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Splenectomy for massive splenomegaly

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Twenty-four patients who underwent resection of giant spleen (spleen weight >1·5 kg) have been reviewed to determine the difficulties and benefits of the procedure and, in particular, whether the use of adrenaline injection into the splenic artery could safely reduce technical difficulty. Although morbidity was higher in patients with giant spleens compared with those undergoing resection of smaller spleens the incidence of serious complications was small, and there were no operative or in-hospital deaths. In addition, virtually all patients benefited either on the basis of minimized haematological defect, or palliation of symptoms. Further, the injection of 1 ml of 1:10 000 adrenaline into the splenic artery before splenic mobilization reduced the splenic volume by approximately 40 per cent on average, and resulted in improved exposure, thereby facilitating the procedure.

Keywords: Elective splenectomy, haematological disorders, Hodgkin's lymphoma, overwhelming infections, thrombocytopenia, giant spleen, adrenaline

Elective splenectomy is a frequently used technique in the diagnosis and therapy of a variety of haematological disorders, including the treatment and staging of some patients with lymphoma[1,2], the treatment of hairy cell leukaemia[3] and for diagnosis of inexplicable splenomegaly[4]. However, most reports on the usefulness of splenectomy in the diagnosis and management of haematology patients focus on patients with normal sized, or moderately enlarged spleens, and there has been a widely held belief that resection of giant spleen is associated with major hazards, and that it is ineffective in providing palliation of symptoms and/or correction of haematological[6] abnormalities.

Goldstone[6] reported that splenectomy for massive spleen provided symptomatic relief in some patients, but that this gain was balanced by a high operative mortality rate. In contrast, Wobbes *et al.*[7] and Bickerstaff and Morris[8] have reported that resection of giant spleen can be accomplished with minimal risk of mortality, and that satisfactory palliation and/or correction of haematological abnormalities can be achieved.

Over recent years, most elective splenic surgery in Auckland has been performed by one of two surgeons in one centre. We have reviewed the local experience of splenectomy for massive splenomegaly and, in particular, we have asked: can resection of giant spleen be undertaken safely; is the procedure effective in providing palliation and/or minimizing the haematological defects; is injection of adrenaline into the splenic artery before mobilization of the spleen useful for both patient and surgeon?

Patients and methods

From a total of 148 patients who underwent elective splenectomy at Auckland Hospital (1978–88), 24 had giant spleens (weight >1·5 kg). There were 14 men and 10 women (mean age 60 years). The indications for splenectomy are summarized in *Table 1*.

Seventeen operations were done through abdominal incisions and in seven a thoracoabdominal incision was used. Seven severely thrombocytopenic patients (bleeding times >15 min) received platelet transfusions intraoperatively, and five also required whole blood.

Most commonly the splenic vessels were controlled via the lesser sac before mobilization of the spleen. In the seven patients most recently operated on, 1 ml of 1:10 000 adrenaline was injected into the splenic artery after the vessel had been controlled. After the injection, the artery was immediately ligated to maximize the effect of the adrenaline on the spleen while minimizing the systemic effect. The intention was to reduce the volume of the spleen and improve access and ease of dissection, while having only a minor haemodynamic effect (due to the leak of adrenaline into the systemic circulation as part of the contraction of the spleen). After splenic artery ligation the lienorenal ligament was incised, adhesions between spleen and adjacent structures were ligated and divided, and the spleen was mobilized. Finally, the splenic artery and vein were separately ligated.

Pneumococcal vaccine was used routinely (most commonly preoperatively) to minimize the risk of overwhelming postsplenectomy infection. In addition, in order to reduce the risk of wound infection, pneumonia and/or intra-abdominal abscess formation, a single dose of broad spectrum antibiotic was administered on induction of anaesthesia.

Results

The weight distribution of the resected spleens was 1539–3600 g (mean 2142 g), and the final diagnoses are shown in *Table 2*.

Table 1 *Indications for splenectomy in patients with massive splenomegaly*

Indication (primary)	No.
Correction of cytopenia	9
Diagnosis	6
Relief of abdominal pain	4
Rupture	1
Initial treatment (hairy cell leukaemia)	4
Total	24

Table 2 *Diagnoses in patients with massive splenomegaly*

Diagnosis	No.
Myelofibrosis	10
Non-Hodgkin's lymphoma	
Poorly differentiated	2
Large cell	1
Mixed histiocytic and lymphocytic	1
Chronic myeloid leukaemia	1
Chronic lymphatic leukaemia	2
Hairy cell leukaemia	4
Congestive splenomegaly	2
Wilson's disease	1
Total	24

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Table 3 *Effect of adrenaline injection on giant splenomegaly*

Diagnosis	Spleen volume		Blood pressure (mmHg)		Heart rate	
	Preoperative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative
Myelofibrosis	3·3	2·1	140	170	70	90
Hairy cell leukaemia	1·5	1·0	130	135	75	80
Myelofibrosis	2·2	1·3	125	145	65	65
Ruptured chronic myeloid leukaemia	2·6	1·3	150	160	60	68
Non-Hodgkin's lymphoma	3·2	1·8	105	105	65	65
Wilson's disease	1·6	0·9	145	200	70	110
Chronic lymphatic leukaemia	1·8	1·2	135	175	75	75
Mean	2·3	1·4	133	156	69	79

Table 4 *Complications of splenectomy for massive splenomegaly*

Complication	No.
Chest infection	5
Wound infection	3
Pleural effusion	2
Hepatitis B infection	1
Haemorrhage	1
Pulmonary embolus	1
Total	13

The nine patients with cytopenia as the primary indication for splenectomy all had reversal of this problem. Six are alive at an average of 5 months after surgery. Two died at 23 and 36 months after surgery, and the remaining patient was lost to follow-up.

Six splenectomies were performed for diagnosis and a diagnosis was obtained in all. Two had congestive splenomegaly (both alive at 36 months) and the remaining patients proved to have either non-Hodgkin's lymphoma, or myelofibrosis.

The four patients who had palliative splenectomy gained symptomatic relief. One is alive 1 month postoperatively, two died of their malignancy on average 4 years after surgery and another succumbed to overwhelming postsplenectomy infection (pneumococcal meningitis) after 5 months. Five other patients who underwent splenectomy primarily for reasons other than relief of pain also experienced relief from intra-abdominal mass symptoms.

The splenectomies undertaken as initial treatment of hairy cell leukaemia were all successful, either as sole treatment of the leukaemia, or as an adjunct to interferon, and all were alive at the time of the study. The patient who had resection of ruptured giant spleen (secondary to chronic myeloid leukaemia) is alive and well at 1 year, and the patient who underwent splenectomy (and splenorenal shunt) for Wilson's disease is also alive after 1 year.

The alterations in splenic volume, blood pressure and pulse rate following the injection of adrenaline are summarized in *Table 3*.

There were no in-hospital deaths and complications are summarized in *Table 4*.

Discussion

The major goals of our study were to assess whether resection of giant spleen is a safe procedure with an acceptable complication rate, to determine whether the procedure was an effective means of palliating symptoms and/or reversing haematological abnormalities, and to assess whether the intra-arterial injection of adrenaline into the splenic artery could safely reduce the technical difficulty of the operation. With respect to the first two goals, both premises are true, and our study confirms the findings of Bickerstaff and Morris[8].

Good results for surgical treatment of giant splenomegaly are dependent on a team approach involving surgeon, haematologist, and anaesthetist, coupled with meticulous surgical technique. In their account of the subject, Bickerstaff and Morris[8] recommend not using adrenaline to reduce the size of the spleen, but the paper on which they base this was written in 1951. Our experience with this technique is different and, in the seven cases where it was used, the most important finding was the ease with which the operation could be performed. The 40 per cent reduction in splenic size results in the creation of a space around the spleen that improves exposure, in particular the exposure of the diaphragmatic adhesions that can present a technical challenge. The procedure was not associated with any complications aside from minor changes in blood pressure and heart rate which were not of any clinical consequence. It is impossible to estimate whether the use of adrenaline reduced the need for blood replacement, as only five of the 24 patients received intraoperative blood transfusion. However, the 40 per cent reduction in splenic volume that occurred after the adrenaline injection would have resulted in a significant autotransfusion and this is likely to have had a beneficial effect. One potential disadvantage of the procedure is that it would be inappropriate in the presence of an anaesthetic that was particularly sensitive to catecholamine injection but, in most instances, this potential problem could probably be avoided.

We have previously shown that the degree of catabolism in patients with haematological malignancy is associated with bulk of disease, with the most marked degree of catabolism occurring in patients with leukaemia and giant splenomegaly[5]. As splenectomy drastically reduces the bulk of disease in these patients it is probable that the resulting reduction in catabolism is also a factor contributing to the feeling of well-being experienced by most of these patients after surgery.

As with the other reported studies, we have shown that resection of a giant spleen is associated with a higher rate of complications than the resection of smaller spleens. Goldstone[6] points out that patients undergoing resection of a giant spleen are not only older than most other patients undergoing splenectomy, but the underlying diseases are more likely to render the patient prone to infection and/or haemorrhage. Most patients in our study had haematological malignancies known to be associated with bleeding disorders, immune defects, and catabolic metabolism[1–5]. However, despite this, there were no in-hospital deaths in our series, and of the six patients who died during the period of our study, only one did so within 1 year of operation while 21 out of 24 patients experienced either palliation of symptoms or minimization of their haematological problem.

We conclude that splenectomy plays an important part in the diagnosis of unexplained giant splenomegaly. Resection of giant spleen effectively minimizes both pressure symptoms and haematological problems, and survival is long enough to make this worthwhile. Although morbidity is comparatively high in patients undergoing resection of giant spleen most complications are minor and transient. The injection of 1 ml of adrenaline (1:10 000) effects: a 40 per cent reduction of splenic volume, an autotransfusion for the patient, and greatly facilitates the ease of dissection for the surgeon.

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References

1. Mitchell A, Morris PJ. Splenectomy for malignant lymphomas. *World J Surg* 1985; **9**: 444–8.
2. Cooper MJ, Williamson RCN. Splenectomy: indications, hazards and alternatives. *Br J Surg* 1984; **71**: 173–80.
3. Jacobs P, King HS, Dent DM, van der Westhuizen N. Splenectomy as primary treatment for hairy cell leukaemia. *Br J Surg* 1987; **74**: 1169–70.
4. Knudson P, Coon W, Schnitzer B, Liepman M. Splenomegaly without apparent cause. *Surg Gynecol Obstet* 1982; **155**: 705–8.
5. Humberstone DA, Shaw JHF. Metabolism in haematological malignancy. *Cancer* 1988; **62**: 1619–24.
6. Goldstone J. Splenectomy for massive splenomegaly. *Am J Surg* 1978; **135**: 385–8.
7. Wobbes T, van der Sluis R, Lubbers E. Removal of the massive spleen. *Am J Surg* 1984; **147**: 800–2.
8. Bickerstaff KI, Morris PJ. Splenectomy for massive splenomegaly. *Br J Surg* 1987; **74**: 346–9.

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Right splenorenal bypass: a technical suggestion

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At present the most effective treatment of early renal artery stenosis is aortorenal bypass using a prosthesis or autogenous vein graft. However, this may prove impossible in patients with marked aortic arteriosclerosis and in those who have had previous surgery to the abdominal aorta. Many procedures have been suggested to solve these problems without using the abdominal aorta. They include transplantation of kidney, hepatorenal arterial bypass, gastroduodenal arterial bypass, iliorenal arterial bypass, the mesenteric–renal arterial bypass, and left splenorenal arterial bypass. It appears that use of the splenic artery for revascularization of the right renal artery has not been described in this context.

The technique involves exposure of the right renal artery after mobilization of the right side of the colon and a Kocher manoeuvre to mobilize the duodenum and head of pancreas. The splenic artery is then isolated as it runs along the upper border of the pancreas to the splenic hilum. This is achieved by opening the gastrocolic ligament, paying attention to preserving the integrity of left gastroepiploic artery. The splenic artery is encircled by a loop and dissected free until the root of the coeliac axis is reached. Bleeding from its small pancreatic branches is controlled by metal clips. The artery is then easily passed through the foramen of Winslow after full mobilization to reach the right renal artery.

After local heparinization, an end-to-side anastomosis between the mobilized splenic and the right renal arteries is made with an interrupted suture of 6-0 Prolene® (Ethicon Ltd., Edinburgh, UK, *Figure 1*). At the completion of the operation

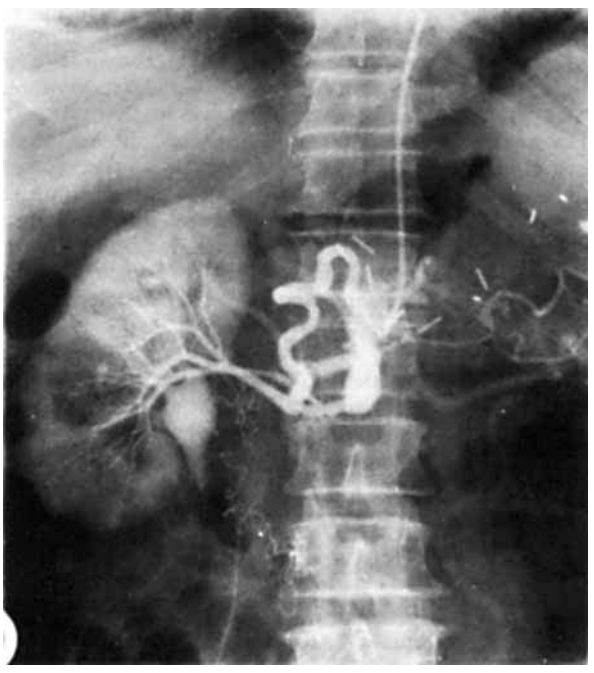

Figure 1 *Selective angiography of the splenic artery made on the seventh day after surgery showing a functioning splenorenal bypass*

in a 67-year-old man in whom we have used this technique the spleen appeared well vascularized and we did not feel that removal was indicated. Clearly, preservation of the left gastroepiploic arcade and short gastric vessels is important in this context. The patient remains well 20 months after surgery.

We conclude that anastomosis of the splenic artery to the right renal artery may be a further useful method of bypass in renal artery stenosis where direct use of the aorta is contraindicated. Before using the splenic artery one must study its anatomy, length and calibre and ensure that it has no arteriosclerotic areas that might obviate its use.

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