



Adherence to vaccination guidelines post splenectomy: A five year follow up study



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ABSTRACT

Following a splenectomy patients are at increased risk of significant infections. In its most severe form, overwhelming post-splenectomy infection (OPSI) has a mortality rate of up to 80%. In this study we aim to establish the adherence to vaccination and antibiotic national guidelines in splenectomised patients. A retrospective study of 100 patients who underwent splenectomy (21 emergency, 79 elective), in two teaching hospitals was undertaken over a five-year period. Patients were followed up for five years. Hospital and GP records were reviewed for adherence to pre, intra and postoperative vaccination, thromboprophylaxis and antibiotic guidance. Eighty-six eligible patients (91.5%) received their *Haemophilus influenzae* B, meningococcal C and pneumococcus vaccinations peri-operatively. Eighty-one (86%) received post-operative antibiotics. Ninety-nine percent of patients received thromboprophylaxis treatment. Eighty-nine (95%) were treated with long-term antibiotic prophylaxis. Only 20 patients (23%) had an emergency supply of antibiotics. Ninety-five percent of patients were administered an annual influenza vaccination and 84% of eligible patients received a five-year pneumococcal booster vaccination. Improvement in the management of this patient cohort can be achieved by a multidisciplinary approach involving adherence to national guidelines, standardised trust protocols, patient information leaflets and advice detailing risk of infection, standardised GP letters and a splenectomy register to monitor and manage this vulnerable group of patients.

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Introduction

Following splenectomy patients are at increased risk of severe infections [1]. In its most virulent form, overwhelming post-splenectomy infection (OPSI) has a mortality rate of up to 80%. The lifetime risk of OPSI in splenectomised patients has been estimated at around 1–2% [2] and the three most common causative organisms are *Streptococcus pneumoniae*, *Haemophilus influenzae* B (HiB) and *Neisseria meningitidis* group C (Men C) [3]. Antimicrobial prophylaxis in this patient group is indicated to protect against infections by these pathogens [4]. Patients are also at increased risk of mortality from protozoal infections, principally malaria and babesiosis and should be alert to the risks of overseas travel and animal bites [5]. Short and long term risk of infection following

splenectomy vary depending on the initial indication and patient co-morbidity risks [6]. Higher risks of mortality are clearly associated with underlying malignancy [7]. Current best practice for prevention of these complications can be grouped into a triple approach consisting of vaccination, antibiotics and patient education. In addition to the risk of infection, splenectomised patients are also at an increased risk of venous thromboembolism [6], so preventative measures must be employed particularly if a post-operative thrombocytosis occurs. The majority of NHS trusts have guidelines for the management of splenectomised patients which vary in degrees of similarity to national recommendations. In this article we present a retrospective study of adherence to vaccination, thromboprophylaxis and antibiotic national guidelines for splenectomised patients and a review of the current literature.

Methods

A retrospective study of post-splenectomy antimicrobial and thromboembolic prophylaxis was undertaken at the University

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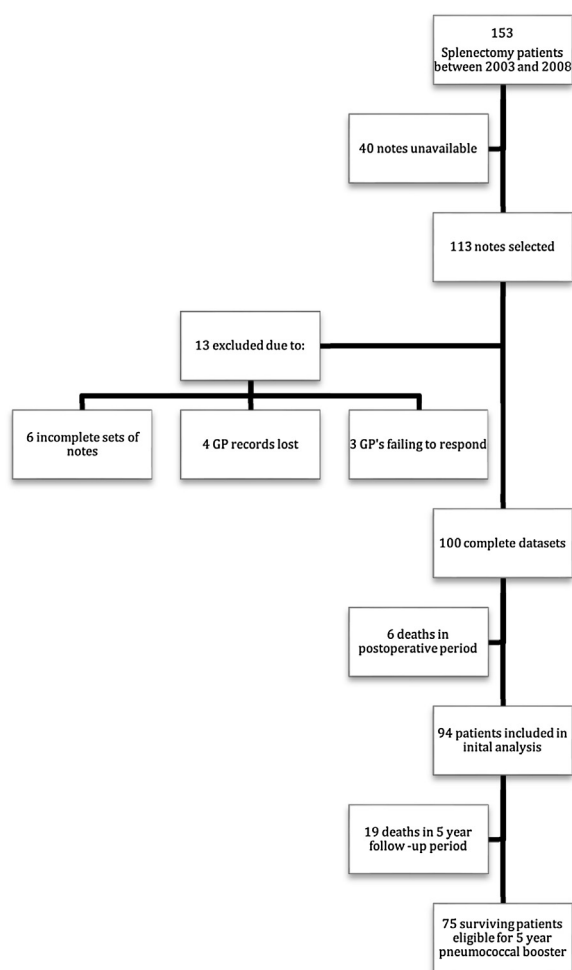


Fig. 1. Patient selection process and reasons for exclusion from each stage of the analysis.

Teaching Hospitals of Leicester (UHL). The standards used were recommendations set in a publication by a Working Party of the Haemato-Oncology Task Force and British Committee for Standards in Haematology (BCSH) in 2011 [8]. These recommendations are based on evidence from well-conducted clinical studies and expert opinions given the lack of randomised-controlled trials in this field. We reviewed both hospital notes and contacted General Practitioners (GP) by telephone for predetermined criteria based on the current UHL guidelines.

A five year period between January 2003 and December 2008 was selected to evaluate treatment and follow-up of 153 adult patients who underwent splenectomy (Fig. 1). Patients were followed up for five years and 113 patients were randomly selected on the basis of availability of their hospital notes. Hospital notes were assessed for: the indication for splenectomy, triple vaccinations for Men C, HiB and pneumococcus before or after splenectomy, peri-operative prophylactic antibiotics, peri-operative thromboembolic prophylaxis both mechanical (thromboembolic stockings) and pharmacological (low molecular weight heparin), intra and post-operative intravenous antibiotics if nil-by-mouth and post-operative aspirin if platelets exceeded 1000 $\mu\text{L}/\text{mL}$. GP notes were assessed for long term prophylactic antibiotics (Phenoxymethylpenicillin [Pen V] or Erythromycin), patient supply of emergency antibiotics, annual influenza vaccination and five-year pneumococcal booster vaccination.

Results

One hundred and thirteen patient notes were selected, in 6 notes were incomplete or inadequate, 4 were not on GP records or the GP had closed down and 3 GPs failed to respond. A total of 21 emergency and 79 elective patients who underwent splenectomy were evaluable. There were 58 male and 42 female patients between the ages of 18 and 86 years old (mean = 56 years old). Idiopathic thrombocytopenic purpura (ITP) was the most common indication for elective splenectomy ($n = 21$). Splenic injury, for example in road traffic accidents was the most common indication for emergency splenectomy ($n = 10$), the second most common being iatrogenic ($n = 9$). The other indications for surgery are shown in Table A1. Of the 100 patients, 6 died in the immediate post-operative period, 3 emergency patients and 3 patients who had a splenectomy following intestinal surgery for malignancy. Reasons for death included myocardial infarction ($n = 1$), pneumonia ($n = 1$) but in 4 notes were incomplete and the reason for death was not documented or attainable. Ninety-four patients were suitable for final analysis. Nineteen patients died during the five-year follow-up period and were excluded from the five-year pneumococcus booster vaccination analysis.

Hospital treatment

Eighty-six patients (91.5%) received their HiB, Men C and pneumococcus vaccinations peri-operatively (Fig. 2). Fourteen patients (8.5%), 12 elective and 2 emergency, did not have a record of their vaccinations having been administered. Eighty-one patients (86%) received post-operative antibiotics and 13 (14%) did not have any documentation of antibiotic prophylaxis in the peri-operative period. Eleven patients had a post-operative platelet count greater than 1000 per μL , only 5 received post-operative aspirin (45%) until their count was below 1000 per μL . Ninety patients were suitable for thromboembolic prophylaxis of whom 89 (99%) received treatment in the form of subcutaneous low molecular weight heparin and thromboembolic stockings.

General practice follow-up care

Eighty-nine patients (95%) were placed on long term prophylactic Penicillin V or Erythromycin (Fig. 3). Only 20 patients (23%) were given an emergency supply of antibiotics in case they were to run out or become acutely unwell. Seven patients were excluded due to frailty or other underlying conditions such as dementia. An annual Influenza vaccination was administered to 81 of 85 eligible patients (95%), with 9 patients being excluded due to receiving other treatments such as chemotherapy at the time of treatment and or death before vaccination could be administered. A five-year pneumococcal booster was given to 57 of 68 eligible patients (84%). Twenty-six patients were lost to follow-up due to death or moving out of the area.

Discussion

Current national guidelines state that the pneumococcal, Men C and HiB triple vaccination should be given in patients with an absent or dysfunctional spleen, in addition to an annual influenza vaccination.

The pneumococcal vaccination is available as a 23-valent polysaccharide (PPSV23) (*Pneumovax*[®]) or as a 13-valent conjugate (PCV13). Current "green book" guidelines recommend PPSV23 for all patients over the age of 65 that require primary vaccination, and splenectomised patients must receive a dose in the perioperative period and boosters every 5 years as the antibody levels are found to decline in these cases. PCV13 is currently given to infants as

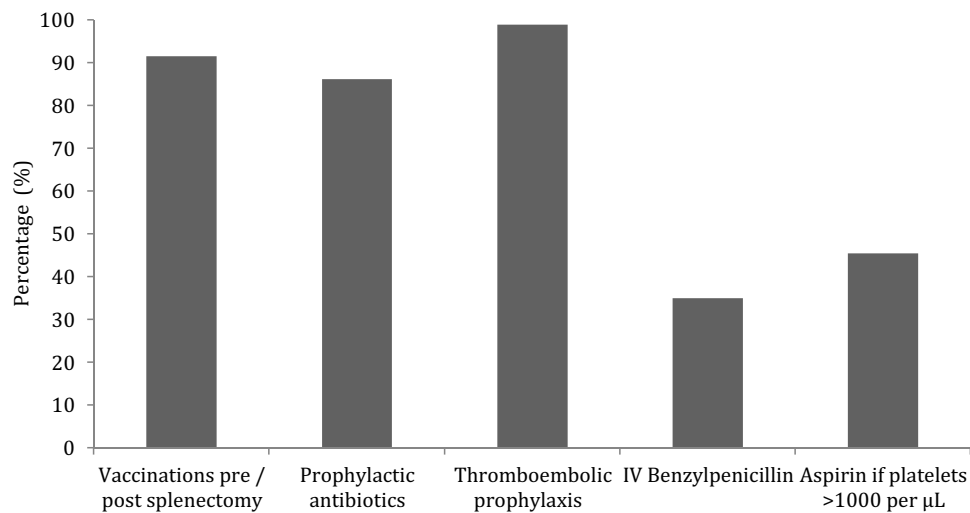


Fig. 2. Hospital treatments administered.

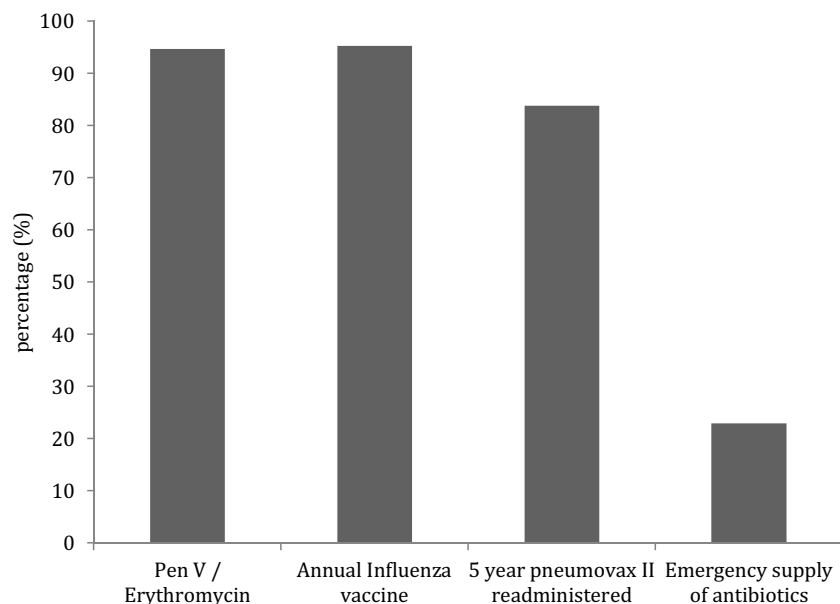


Fig. 3. GP post operative treatment.

part of routine vaccination and for immunocompromised children under 5 years of age. It is currently not recommended for asplenic adults unless they have a concomitant disease such as leukaemia or myeloma, or severe immunocompromise that puts them at high risk of pneumococcal infection [9]. There was no documented use of PCV13 in our 2003–2008 cohort, as PCV13 was introduced in 2010 and it is likely that the guidance was not widespread among GP's at the time of data collection.

The Men C and HiB combined conjugate vaccine (*Menitorix*®) used in this cohort is likewise recommended as part of the routine childhood vaccination schedule, and as a one off in adult splenectomised patients. In addition this, the Centre for Disease Control has recently recommended the additional use of the meningococcus serogroups A, CW & Y conjugate vaccination in splenectomised patients [10] and this recent recommendation has been included in our local guidelines. Based on the relatively poor compliance for

the pneumococcal booster in our trust and nationally, we propose that this vaccination should be administered one month post-splenectomy and should be documented in a standardised GP letter. The recent development of the Meningitis B recombinant vaccine has prompted some UK trusts to also include this in their guidance for asplenic patients [11].

Our results show that the rates of triple and annual influenza vaccination were 91.5% and 95% respectively. Ideally the vaccinations should be given at least 2 weeks prior to splenectomy in order to maximise the immune response. If this is not possible they should take place 2 weeks afterwards [2] and the patient's vaccination status should also be clearly documented in the notes [8]. Comparatively, a UK study has shown that nationally the uptake rates of the pneumococcal vaccine in asplenia was 53.4%, between 1999 and 2005 [12], so our results are an improvement on national trends. Our study demonstrated that 16% of patients do not receive

the five-yearly pneumococcal booster, and it should be noted that the fifth influenza vaccination should be given at the same time as the pneumococcal vaccination and yet there was a significant difference between the administrations of these two vaccines (Chi-squared p -value = 0.0012). Given the importance of the five-year pneumococcal booster in increasing antibody levels [13], it is critical that all patients receive this. BCSH guidelines also suggest that if antibody assays are available, the response to the pneumococcal vaccine can therefore be measured and the need for the booster reassessed [8]. The need for a five-year pneumococcal booster is documented in our guidelines, and the shortcomings in its administration may be due to decreased GP awareness resulting from the lack of a standardised GP information letter, and we have updated guidelines to improve this.

High rates of non-vaccination are described in the literature for recipients of emergency or unplanned splenectomy [14]. A study in Spain highlighted higher rates of vaccination in patients with haematological disorders [15], an observation that may possibly be due to more robust infection prevention policies employed by haematology departments. Our study shows that there was no significant difference in non-vaccinated patients when comparing elective to emergency/unplanned operations included in the study.

The BCSH guidelines advise that asplenic patients should be offered lifelong oral prophylactic antibiotic therapy based on either penicillin or a macrolide. The risk of OPSI is lifelong but is highest in the first 2 years post-splenectomy, so patients should be encouraged to take antibiotics for this period at least. There is some evidence to suggest that certain groups are at increased risk of OPSI, in particular of pneumococcal disease, which allows a degree of risk stratification when deciding to carry on antibiotics. Suggested at-risk groups include those aged under 16 or over 50, patients with a haematological malignancy, those with previous pneumococcal infection or poor pneumococcal vaccine response [8]. Our study demonstrates that 95% of patients were administered lifelong antibiotics. The 5 patients with no documented prescription of these were a 31 year old with ITP, a 30 year old with hereditary spherocytosis, a 36 year old with a traumatic splenic laceration, a 71 year old with a colorectal carcinoma and a 69 year old with gastric adenocarcinoma and lymphoma, the latter 2 patients fitting into the high risk category. Patient choice to continue antibiotics or later prescription of antibiotics by the GP was difficult to determine and therefore a limitation of this study. Certainly an emergency supply of antibiotics should also be provided (guidelines suggest a single dose of oral Amoxicillin 3 g or Clarithromycin 1 g); patients are to take this at the first sign of infection before seeking medical attention [2,8].

The advent of electronic records utilised by GP practices has improved documentation and recording of medication and vaccination administration, this should be further utilised to improve recording and automatic reminders for the administration of these interventions.

A penicillin based (or alternative if allergic) antibiotic should be administered intravenously intra-operatively and post-operatively if the patient is in a high-risk group (e.g. trauma and immunocompromised patients), and nil-by-mouth for a period of time post-operatively. Patients are at highest risk of OPSI in the immediate post-operative period and antibiotic cover should be provided [16–19]. Eighty-six percent of patients in this study had documented post-splenectomy antibiotic cover. Poor documentation, missing notes and prescription charts could explain the apparently low level of antibiotic administration. The recent introduction of electronic prescribing in our trust and nationally should lead to an improvement in the documentation of prescriptions in patient records.

Patients should be well informed about the risks of overwhelming infection. They should be counselled appropriately and should

carry an information card or medic-alert bracelet to alert medical professionals to their condition. Awareness of the risks of overseas travel, in particular malaria, tick and animal bites is also an important part of patient education [8]. A study of the information available to asplenic patients on the internet revealed that whilst there was adequate discussion of the risk of infection and the need for anti-microbial prophylaxis, most of the websites did not cover all of the important information needed [20]. Our study did not address the standards of patient education in our trust; currently all elective patients should receive advice from a consultant and a nurse specialist, and are provided with an information leaflet. This was not regularly documented in the notes and formal documentation and education should be encouraged for long-term management of this patient cohort. Our current trust guidelines do have a comprehensive section on the specific advice to be given to patients post-splenectomy, including the recommendation for patients to carry information cards and medic-alert bracelets. A standardised document that includes a checklist, information for the patient and a letter for the GP has been introduced to improve patient education and care.

Review of guidelines from other UK trusts did not reveal any major differences in management recommendations [16–19,21–24], however Southampton Hospital Trust has a comprehensive set of guidelines with a checklist and patient and GP information letters, they also included the recommendation that aspirin 75 mg should be given if a patient's platelets rise above 1000 on discharge (due to the increased risk of thromboembolism) [19]. Our results show that the rate of administration of aspirin for thrombocytosis was 45%, however as this treatment is rarely given it indicates that staff are unaware of the risk of thrombocytosis and the need for this treatment. Although inpatients are administered low molecular weight heparin as a form of thromboembolic prophylaxis the risk following discharge does require consideration. Two trusts have a standardised letter to GP's with specific details for vaccination and antibiotic prescriptions [19,25]. The previous lack of a standardised GP letter and advice on thromboembolic prophylaxis and subsequent vaccinations in our trust guidelines are highlighted by this study. A survey of GP's from Essex in 2000 revealed that approximately half were successfully identifying splenectomised patients from their registers. The survey showed that whilst 79% had received the pneumococcal vaccine, only half of the patients had received the Men C or HiB vaccination. In addition only about a third of patients were taking antibiotic prophylaxis or carrying a medic alert card [26]. An audit of 76 splenectomised patients in Salisbury found that only 30 (39%) patients received all 3 vaccines, 63% had prophylactic antibiotics, and 81% of surviving patient's GP's were adequately informed about the splenectomy [14]. Data from international studies (Table A2) also demonstrates widespread poor compliance with vaccination guidelines and the need for improved adherence and the need for a comprehensive multi-disciplinary approach to the management of this patient cohort.

The outcomes measured in our study support these results but as previously mentioned we were unable to measure the quality and comprehensiveness of education provided to patients. A quality improvement report based on patients in Lincolnshire demonstrated an increase in administration of pneumococcal and influenza vaccine in at-risk patients after a vaccination register was implemented [27]. The implementation of a vaccination register with the involvement of a multi-disciplinary team managing this cohort of patient will improve the implementation of guidelines and ensure patients are not "lost in the system". Our trust does not currently have a vaccination register but we are working on introducing one with multi-disciplinary input and this should improve

post-operative care of this patient cohort in addition to the rate of the five-year pneumococcal booster uptake observed in this study.

Conclusion

This study demonstrates that the rates of triple vaccination, antibiotic administration and thromboembolic prophylaxis in the University Hospitals of Leicester Trust between 2003 and 2008 are comparable (or slightly better) to both national and international standards. Review of our results and the literature demonstrate that significant improvements need to be made to ensure patients receive the best possible care as outlined by national guidelines. We have identified significant shortcomings in the uptake of the five-year pneumococcal booster and supply of emergency antibiotics. Improvement in the management of this patient cohort can be achieved by a multidisciplinary approach involving adherence to national guidelines, standardised trust protocols, patient information leaflets, standardised GP letters and a splenectomy register to monitor and manage this vulnerable group of patients.

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Competing interests

None declared.

Ethical approval

Not required.

Appendix A.

Table A1

Indication for splenectomy.

Indication for splenectomy	Number of patients (100)
Idiopathic thrombocytopenic purpura	21
Lymphoma	14
Colorectal cancer	10
Pancreatic carcinoma/cyst	10
Trauma	10
Gastric adenocarcinoma	9
Iatrogenic	9
Autoimmune haemolytic anaemia	4
Hereditary spherocytosis	4
Hairy cell leukaemia	2
Ovarian cancer/Teratoma	2
Splenic mass/Portal hypertension	2
Chronic pancreatitis	1
Diverticular disease	1
Hereditary elliptocytosis	1

Table A2
Summary of post-splenectomy antimicrobial prophylaxis from international studies.

Study	Country	Years	Pneumococcal vaccination rate	HIB Vaccine	Men C Vaccine	Pneumococcal booster	Influenza vaccine	Long term prophylactic antibiotics	Education
Bruni et al. [15]	Spain	2000–2002	63%	63%	61%	33%	–	–	65% of discharge letters mentioned vaccination status
McHugh et al. [28]	Ireland	2002–2008	90% of eligible patients received unspecified peri-operative vaccines	–	–	–	–	87%	Poor documentation in discharge letters
O'Donnell et al. [29]	Ireland	1990–2000	60%	19%	6%	–	–	47%	Poor patient knowledge
Hasse et al. [30]	Switzerland	1998–2003	70%	6.6%	3.3%	0%	–	0%	22% received education
Kotsanas et al. [31]	Australia	1999–2004	84% received all 3 vaccines	–	–	–	–	67%	Less than 25% had adequate recommendations given to GP
Kyaw et al. [32]	Scotland	1988–1988	88%	70%	51%	–	76–96%	52%	47% of patients had adequate information
Lammers et al. [33]	Netherlands	1997–2008	85.4%	39.4%	32.3%	23.5% patients' GP's advised	12.6% patients' GP's advised	12.4%	27% patients recall receiving education
Coignard-Biehler et al. [34]	France	2000–2005	70.8%	44%	24%	–	–	74%	–
Kealey et al. [35]	USA	1996–2011	76%	68%	75%	39%	55%	–	–

– Not assessed.

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