Journal of BTHA, Volume XVII, 2011

Asplenia

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Introduction

The spleen has an important role in removing bacteria and parasitised red cells from the circulation. It also produces proteins, such as properdin and tuftsin that have a role in complement activation and opsonisation, respectively. The effect of splenectomy is most apparent as a loss of phagocytic function and a depletion of marginal zone B cells that produce specific antibody. Loss of specific antibody production also increases the risk of infection by encapsulated bacteria. This is because the phagocytic function of the spleen normally involves clearance of microorganisms, such as encapsulated bacteria and protozoa.

After splenectomy, there is a reduction in circulating IgM memory B cells, which have a significant role in the production of natural as well as specific IgM antibodies. The latter are important in the early control of infection due to encapsulated bacteria. These IgM memory B cells originate in the splenic marginal zone B. Cells from this zone can rapidly respond to Tcell- independent polysaccharide antigens such as those in bacterial capsules. This in turn, activates the innate and adaptive immune systems.

Splenectomy has been estimated to carry a lifetime risk of overwhelming sepsis of up to 5%, although the risk is probably highest in the first 2 years after splenectomy and higher in children than in adults.[1]

Patients with surgical or functional asplenia (patients after bone marrow transplantation, with sickle-cell disease and some haemoglobinopathies) have reduced clearance of encapsulated bacteria, such as the pneumococcus, from their bloodstream. Splenectomy removes the splenic macrophages that filter and phagocytose bacteria and other bloodborne pathogens. After splenectomy, overwhelming infection can follow, caused most often by the encapsulated bacteria *Streptococcus pneumoniae* (90% of all cases of 'overwhelming postsplenectomy sepsis'), *Haemophilus influenzae* type b and *Neisseria meningitidis.* More than half of those infected die as a result of such overwhelming post-splenectomy infection. Other pathogens such patients are at risk from are *Psudomonas aeruginosa, Escherichia coli, Enterococcus species,* Capnocytophagia carnimorsus, group B streptococci, protozoa infections including babesiosis (a tick-borne protozoal disease with similar manifestations to malaria), and *Plasmodium* that leads to malaria. Such a complication is common in the first two years after splenectomy but it is not unusual for it to occur in later years. Among splenectomised patients, the incidence of this complication is put at 0.18-0.42% per year, with lifetime risk of 5%.

In order to avoid infections after splenectomy, specific measures need to be taken:
• antibiotic prophylaxis; • prompt treatment of infections;
• education about the condition and its management;
• card or bracelet or pendant should be carried to indicate asplenia;
• appropriate and timely immunisation.

Immunisation
Before splenectomy, patients should receive pneumococcal, H. influenzae b, and Meningococcal serogroup ACWY conjugate vaccines (check that the child has not already received these) and seroconversion should be checked before the surgical procedure. If immunisation was not performed before splenectomy, it should be carried out after the operation. Asplenic individuals respond poorly to polysaccharide vaccines. Antibody levels are lower than in hosts with a spleen and wane more rapidly.

All patients with anatomical splenectomy or functional asplenia should be considered for the following vaccines:
• ***Pneumococcal polysaccharide vaccine (PPV)***
If not given before, it should be given as soon as possible after the operation and before discharge from hospital. Boosters are needed every 5–10 years as indicated by antibody titres. Asplenic patients with lymphoproliferative disorders or sickle-cell anaemia may require reimmunisation earlier, after 3–5 years. The recommended pneumococcal antibody post splenectomy is >40 u/mL. Because pneumococcal antibody levels may decline rapidly in some high-risk groups, GPs should consider monitoring these antibody responses, perhaps two to five years (the test can only be undertaken in a few centres). Some patients (e.g. patients with Sickle cell anaemia and lymphoproliferative disorders), in fact, may need reimmunisation earlier than the recommended 5–10 years. Such a decision may be made on the basis of antibody levels.

• ***H. influenzae b vaccine***
In the case of a child, check that the vaccine has not already been given. The need for boosters is still unclear.

• ***Meningococcal C Conjugate vaccine (MenC)***
Check the patient's immunisation status. Hib and MenC are given in the combined vaccine Menitorix® (Hib/MenC) To prevent meningococcal disease, the Meningococcal polysaccharide ACWY is no longer recommended. Instead, the DH recommends we use the meningococcal conjugate ACWY vaccine (MenACWY);

• ***Influenza vaccine annually***
Children and adults previously unimmunised against pneumococcal infection and due to under go splenectomy or commence immunosuppressive therapy, such as chemotherapy and radiotherapy, are at increased risk of pneumococcal disease. They should be immunised according to their age as per UK recommendations. If fully immunised and under 5 years of age, provided one year has elapsed since completing the immunisation course, these children should be given an additional dose of the pneumococcal conjugate vaccine (PCV).

It is important to follow the DH recommendations as regards to the timing of pneumococcal immunisation in relation to the splenectomy operation or the commencement of chemotherapy or radiotherapy and avoid vaccination during chemotherapy or radiotherapy. These recommendations for unimmunised children and adults are summarised in table 1. Where an elective splenectomy is planned, ensure the child has received Hib and MenC vaccinations as well as pneumococcal vaccination, as early as possible. Table 2 shows the immunisation schedule of individuals with asplenia or splenic dysfunction but also immunosupression, or complement deficiency, according to the DH *Green Book.*

Table 1.
UK DH recommendations for the timing of pneumococcal immunisation in relation to splenectomy

Procedure	Ideal time for vaccination **before** the procedure	Minimum time **before** the procedure	Minimum time **after** the procedure
Elective Splenectomy	4 to 6 weeks	Up to 2 weeks	
Chemotherapy or Radiotherapy	4 to 6 weeks	Up to 2 weeks	
Not practicable to vaccinate before Splenectomy			At least 2 weeks
Not practicable to vaccinate before Chemotherapy or Radiotherapy			At least 3 months after completion of therapy

Antibiotic prophylaxis
In children, the risk of infection after splenectomy is high enough to justify a tablet of phenoxymethylpenicillin (penicillin-V 125 mg up to age 5 years, 250 mg from 6 years onwards) twice daily. If cover for *Haemophilus influenzae* b is needed, amoxicillin can be given instead, at a dose of 125mg up to 5 years and 250mg for those over 5 years of age, twice daily. Prophylaxis should be continued for life, or at least until their sixteenth birthday. Patients who are allergic to penicillin should take erythromycin.

Ideally, postsplenectomy patients should take prophylactic penicillin (or erythromycin) for life. On the other hand, not many patients are willing to comply. In adulthood, by 2 years after splenectomy, the risks of overwhelming infection are much reduced to the point that prophylaxis in those who do not comply could be reserved for the most vulnerable (those with malignant haematological disease or immunosuppression). The adult prophylactic dose is: penicillin-V 500 mg twice daily or amoxicillin 250–500 mg twice daily.

Patients who are unwilling to take regular penicillin should be made aware of the risks and supplied with penicillin/amoxicillin to take immediately at the onset of suggestive symptoms.

Give the patient a splenectomy leaflet and a card to carry. Consider recommending a Medic-Alert bracelet or pendant.

Recommendations for Travel
Prophylactic antibiotics are taken irrespective of whether the patient has been fully immunised. If a patient is not taking antibiotic prophylaxis, he/she should do so during periods of travel and should keep a therapeutic course of antibiotics in reserve. The prophylactic dosage of phenoxymethylpenicillin – penicillin-V is as follows: children aged 1

month to 2 years:- 125 mg every 12 hours; aged 6 to 12 years: 250 mg every 12 hours; aged 12 to 18 years and adults: 500 mg every 12 hours. The prophylactic dosage of amoxicillin: children aged 1 month to 5 years:- 125 mg every 12 hours: 5 to 12 years:- 250 mg every 12 hours; 12 to 18 years and adults:- 500 mg every 12 hours.

Table 2:

Immunisation schedule with conjugated vaccines in individuals with asplenia, splenic dysfunction, immunosupression, or complement deficiency - according to the DH Green Book. "Age' indicates the age of patient at which asplenia or splenic dysfunction or immunosupression is acquired or when complement deficiency is diagnosed.

Age	*Month 0*	*Month 1*	*Later*
< 2 years (first presenting)	According to national routine childhood schedule (including Hib/MenC & PCV3 boosters	At least 1 months after Hib/MenC & PCV3 boosters: Single dose of MenACWY	After the second birthday: Additional dose of Hib/MenC & single dose of PPV
>2 years & <5 y (previously had PCV7	Hib/MenC booster PCV13	MenACWY (single dose)	PPV (at least 2 months after PCV13)
>2 years & <5 y (previously had PCV13	Hib/MenC booster PPV	MenACWY (single dose)	
>2 years & <5 y (unvaccinated or previously partially vaccinated with PCV7)	Hib/MenC booster PCV13 (1st dose)	MenACWY (single dose)	PCV13 (2nd dose) & (at least two months later) PPV
>5 years (regardless of vaccination status)	Hib/MenC PPV	MenACWY (single dose)	

A local doctor should be consulted immediately should infective symptoms of rigors, malaise or pyrexia occur. Local medical advice is very important because of a high incidence of penicillin-resistant pneumococci in a number of countries and, of course, malaria and other pyrexial disease in endemic countries.

Asplenic patients should be warned that they should avoid animal bites, especially dog bites as these can transmit the bacteria Capnocytophaga canimorsus, which can lead to septicaemia and death if not treated early and appropriately with co-amoxiclav or erythromycin. They should avoid tick-borne protozoal infection such as babesiosis. Babesia species is a red cell parasite that occurs along the eastern seaboard of the USA and in some parts of northern Europe. Asplenic patients should avoid travelling to malaria-endemic areas, especially areas where falciparum malaria predominates. Such travellers are at particular risk of severe malaria. They should consider avoiding travel to malarious areas and in particular to coastal

West or East Africa, where transmission rates of malaria are high. Strict adherence to the appropriate prophylaxis for the area being visited and avoidance of mosquito bites are essential.

The DH provides an information sheet and a patient card for asplenic and hyposplenic patients. This can be obtained from:
• England: Department of Health Publications, tel: 08701 555 455, email: dh@prolog.uk.com
• Wales: Welsh Assembly Publications Centre, tel: 029 2082 3683,
email: assembly-publications@eales.gsi.gov.uk
• Scotland: Public Health Division 1, Health Department, Scottish Executive tel: 0131 244 2241

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Reference:
1 O'Neal B.J. & McDonald J.C. (1981) The risk of sepsis in the asplenic adult. Ann. Surg. 194, 775–8].