Original article

Laparoscopic splenectomy: size matters

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Background: Laparoscopic surgery is arguably the treatment of choice for patients undergoing elective splenectomy; however, for those patients with massive splenomegaly, laparoscopic surgery may prove difficult.

Patients and Methods: 6 years' experience of elective splenectomy was reviewed, in particular looking at the outcome of laparoscopic splenectomy in relation to the degree of splenomegaly.

Results: The conversion rate for laparoscopic splenectomy on patients with spleens weighing less than 1 kg was 0% whereas the conversion rate for those with spleens weighing more than 1 kg was 60%. In addition, a good correlation between both operative time and intra-operative blood loss in relation to splenic weight was observed. Open splenectomy on patients with spleens weighing more than 1 kg reduced the operative time and intra-operative blood loss without affecting hospital stay.

Conclusions: Laparoscopic splenectomy is the method of choice for elective splenectomy in patients with splenic weight estimated to be < 1 kg; however, the operation takes longer, there is a high risk of conversion and there is an increase in blood loss/morbidity associated with massive splenomegaly (spleen > 1 kg) if splenectomy is attempted laparoscopically.

Key words: Laparoscopy – Splenectomy – Treatment outcome

Laparoscopic splenectomy was first reported at the end of 1991^{1,2} and within 5 years reports of larger personal series began to appear.^{3,4} Although there have been fears over increased morbidity in patients with massive splenomegaly, some suggest that laparoscopic splenectomy is safe and effective for all patients, no matter the degree of splenomegaly.⁵ Other authors have suggested that hand-assisted surgery has a place for such patients⁶ or that the splenic artery should be embolised prior to surgery.⁷ It may be, however, that open surgery is safer and more straightforward in patients with massive splenomegaly.

The aim of this paper is to report our experience with laparoscopic splenectomy over a 6-year period and, in

particular, to look at the outcome in relation to the degree of splenomegaly.

Patients and Methods

All elective splenectomies performed by this unit from August 1995 to March 2001 were examined (Table 1). Data from patients were collected prospectively. All patients had meningococcal, pneumococcal and HIB vaccines pre-operatively and were also placed on penicillin V, 250 mg bd, in the long term.

Initially, all splenectomies were performed laparoscopically; however, it became apparent that patients with

very large spleens (those weighing more than 1 kg) took longer, bled more and had a higher incidence of complications.

Looking back at the ultrasound scan reports (performed by the local radiology department) on patients with spleens found to weigh more than 1 kg, we found that we would have been able to predict them as their measurement in the largest of the three planes was over 16.5 cm; however, in many patients with massive splenomegaly, this was obvious at clinical examination anyway. Laparoscopic surgery was continued only on patients with smaller spleens, using a conventional laparotomy for patients expected to have spleens weighing more than 1 kg.

Laparoscopic splenectomy in this unit is carried out with the patient simply positioned supine with a sandbag under the left loin. A 10 mm re-usable port is inserted into the umbilicus using a Hasson technique. Three disposable 5 mm ports are positioned in the epigastrium, above the umbilicus and in the left flank and one 12 mm port is also positioned in the left flank. Endoclinch (Endoclinch II, Tyco/Auto Suture, Connecticut, USA) atraumatic grasping forceps are used to provide retraction of the stomach and greater omentum and a harmonic scalpel (Ultracision LCS-5, Ethicon, Cincinnati, OH, USA) is used to divide the short gastric vessels and the lower splenic pole. A linear cutter/stapler (Endopath ETS, Ethicon) is used to divide the splenic hilum. The 12 mm port is enlarged to 15 mm and the fully mobilised spleen is then placed into an endoscopic bag (Endocatch II, Tyco/Auto Suture) for retrieval. The spleen is morcellated via finger fracture

Table 1 Wet splenic weight and conversion rate

	No. of patients	Median weight (g) [range]	Converted
Laparoscopic < 1 kg	29	360 [128–970]	0 (0%)
Laparoscopic > 1 kg	10	2000 [1000–3530]	6 (60%)
Open	11	2900 [360–6000]	

intra-abdominally (inside the bag) and retrieved through the 15 mm incision. Finally, the patient is re-laparoscoped and any ectopic splenic tissue is removed.

The Mann Whitney U-test of statistical significance was used to analyse data.

Results

Of the 39 laparoscopic splenectomies performed, 29 had a wet splenic weight of less than 1 kg. A total of 33 laparoscopic splenectomies were successfully completed, 6 being converted to open surgery – all 6 converted patients had a spleen weighing more than 1 kg (Table 1). Eleven patients underwent open splenectomy and 10 of these had spleens weighing more than 1 kg; however, one patient with a smaller spleen (360 g) requiring splenectomy refused to undergo laparoscopic surgery.

Time taken to perform surgery and blood loss both increased in relation to the wet splenic weight of the spleen removed (Figs 1 & 2). Good correlation was found with R² values equal to 0.52 and 0.41, respectively.

Figure 1 Wet splenic weight plotted against operating time (R² = 0.52).

Figure 2 Wet splenic weight plotted against intra-operative blood loss (R²=0.41).

Table 2 Operative time, blood loss and hospital stay

	Median operative time (min)	Median blood loss (ml)	Median stay (days)
Laparoscopic < 1 kg	72.5 [30–120]	75 [0–2000]	2 [1–15]
Laparoscopic > 1 kg	94 [50–225] *P = 0.009	1150 [20–5120] *P = 0.003	6 [2–8] *P = 0.001
Open	50 [25–85] **P = 0.002	0 [0–1635] **P = 0.019	7 [5–8] **P = 0.331

*P values for comparison of laparoscopic
< 1 kg *versus* laparoscopic > 1 kg.
**P values for laparoscopic > 1 kg *versus* open.
Ranges given in square brackets.

Table 3 Postoperative complications

	No. of patients	Complication
Laparoscopic < 1 kg	2/29	Delayed perforation stomach Pancreatitis
Laparoscopic > 1 kg	2/10	Haemorrhage Infarcted bowel (death)
Open	1/11	Haemorrhage

When looking at the wet weight of removed spleen, differences were found in the time taken to perform the procedure laparoscopically and also in the intra-operative blood loss. Laparoscopic splenectomy in patients with spleens weighing more than 1 kg took much longer than in patients with smaller spleens, had more intra-operative bleeding and had a high risk of conversion. Patients also

stayed in hospital longer. These differences were significant (Table 2). The rate of conversion in patients with spleens weighing less than 1 kg was 0%.

Open splenectomy on patients with spleens weighing more than 1 kg significantly reduced the operative time and bleeding compared to the laparoscopic approach and laparoscopic splenectomy in patients with massive splenomegaly (> 1 kg) did not significantly reduce the hospital stay.

Other than conversion, which occurred in 60% of patients undergoing laparoscopic surgery with spleens weighing more than 1 kg, significant complications are listed in Table 3.

Discussion

It has previously been shown by several authors that, in patients undergoing elective open splenectomy, massive splenomegaly increases patient morbidity and mortality.⁸ Why should we expect this to be different with patients undergoing laparoscopic surgery? Although initially defined as a spleen weighing more than 10 times normal weight (> 1.5 kg) by Goldstone,⁹ other authors have suggested that 1 kg should be used as the basis for massive splenomegaly.¹⁰

During laparoscopic splenectomy in patients with such massive spleens, the volume the surgeon has to work in is reduced and the spleen is obviously more difficult to move around due to its weight and bulk. In addition, removal of the spleen becomes difficult, often requiring intraperitoneal division of the organ (if spillage is not a problem with regard to the haematological diagnosis) so

that it can be removed in multiple retrieval bags or an additional incision may be required for the extraction, negating many of the benefits of minimal access surgery.

In view of our findings, it may be that in the presence of massive splenomegaly > 1 kg (or ultrasound findings of length > 16.5 cm), open splenectomy is safer than the laparoscopic approach. Although Targarona *et al.* found no significant difference in morbidity between open and laparoscopic approaches when divided into three groups according to splenic weight, it is significant to note that they had a high conversion rate (25%) and a 100% requirement for an accessory excision (of up to 14 cm) for the largest spleens attempted laparoscopically.¹¹ McAneny *et al.* have also shown higher morbidity in patients with massive spleens (> 1.5 kg) compared to those with smaller spleens.¹²

Conclusions

Whilst laparoscopic splenectomy is the treatment of choice in patients with spleens weighing less than 1 kg, with a 0% conversion rate in our hands, further randomised studies are needed to clarify the optimum treatment for patients with massive splenomegaly.

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