Splenectomy results from an 18-year single centre experience

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ABSTRACT

INTRODUCTION Splenectomy is performed both as an emergency procedure following trauma and electively when indicated for haematological disease. Postsplenectomy patients receive immunotherapy vaccines and continuous antibiotic prophylaxis. Despite well documented concerns regarding complications and overwhelming postsplenectomy infection (OPSI) risk, there appears to be only a small amount of consistent data on long-term outcomes. The authors therefore present their postsplenectomy patient outcomes over an 18-year follow-up period.

METHODS One hundred and five postsplenectomy patients operated on between 1991 and 2011 were identified from pathology codes and their case notes were reviewed. Eighty-eight patients (83.8%) were followed up for at least five years or until death.

RESULTS Of the 105 splenectomy patients (58 were male), the median age was 54 years (range: 10–87 years) and the median survival was 80 months. Operative morbidity and mortality rates were 21.0% (n=22) and 8.6% (n=9) respectively. Thirty-seven patients (27 males) underwent an emergency splenectomy with a median age, operative morbidity and operative mortality of 51 years, 13.5% and 21.6% (n=8) respectively. This compares with 68 patients (35 males) undergoing an elective splenectomy with the same parameters respectively of 55 years, 25.0% and 1.5% (n=1). Excluding operative deaths, multivariate analysis revealed age (p=0.002) as the only significant and independent prognostic indicator. Immunotherapy and antibiotic prophylaxis rates for the emergency cohort were 92.6% and 88.9% respectively, compared with 90.2% and 93.4% for the elective cohort. At follow-up, no patients were readmitted with OPSI.

CONCLUSIONS Over an 18-year period and a diverse indication for splenectomy, we have identified no evidence of OPSI. However, a significant operative mortality was associated with traumatic splenic rupture.

KEYWORDS
Splenectomy – Sepsis – Antibiotic prophylaxis – Immunotherapy

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Although relatively uncommon, general surgeons are exposed to splenectomy both as an emergency procedure following major trauma or iatrogenic injury and as an elective procedure when deemed necessary by haematologists. There has been an increasing trend to conserve the spleen following trauma, especially in children, who are said to be at a greater risk of overwhelming postsplenectomy infection (OPSI). Despite this, a significant number of patients still require a total splenectomy. Such patients undergo routine immunotherapy and long-term antibiotic prophylaxis in the UK.

The first recorded splenectomy is believed to have been performed in Naples in 1549 by Adriano Zaccarelli. However, the causal recognition of OPSI was not documented until the 1920s. Immunotherapy was developed to reduce OPSI rates and includes vaccines against Streptococcus pneumoniae, Haemophilus influenzae type B and Neisseria meningitidis.

There appears to be only a small amount of consistent long-term outcome data following splenectomy, and we have therefore reviewed all splenectomy patients over an 18-year period with the primary aim of reporting our operative outcomes in terms of morbidity and mortality. The secondary aims were to identify the incidence of OPSI and report our use of continuous, intermittent or no antibiotic prophylaxis.

Methods
One hundred and five consecutive postsplenectomy patients operated on between July 1991 and August 2011 were identified from pathology coding at one hospital site. The case notes were interrogated and data recorded on a dedicated spreadsheet. All elective and emergency cases were included irrespective of age. Consultants were the lead surgeon for most cases; a small number of cases were
performed by training grade registrars under consultant supervision or independently by very experienced middle grade surgeons. There were no laparoscopic procedures. Eighty-eight patients (85.8%) were followed up for at least five years or until death.

Operative mortality was defined as death within 30 days of surgery. Operative morbidity was defined as non-fatal complications, and termed ‘perioperative’ if occurring within 30 days of surgery and ‘long-term’ if occurring beyond 30 days. For the purpose of this review, OPSI was defined as a rapidly progressing life threatening infection characterised by a high mortality rate often attributed to meningitis, pneumonia or sepsis, and leading to multiorgan involvement and subsequent failure.

Statistical analysis appropriate for non-parametric data was employed. Since the high operative mortality in the emergency cohort was related mainly to multiorgan failure as a result of the trauma and not the splenectomy per se, all operative deaths were excluded from the univariate and multivariate survival analysis.

Local approval from the audit department was obtained prior to conducting this audit. Formal ethics approval was not sought as the work involved retrospective single institution case note analysis with all data anonymised and it was performed as part of a surgical audit.

Results

Of the 105 splenectomy patients identified, 58 were male and the median age was 54 years (range: 10–87 years). Thirty-seven patients underwent an emergency splenectomy (27 males; median age: 51 years, range: 10–87 years). The indications were prehospital trauma (25 cases), iatrogenic injury (10 cases), splenic infarct (1 case) and spontaneous rupture (1 case). This compares with 68 elective cases referred for a splenectomy by haematologists (35 males; median age: 55 years, range: 12–80 years) (Table 1). The operative indications included benign disease (15 cases), myeloproliferative disease (40 cases) and neoplastic disease (15 cases).

| Table 1 | Details of the patients according to operative indication |
|---------|----------------------------------------------------------|
|         | Emergency (n=37) | Elective (n=68) | p-value |
| Male-to-female ratio | 27:10 | 35:33 | 0.295 |
| Median age (years) | 51 | 55 | 0.575 |
| Median survival (months) | 72 | 89 | 0.381 |
| Operative morbidity | 13.5% | 25.0% | 0.169 |
| Operative mortality | 21.6% | 1.5% | <0.001 |
| Immunotherapy | 92.6% | 90.2% | 0.716 |
| Prophylactic antibiotics | 88.9% | 93.4% | 0.469 |

Operative morbidity and mortality

Overall operative morbidity and mortality rates for the series were 21.0% (n=22) and 8.6% (n=9) respectively. Perioperative infective complications accounted for most of the morbidity (11 cases), which included lower respiratory tract infections (4 cases), intra-abdominal collections (2 cases: 1 treated conservatively, 1 drained radiologically), wound infection (1 case) and non-specific infections requiring antibiotics (4 cases). The remaining perioperative complications included retention of urine (1 case), wound haemorrhage (1 case), pulmonary embolus and shingles (1 case), idiopathic thrombocytopenic purpura (1 case) and acute alcohol withdrawal (1 case). Long-term complications included one readmission with adhesion related small bowel obstruction that settled with conservative management and chronic pain relating to the operative wound in five cases.

Multiorgan failure as a direct result of the trauma, postoperative haemorrhage or sepsis was the main cause of operative mortality. This accounted for six cases while the remaining three patients succumbed to myocardial infarction.

Following emergency splenectomy, the operative morbidity and mortality rates were 15.5% (5 cases) and 21.6% (8 cases) respectively. This compares with 25.0% (17 cases, p=0.169) and 1.5% (1 case, p<0.001) respectively following elective splenectomy (Table 1).

Prophylactic treatment

Excluding operative deaths, overall immunotherapy and antibiotic prophylaxis uptake rates were 90.9% and 92.0% respectively. When separating the operative indications, the uptake rates of immunotherapy and antibiotic prophylaxis for the emergency cohort were 92.6% and 88.9% respectively, compared with 90.2% (p=0.716) and 93.4% (p=0.460) for the elective cohort (Table 1). The antibiotics commenced initially were amoxicillin (58 cases), phenoxymethylpenicillin (35 cases), erythromycin (2 cases), benzyl penicillin (1 case) and flucloxacillin (1 case). Four cases were undocumented. At follow-up, no patients were readmitted with overwhelming sepsis despite a 100% follow-up rate in both groups ensuring no patients were lost.

Survival

When considering all cases, the median survival was 80 months. Following emergency splenectomy, the median survival was 72 months compared with 89 months following elective surgery (p=0.381) (Table 1). Excluding all operative deaths, potential prognostic indicators were considered at univariate survival analysis (Table 2), with increasing age emerging as the only significant predictor of poorer outcomes (p<0.001). Following inclusion of the same factors at multivariate analysis, the only independent significant indicator of poor prognosis was increasing age (hazard ratio: 1.051, 95% confidence interval: 1.018–1.084, p=0.002).

Discussion

In our series, the perioperative morbidity rate was 25% when considering the elective patients alone. This
Table 2

| Factor                | X²  | Degrees of freedom | p-value |
|-----------------------|-----|--------------------|---------|
| Sex                   | 0.924 | 1                  | 0.337   |
| Increasing age        | 210.874 | 54                | <0.001  |
| Elective versus emergency | 1.977 | 1                  | 0.160   |
| Surgical morbidity    | 0.326 | 1                  | 0.568   |
| Immunotherapy         | 0.058 | 1                  | 0.810   |
| Antibiotic prophylaxis| 0.167 | 1                  | 0.683   |

The high operative mortality quoted in this series was related largely to the emergency splenectomy patients and was not related to the splenectomy procedure itself. Our operative mortality rate following emergency splenectomy was 21.6%. Low caseloads and the heterogeneity of injuries received following trauma probably account for the wide variety of mortality rates in the literature such as those reported by Pitcher et al (10%) and Arden et al (17.5%). Furthermore, most series (including ours) span over ten years and may include changes such as the compulsory use of seat belts in motor vehicles that will contribute to the heterogeneity of the study population. Our operative mortality rate when considering the elective patients alone was low at 1.5%, similar to other series such as Jameson et al (1.6%) in Leicester and Patel et al (0%) in the US.

Moreover, the most important prognostic indicator associated with poor outcomes for patients surviving the immediate postoperative period in our cohort was increasing age. Increasing age is well recognised as a poor prognostic indicator following elective splenectomy.

Despite its rarity, OPSI is reported widely in the literature with an incidence of 0.1-0.9% and a mortality rate of up to 50%. Risk is reportedly associated with younger age and the indication for splenectomy, with haematological malignant disease conferring a greater risk. No cases of OPSI were identified in our series. One similar US study looking at long-term results in an unselected series of postsplenectomy patients was identified in the literature review that included 195 cases between 1955 and 1979, and reported 2 cases of OPSI. Nevertheless, changes in treatment since 1955, such as antibiotic use, do not allow direct comparison with our work.

Despite the paucity of data relating to the incidence of OPSI, current Royal College of Physicians guidelines recommend the immunotherapy vaccines as stated above and lifelong prophylactic antibiotics. Excluding operative deaths, this was achieved for 90.9% and 92.0% for immunotherapy and antibiotic prophylaxis respectively in this series.

There is conflicting evidence in the literature in terms of the efficacy of long-term antibiotics. Evaluating the effectiveness of this prophylactic strategy has proven difficult in view of the low incidence of OPSI. It has been suggested that patient factors (and possibly even genetic factors) may help guide antibiotic strategies in the future. Furthermore, antibiotic prophylaxis guidelines vary between countries. In Australia, daily antibiotics for at least two years following splenectomy are advised. However, much evidence would suggest this timescale to be too short. Indeed, an Australian report evaluating 1,490 splenectomy patients between 1971 and 1985 concluded that most OPSIs occurred late, over 5 years following surgery. Reports have stated that prolonged courses of antibiotics, beyond ten years, are likely to be of no benefit as OPSI does not tend to occur beyond this period.

Appropriate medical management of asplenic patients has been deficient and patient compliance has been questioned, especially with regard to antibiotic prophylaxis. In our study, we can only comment on antibiotic prescription as we cannot confirm that the patients were compliant on a daily basis, an intermittent basis or not at all. It is likely that immunotherapy compliance is high and antibiotic compliance erratic. Patient advice has a crucial role in OPSI prevention with lower rates reported in well informed patients, receiving information at follow-up appointments by haematologists.

The main drawbacks of this work are the retrospective nature of the data collection and the relatively low numbers, particularly when subanalysis of the emergency group versus the elective patients was employed. Moreover, there was high operative mortality in the emergency group following trauma, not specifically relating to the spleen but effectively eliminating these patients from the long-term analysis. Arguably, our series may also be considered too small to comment accurately on OPSI incidence. Despite the static nature of the local population, we cannot be certain that patients had not moved away and attended other hospitals although, again, this is a general drawback with any retrospective series. However, the low operative numbers themselves and the emergency presentation of many of the cases essentially precludes prospective analysis. Retrospective analysis is therefore probably the best current available option to study such patients. Furthermore, this work represents an up-to-date ‘real life’ cohort in a busy hospital, thereby providing practical results applicable to other surgeons in the UK.

Conclusions

Operative mortality is high following emergency splenectomy, largely owing to the nature of the injury sustained.
Irrespective of the indication for splenectomy, older age confers the greatest operative risk.

Over a period of 18 years, no cases of OPSI were identified in a relatively static unselected postsplenectomy patient group that included both children and adults. Adherence to prophylactic immunotherapy vaccines was satisfactory with uptake by approximately 90% of cases. Apparent uptake of prophylactic antibiotics was also high although actual patient compliance is unknown and likely to be far lower than reported.

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