THE NEW ZEALAND MEDICAL JOURNAL
Vol 119 No 1230 ISSN 1175 8716

Laparoscopic splenectomy at Middlemore Hospital, New Zealand: a safe procedure with heterogeneous indications

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Abstract

Aim To perform an audit on a decade of laparoscopic splenectomy (LS) at Middlemore Hospital.

Methods Electronic case records of patients who had undergone LS from 1996 to 2005 were reviewed. Data were collected on demographics, operative time, hospital stay, complication rates, conversion rates, and haematological response rates.

Results Forty-two patients (14 male, 28 female) were analysed. Mean age was 53 years (16–91 years), and the mean follow-up was 22 months. The indication for surgery was idiopathic thrombocytopaenic purpura [ITP] (47.6%), haematological malignancy [HM] (40.5%), haemolytic anaemia [HA] (9.5%), and Evan's syndrome (2.4%). Median operating time was 112.0 (60–188) minutes, and median hospital stay was 5 (3–11) days, with a significant increase in the length of hospital stay for those converted. Four operations (9.5%) were converted to open surgery and there was a 26.2% morbidity rate and 0% mortality rate.

Haematological response rates were as follows: ITP–complete in 70.0%, partial in 25.0% and none in 5.0%; HA–complete in 75.0%, none in 25%; and HM–desirable response in 88.2%.

Conclusions In Middlemore Hospital, LS can be performed safely. The haematological responses to surgery compare favourably with meta-analyses of LS, as well as with responses seen in open surgery.

There are several haematological conditions where splenectomy improves patient outcomes. Idiopathic thrombocytopaenic purpura (ITP) is characterised by thrombocytopaenia as a result of platelet antibody formation and subsequent platelet phagocytosis. As the spleen is a site of antibody production, and the primary site of platelet destruction,[5] splenectomy is indicated in patients refractory to medical treatment or when the side effects of medical therapy are unacceptable. Splenic size is usually normal in ITP.[14,16]

Haemolytic anaemia encompasses a wide spectrum of aetiologies resulting in erythrocyte destruction. Splenectomy is the standard treatment in some types (e.g. uncompensated hereditary spherocytosis), while in other cases it is not first line (e.g. autoimmune HA).

Splenectomy is also useful in haematological malignancies (HM), such as lymphoma, chronic lymphocytic leukaemia (CLL), and myeloproliferative disorders such as myelofibrosis. The aim in these conditions is to offer symptomatic relief from

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splenomegaly, improve cell counts in cytopaenia (hypersplenism or autoimmune), and, in rare cases, to provide a diagnosis.[13,14]

Laparoscopic splenectomy (LS), first introduced by Delaitre and Maignein in 1991,[6] has become the standard approach for elective splenectomy. Many case series overseas have revealed advantages similar to other minimally invasive techniques: shorter hospital stay, decreased post-op pain, reduced morbidity, and improved cosmesis.[2–4,14,15] Debate continues as to the feasibility of LS in patients with HM (especially with splenomegaly). There is a theoretically higher chance of splenosis in laparoscopic surgery due to instrument manipulation, as well as a possible decrease in the identification and removal of accessory spleens. This may result in higher rates of recurrence in ITP and HA.[8,13,14]

Methods

Data collection—Between September 1996 and January 2005, LS was performed on 43 adults in Middlemore Hospital. An electronic search of the hospital's surgical, medical, laboratory, and audit databases was performed. Data were collected on demographics, indication for splenectomy, operating time, splenic weight, conversion rates, complications (intraoperatively and postoperatively), mortality, and haematological response rates. The only exclusion criterion was that patients needed to be monitored (with a repeat full blood count at haematology clinic or community laboratory) for at least 2 months after discharge. This resulted in the exclusion of one patient who was lost to follow-up. The mean length of follow-up was 22 months.

Statistics—The Wilcoxon (Mann-Whitney) test was used for continuous variables, and Fisher's exact test was used for categorical variables. P values with 95% confidence intervals were reported where appropriate.

Operative technique—For a normal or slightly enlarged spleen the patient was in the full lateral position. For a giant spleen the patient was positioned supine and slightly rotated to the right. In all cases, the patient was secured to allow maximal rotation and negative Trendelenburg position.

This heterogeneous group of patients required a number of operative technical choices to be available and these were used according to the pathology. These included Visiport and Endo GIA linear cutting vascular stapler (Autosuture, Tyco Healthcare Group Ltd, Auckland, NZ), the surgical tissue pouch and Nathanson retractor (Cook, Obex Medical Ltd, Auckland, NZ), and the Hand Port and Harmonic scalpel (Ethicon Endo-Surgery, Johnson and Johnson, Auckland, NZ). Port positions varied, and a 30-degree laparoscope was used exclusively. Preoperative embolisation, and intraoperative intra-arterial adrenaline were used on two occasions for giant spleens. The smaller spleens could be morcellated and retrieved through the largest port site and the large spleens were removed piecemeal through the left iliac fossa "hand assist" incision.

Results

Demographics and indication—Of the 42 patients included, 14 (33.3%) were male and 28 (66.6%) were female. Their ages ranged from 16 to 91 years, with a mean age of 53, and 12 patients (28.6%) were over 70 years old. Indications for surgery are shown in Table 1. Twenty patients (47.6%) suffered from ITP of which five had systemic lupus erythematosus (SLE) as a 'causative' condition. Seventeen patients (40.5%) had HM, four patients (9.5%) had HA, and one patient (2.4%) had Evan's syndrome (ITP and HA occurring together).

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Table 1. Indications for laparoscopic splenectomy

Indication (total no.)	Subgroups		No. of patients	Mean splenic weight (grams)
ITP (20)	SLE		5	107.3
	No SLE		15	
HA (4)	SLE		1	272.0
	No SLE		3	
Evan's syndrome (1)	SLE		0	73.0
	No SLE		1	
HM (17)	Lymphoma	Diffuse large B-cell	2	1543.4
		Splenic marginal zone	2	
		Chronic lymphocytic leukaemia	2	
		Small lymphocytic lymphoma	1	
		Lymphoplasmacytic lymphoma	1	
		Hairy cell leukaemia	1	
		Mantel cell lymphoma	1	
		Unclassifiable B-cell	1	
	Myelodysplasia (MDS) / Myeloproliferative	CMML	3	
		Myelofibrosis	2	
		Unclassifiable	1	

ITP=Idiopathic thrombocytopaenic purpura; HA=Haemolytic anaemia; HM=Haematological malignancy; SLE=Systemic lupus erythematosus; CMML=Chronic myelomonocytic leukaemia

Operation—Twenty-eight operations (66.7%) were completed using the full lateral technique; and in a further 10 (23.8%), the hand-assisted technique was used. The remaining four cases (9.5%) were converted to open splenectomy (OS) via a subcostal incision (three because of heavy bleeding and one because splenic access was poor). Two other patients had planned open surgery due to end-stage cardiac failure and these patients are not included in the analysis. Three conversions occurred in the first 21 operations performed (between September 1996 and December 2001), and only one in the second half of the timeline (between December 2001 and January 2005) (p=0.61).

Accessory splenic tissue was identified and removed in five patients (11.9%). A redivac drain was brought out from the splenic bed in five patients. The median operative time was 112.0 minutes (60–188 minutes); with a median of 131.5 minutes for the first 21 patients and a median of 102.0 minutes for the second 21 patients (p=0.2385, 95%CI: 14.01–40.98).

Splenomegaly did not limit our selection for LS.[12] Spleens ranged in weight from 52 to 3590 g, with a mean weight of 701.6 g (see Table 1; normal adult splenic weight is 75–150 g).[11] Six spleens weighed greater than 2000 g, and five spleens weighed 1000–2000 g. Splenic weights in the operations converted to OS were (in order of increasing size): 382, 773, 1309, and 3590 g.

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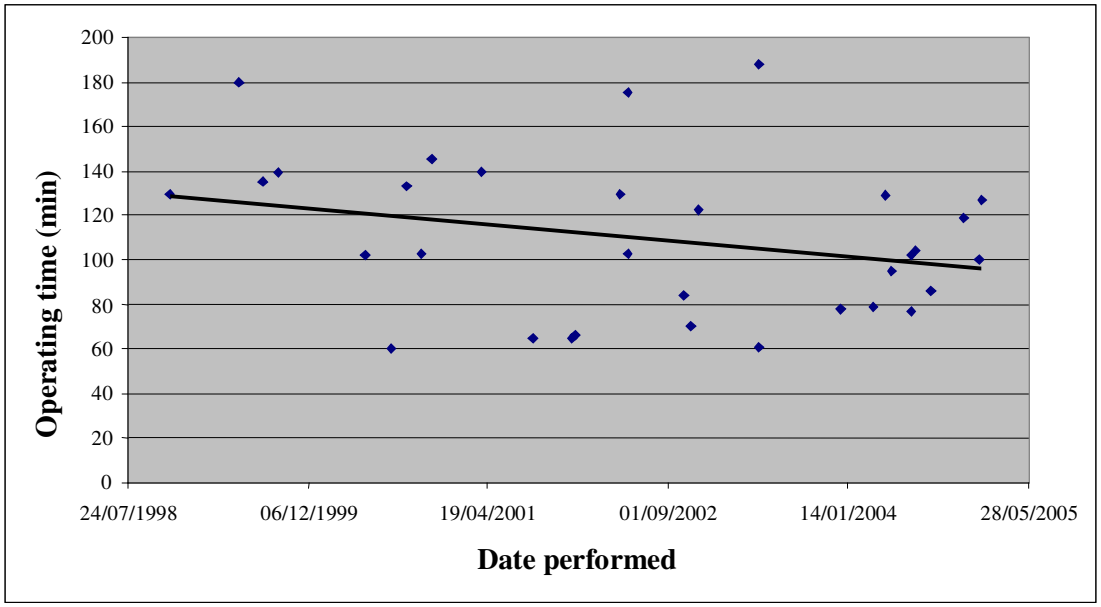
Figure 1. Operating time vs date performed for laparoscopic splenectomy (conversions not included)



Transfusion requirement—Three patients needed a blood transfusion pre-op (defined as a transfusion up to a week before surgery) with an average of two units transfused. Many patients went to theatre anaemic. Nine were transfused intraoperatively (mean 4.1 units, one patient requiring 10 units), and four were transfused post-op (mean 2.3 units). Four patients were given platelets pre-op (mean 2.3 units), 12 intraoperatively (mean 2.8 units), and two post-op (mean 5.5 units, both converted cases, with one patient requiring 10 units). All 4 converted cases needed intra-op blood (100%) and two needed post-op platelets (50%) compared with 13.2% and 0.0%, respectively, in unconverted cases (p=0.0011 and 0.007). There were no other significant differences in transfusion rates.

Post-op recovery and complications—Median length of post-op hospital stay was 5 days (range: 3–11 days). For those who underwent LS, the median stay was 4.5 days, while for those who were converted to an open procedure, it was 7.5 days (p=0.018; 95%CI: -6.00–0.00). The median length of stay in the first half of the study was 4 days, and in the second half, it was 5 days (p = 0.9380; 95%CI: -1.00–1.00).

Eleven patients (26.2%) developed post-op complications (described below). Of those, three had been converted from LS to OS. This gives a complication rate of 75.0% for converted cases, and 21.1% for unconverted cases (p=0.05). Seven patients needed antibiotic treatment. Four developed pneumonia, (one of which also suffered a myocardial infarct), one became febrile possibly due to atelectasis (no other cause found), one patient developed septicaemia, and another developed a wound infection. Two patients had a period of gastrointestinal ileus requiring nasogastric decompression. One patient complained of persisting lateral thigh numbness (thought to be a result of theatre positioning). One patient had a presumed delayed bleed and required transfusion. No patient was taken back to the operating theatre. Mortality rate was nil.

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Haematological response—Defining criteria for response rates can be a complex and somewhat arbitrary process, as one must define a finite period of time with which to differentiate a complete from a partial response. The use of differing criteria in prior case series has contributed significantly to result variability, and reduced the power of metanalyses.[2,7,16] The series criteria were carefully defined before data collection began (see Table 2). A relapse in ITP (defined as a platelet reduction to $< 30 \times 10^9$/L after a period of response) was considered a partial response, even if the patient had a sustained platelet count $> 100 \times 10^9$/L for several years before or after the relapse.[2] Also, the criteria for HM response are broad because the indications for LS in this patient group are varied. For example, a patient with CLL operated on for symptomatic splenomegaly was classified as having a response if the symptoms resolved post-op, even if transfusion requirements did not improve.

Table 2. Criteria for haematological response rates

Variable			Criteria
ITP	Complete		Platelet count $> 100 \times 10^9$/L sustained for > 2 months AND, Tapering steroids or none AND, No relapse
	Partial		Platelet count $30–100 \times 10^9$/L sustained for > 2 months AND, Tapering steroids or none OR, If relapse occurs
	None	With response	Platelet count not $> 30 \times 10^9$/L, but responsive to steroids
		Without response	Platelet count not $> 30 \times 10^9$/L, not responsive to steroids
HA	Complete		Haemoglobin > 100 g/L sustained for > 2 months AND, No need for blood transfusion
	Partial		Above not fulfilled, but decreased transfusion (or steroid) requirement
	None		No decrease in transfusion (or steroid) requirement
HM	Yes		Responsive to chemotherapy OR, Decreased transfusion requirement OR, Increased platelet count OR, Relief from splenomegaly symptoms OR, Survival past prognostic indications

Response rates

ITP—Complete response was seen in 14 patients (70.0%), partial response in 5 patients (25.0%), and none in 1 patient (5.0%). The latter patient did show a response with steroids. Prior to splenectomy, she had a platelet count of < 10 despite steroids, which initially continued to be < 30 post-op, but with a subsequent steroid response resulting in an improvement in platelets to the 30–100 range). Three out of the five partial response patients relapsed after an initial response (one with confirmed splenosis on CT). Of the patients with ITP whose condition was secondary to SLE, a complete response was seen in three (60%), while the other two had a partial response (40%).

HA—Complete response in three patients (75.0%). One patient (the only one in this group with SLE) continued to have haemolytic crises requiring high dose immunosuppressants and regular transfusions. She had a re-operation for removal of

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splenunculi with an eventual improvement in transfusion requirement (on cyclosporin).

Evan's syndrome—This patient achieved a complete response under both HA and ITP criteria.

HM—Fifteen patients achieved a response (88.2%), and two did not (11.8%). There were five deaths in this group within the follow-up period; four as a result of the malignancy, and one due to an unrelated ischaemic stroke. Two cases have developed confirmed splenosis (both these patients were operated on successfully for splenomegaly).

Discussion

Laparoscopic splenectomy has become the standard approach for spleen removal in the non-acute setting. No prospective, randomised controlled trial comparing LS to OS has been published, but several reports have shown that LS confers the traditional benefits of laparoscopy.

Although generally associated with longer operation times subject to a learning curve, LS has similar rates of accessory spleen identification, haematological response, and mortality when compared to OS.[3,14,15] Winslow et al conducted a meta-analysis of 51 series published worldwide on LS vs OS. For the 2119 laparoscopic operations performed, average splenic weight was 342.1 g, mean operative time was 179.9 minutes, the mean post-op stay was 3.6 days, the complication rate was 15.5%, and the mortality rate was 0.6%.[15]

Kojouri et al reported a meta-analysis of 47 case series dealing with splenectomy (both LS and OS) for ITP. They calculated a complete response rate of 66%, and a complete or partial response of 88%.[7] The only published Australasian case series documents early results on 31 laparoscopic splenectomies performed between February 1995 and December 1998. The data reported included an average splenic weight of 225 g, a mean operative time of 132 minutes, a mean post-op stay of 4.9 days, a complication rate of 10%, a mortality rate of 3%, and a conversion rate of 22.6%, (with a statistically significant learning curve effect for the latter four figures).[4]

A widely debated issue is that case series' follow-up is too short to give an accurate indication of relapse rates in ITP/HA; with some suggesting that rates may be higher with LS since there is a theoretical risk of missing accessory spleens and of splenosis due to instrument manipulation.[8] Berends' case series of 50 ITP patients who underwent LS were followed up for at least 20 months, (average of 35 months); 64.0% had a complete response, 22% a partial response, and 14.0% no response.[2]

Available studies show that 70–80% of relapses occur within the first 2 years, with a continuing response in > 50% of patients up to 20 years.[1,2] No significant difference in rates of accessory spleen detection or recurrence rates in ITP with LS vs OS has been convincingly demonstrated in any case series or meta-analysis.[2,9,15]

Our case series attempts to present local data relevant to New Zealand patients. The results achieved with LS are at least comparable to those described overseas, and reaffirm the feasibility of this operation as a method of elective spleen removal for the treatment of various haematological conditions.

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Acknowledgments: We thank Drs Gordon Royle and Sharon Jackson (Haematologists) and Andrea Soengkono (Transfusion Review Nurse) for their help in conducting this case series.

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References:

1. Bell WR Jr. Long-term outcome of splenectomy for idiopathic thrombocytopenic purpura. Semin Hematol. 2000;37:22–5.
2. Berends FJ, Schep N, Cuesta MA, et al. Hematological long-term results of laparoscopic splenectomy for patients with idiopathic thrombocytopenic purpura: a case control study. Surg Endosc. 2004;18:766–70.
3. Brodsky JA, Brody FJ, Walsh RM, et al. Laparoscopic splenectomy. Surg Endosc. 2002;16:851–54.
4. Chan SW, Hensman C, Waxman BP, et al. Technical developments and a team approach leads to an improved outcome: lessons learnt implementing laparoscopic splenectomy. A N Z J Surg. 2002;72:523–27.
5. Cines DB, Bussel JB, McMillan RB, Zehnder JL. Congenital and acquired thrombocytopenia. Hematology (Am Soc Hematol Educ Program). 2004;1:390–406.
6. Delaitre B, Maignein B. Splenectomy by the laparoscopic approach. Report of a case. Presse Med. 1991;20:2263.
7. Kojouri K, Vesely SK, Terrell DR, George JN. Splenectomy for adult patients with idiopathic thrombocytopenic purpura: a systematic review to assess long-term platelet count responses, prediction of response, and surgical complications. Blood. 2004;104:2623–34.
8. Kumar RJ, Borzi PA. Splenosis in a port site after laparoscopic splenectomy. Surg Endosc. 2001;15:413–14.
9. Mazzucconi MG, Arista MC, Peraino M, et al. Long-term follow-up of autoimmune thrombocytopenic purpura (ATP) patients submitted to splenectomy. Eur J Haematol. 1999;62:219–22.
10. Poulin EC, Mamazza J, Schlachta CM. Splenic artery embolization before laparoscopic splenectomy. An update. Surg Endosc. 1998;12:870–5.
11. Satyadas T, Nasir N, Bradpiece HA. Wandering spleen: case report and literature review. J R.Coll.Surg Edinb. 2002;47:512–4.
12. Smith L, Luna G, Merg AR, et al. Laparoscopic splenectomy for treatment of splenomegaly. Am J Surg. 2004;187:618–20.
13. Trias M, Targarona EM, Espert JJ, et al. Impact of hematological diagnosis on early and late outcome after laparoscopic splenectomy: An analysis of 111 cases. Surg Endosc. 2000;14:556–60.
14. Vavra AK Sweeney JF. Laparoscopic splenectomy—a review. J Long Term Eff Med Implants. 2004;14:347–58.
15. Winslow ER, Brunt LM. Perioperative outcomes of laparoscopic versus open splenectomy: a meta-analysis with an emphasis on complications. Surgery. 2003;134:647–55.

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16. Wu JM, Lai IR, Yuan RH, Yu SC. Laparoscopic splenectomy for idiopathic thrombocytopenic purpura. Am J Surg. 2004;187:720–3.

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