY, UK

Summary. Laparoscopic techniques have been refined to the point where exposure, haemostasis and tissue approximation by suture approach those obtained at open access surgery. We report a patient with acute perforation of an ulcer in the first part of the duodenum who was successfully treated by laparoscopic oversewing and omental patching. The clinical indications for contemplating use of laparoscopic surgery for acute ulcer perforation, techniques employed and the areas for potential improvement of instruments, needles and sutures are discussed.

Key words: Laparoscopy – Perforated duodenal ulcer – Suture techniques

The technical requirements for laparoscopic closure/toilet of acute duodenal ulcer perforation have been available for 8 years [1]. The use of multiple cannulas to allow two-handed instrumental tissue manipulation underlies the basic technique of bowel suture using 4/0 polydioxanone on a straight needle, with internal instrument knotting using microsurgical methods [2]. Peritoneal toilet is accomplished by pressurized warm saline irrigation and suction of purulent exudates. Escaped gastrointestinal contents and blood clot are removed through the same cannula, which incorporates finger-tip controlled trumpet valves to activate either irrigation or suction.

Patient details

A 32-year-old female patient was admitted with acute abdominal pain of 9 h duration. This had been preceded by 3 days of upper abdominal discomfort and loss of appetite. The patient gave no history of ulcer disease or medication with steroids or anti-inflammatory drugs, but she was a long-standing smoker. Past history included appendicectomy and

laparoscopic tubal ligation. The diagnosis of perforated peptic ulcer was made by documenting the presence of right upper quadrant peritonism and free subdiaphragmatic intraperitoneal gas on plain X-ray films. On admission her haemoglobin was 12.2 g%, white cell count $18.6 \times 10^9/l$ (84% polymorphonuclear leucocytes).

The option of performing surgical treatment by the laparoscopic approach was discussed with the patient. In addition, she was given a patient information sheet approved by the Ethics Committee of the Tayside Health Board. The patient gave consent to laparoscopic repair with the option for open surgery if the need arose at any time during the procedure. Antibiotic therapy was commenced using parenteral cefuroxime and metronidazole and a nasogastric tube was inserted.

Technique of laparoscopic treatment

Visualization of the subhepatic region with the laparoscope revealed fibrinous exudate between the first part of duodenum and left lobe of liver. Turbid peritoneal fluid was present in the right paracolic gutter. Morrison's pouch and the pelvis. This was evacuated and the left lobe of the liver was retracted off the anterior aspect of the first part duodenum, revealing an acute 3 mm perforation. No scarring was present and the duodenal wall was only slightly indurated. Liver retraction was maintained with the suction/lavage instrument placed in the right subcostal cannula. A 4/0 polydioxanone suture on an 18 mm straight round-bodied needle grasped by the 3 mm needle holder inside the suture applicator was inserted via the right lower quadrant cannula. With the 5 mm needle holder in the left upper quadrant cannula, the perforation was suture-closed by means of a single full-thickness suture knotted internally. This was followed by omental patching with two interrupted sutures, one taking the apex of a suitable pedicle of omentum and tacking it to the anterior aspect of the duodenum superior to the perforation. The second suture approximated the omentum to the anterior duodenal wall to the left and inferior to the perforation, taking care to avoid strangulating the omental blood supply.

Careful peritoneal toilet was then accomplished by systematic aspiration of turbid peritoneal fluid and copious warm saline lavage. A 5 mm silicone drain was left with the end positioned under visual control in the right subhepatic pouch close to the closed perforation. On completion, the pneumoperitoneum was released and the linea alba at the 11 mm subumbilical cannula site approximated with a single nylon suture. Skin incisions were approximated with interrupted 4/0 polypropylene. The procedure took 130 min, most of which was spent cleaning the peritoneum.

Post-operative antibiotics were continued for 5 days. The nasogastric tube was removed next day and oral fluids introduced. Full diet was tolerated on the 3rd post-operative day. Post-operative pain relief was

achieved with diclofenac (75 mg i.m.; 8 hourly p. r. n.). A total of 5 doses were required over 55 h. The patient was commenced on ranitidine 150 mg b.d. and was discharged home on the 5th post-operative day. Follow-up over a period of 6 weeks confirmed full recovery without any symptoms or evidence of residual intra-abdominal sepsis. Treatment with full-dose ranitidine was continued for a further 2 months and maintenance therapy is planned for a further 12 months.

Discussion

Laparotomy with oversewing of acute duodenal ulcer perforation and peritoneal toilet is a well-proven method of emergency surgical treatment for perforated duodenal ulcer. The laparoscopic method of treatment reported in this patient involves the same principles of tissue approximation and peritoneal toilet, the only difference being the access to the peritoneal cavity. Whereas this patient would conventionally have had oversewing of the ulcer and peritoneal toilet by laparotomy, this was accomplished instead by a laparoscopic approach.

The decision not to perform definitive ulcer surgery, (e.g. highly selective vagotomy) was made on the basis of no previous history of ulcer disease and the absence of duodenal scarring at operation. This decision may be challenged by surgeons who adopt a more aggressive policy in this situation favouring definitive ulcer surgery – this is not the issue of this report.

Accurate placement of the two right upper quadrant cannula and the left upper quadrant cannula is crucial, as their relative positions must permit instruments inserted through them to meet perpendicularly within the operative field (the area of the first part of the duodenum). The importance of this in relation to needle placement, suturing and internal knotting must be stressed.

The technique of suture using the straight needle was satisfactory but certainly not ideal. The laparoscopic needle holders presently available lock adequately onto a straight needle. However, the use of ordinary curved needles in these needle holders results in "capsizing" of the needle tip as it swivels within the spring-locked needle holder jaws during placement through tissue. As a result, the needle is inadequately controlled by the surgeon. Although we encountered little difficulty in needle placement in this particular case, we could well appreciate problems that might occur with fibrosed/indurated or friable/old per-

forations. In addition, polydioxanone which has the advantage of being a slowly absorbable monofilament suture that slides easily through tissues, is difficult to knot internally because of its springy nature and requires a great deal of prior practice on a mechanical model to achieve the necessary level of competence. A suture such as polyglactin would be somewhat easier to knot. Tightening of the suture knot by instruments rather than finger-tip control, to coapt tissue edges at the correct tension without cutting out, also requires practice and care. We feel that the development of improved needle holders and suitable curved (J-shaped) needles will expand the scope of these laparoscopic techniques and will permit surgeons to cope with more surgically demanding tissue pathology.

Conclusions

The presently available laparoscopic techniques and instrumentation allow duplication of the technical steps used at open surgery for oversewing and omental patching of a perforated duodenal ulcer. We envisage a rapid improvement in the range and technical development of needles, suture materials and instruments available for laparoscopic general surgery. The potential benefit to patient recovery is a substantial reduction in the trauma of access. This indeed has the potential to reduce respiratory complications, encourage early mobility in the postoperative period, and accelerate recovery following discharge from hospital. The main disadvantage at present is the increased duration of the operation. The actual advantages and disadvantages for the patient await confirmation by a large clinical experience.

Acknowledgements. A. C. would like to thank Karl Storz Co. (Tuttlingen) for support. The experimental work carried out before treating the patient was supported by an MRC grant.

References

1. Semm K (1983) Endoscopic appendectomy. *Endoscopy* 15: 59–64
2. Semm K (1987) Operative manual for endoscopic abdominal surgery. Year Book Medical Publishers, Chicago London, pp 95–102