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Results of Splenectomy Performed on a Group of 91 Children

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Summary

In the period 1971–1990 91 children underwent splenectomies in the University Hospital of Nijmegen. The most important indications are hereditary spherocytosis, *Hodgkin's* disease and very severe immune thrombocytopenic purpura (ITP). Splenectomy after a traumatic rupture of the spleen has become less frequent: from 20 % in 1971–1980 to 4 % in 1981–1990. Short-term complications included thrombocytosis (84 %), fever without an obvious cause (46 %), which is quite regularly seen in patients suffering from *Hodgkin's* disease (48 %), and infections of the respiratory tract in 10 % of the patients. The platelet count shows a steady increase in the first nine post-operative days. No thromboembolic complications were seen. Based upon the literature there seems to be no reason at this moment for anti-platelet aggregation therapy when platelet counts are below $1000 \times 10^9/l$. More information about long-term complications was obtained through a questionnaire completed by general practitioners. The morbidity through overwhelming post splenectomy infection (OPSI) is 3.8 % (3/79), the mortality of OPSI is 2.5 % (2/79). Underlying diseases, especially those which involve the immunological system as auto immune haemolytic anemia (AIHA), seem to play an important role in the possible development of OPSI (morbidity 2/11, 18 %).

Key words

Splenectomy, indications, complications – OPSI – Thrombocytosis

Résumé

Une splénectomie a été pratiquée chez 91 enfants entre 1971–1990. Les diagnostics les plus fréquents ont été la sphérocytose, la maladie de *Hodgkin* et le purpura thrombocytopenique. Pendant le même temps, le pourcentage de splénectomie traumatique est descendu de 20 % entre 1971–1980, à 4 % dans la période 1981–1990. Les complications précoces ont comporté: une augmentation des thrombocytes (84 %), de la température sans cause précise (46 %) et une infection des voies respiratoires supérieures chez 10 % des patients. Une température de cause imprécise fut observée particulièrement fréquemment chez les patients atteints de maladie de *Hodgkin*. Le nombre des thrombocytes est élevé dans les premiers neuf jours post-opératoires; il n'y a toutefois eu aucune complication thrombo-embolique. De ce fait, il apparaît qu'il n'est pas nécessaire

d'envisager de traitement thrombocytopenique lorsque le compte des thrombocytes est en dessous de $1000 \times 10^9/l$. Evidemment les complications à lointaine échéance restent une question pendante. Dans le relevé, on constate une fréquence de sepsis post-splénectomie de 3,8 % (3/79) et une mortalité de 2,5 % (2/79). En conséquence, les maladies de base qui intéressent le système immunologique comme l'anémie auto-immunohémolytique jouent un rôle important au regard d'une possible OPSI (morbidity 2/11, 18 %).

Mots-clés

Splénectomie, indications, complications – OPSI – Thrombocytose

Zusammenfassung

Im Zeitraum 1971–1990 wurde bei 91 Kindern eine Splenektomie durchgeführt. Die häufigsten Diagnosen waren Sphärozytose, Morbus *Hodgkin* und thrombozytopenische Purpura. Hingegen sank die Rate von traumabedingten Splenektomien von 20 % im Zeitraum 1971–1980, auf 4 % im Zeitraum 1981–1990. Die Frühkomplikationen umfaßten: Thrombozytenanstieg (84 %), Fieber ohne sichere Ursache (46 %) und Infektion der oberen Luftwege (bei 10 % der Patienten). Unklares Fieber wurde besonders häufig bei Patienten mit Morbus *Hodgkin* beobachtet. Die Thrombozyten stiegen in den ersten 9 postoperativen Tagen an. Es kam jedoch zu keinen thromboembolischen Komplikationen. Aus diesem Grunde erscheint auch keine thrombozytopenische Therapie bei Thrombozytenwerten unter $1000 \times 10^9/l$ indiziert zu sein.

Hinsichtlich Langzeitkomplikationen wurde ein Fragebogen verschickt. Bei der Auswertung ergab sich eine Postsplenektomie-Sepsis-Häufigkeit von 3,8 % (3/79) und eine Mortalität von 2,5 % (2/79). Dabei schienen Grundkrankheiten, die das immunologische System beeinträchtigen wie die autoimmun-hämolytische Anämie, eine besondere Rolle hinsichtlich einer möglichen OPSI zu spielen (Morbidity 2/11, 18 %).

Schlüsselwörter

Splenektomie, Komplikationen – OPSI – Thrombozytose

Introduction

Since 1952 (13) several articles concerning the complications of splenectomy at a young age have been pub-

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lished. The spleen has an important role in resistance to infection, it produces specific antibodies which stimulate phagocytosis of non opsonized bacteria. The spleen is also the producer of tuftsin and properdin which are both stimulators of phagocytosis also. In bacteria with a capsid such as pneumococci, meningococci and haemophilus influenzae, polysaccharide antigens of the capsid can provoke a humoral immune response through B-cell activation, without T-cells. This is only possible in the spleen, because

the B-cell compartment of the spleen has a marginal zone. After the immune response has been provoked, phagocytosis of these bacteria can occur both in the spleen and the liver. The antibody production against these bacteria starts early during the course of infection and is important for the protection of the host against infections caused by bacteria with a capsid. The ability of synthesis of these antibodies is absent until 3–4 weeks after birth and will develop to an adult level at the age of about 5 years. There is a higher incidence of overwhelming post-splenectomy infection (OPSI), caused by bacteria with a capsid, after splenectomy performed in children (10, 13, 18). This has resulted in a management avoiding splenectomy at a young age as often as possible. Most of the information about complications of splenectomy is based on old publications. Recent information on results and complications is still missing. This retrospective study was undertaken to define the risks of a splenectomy at young age performed on 91 children from 1971–1990.

Patient population and methods

Patient population

From 1971 to 1990 91 children varying in age from 8 months to 16 years underwent splenectomy in the University Hospital of Nijmegen (UHN), 42 in the period of 1971 to 1980, 49 from 1981 to 1990. The group mentioned first did not receive pneumococcal vaccine pre-operatively. Both groups received the usual prophylaxis with antibiotics after the operation.

Methods

By means of a retrospective study of notes, the following has been registered from the patient population:

- age at time of the splenectomy
- indication
- short-term complications; all complications within a month after the operation, e.g. fever and infections. Fever is defined as a morning body temperature higher than 37.5°C after the 5th post-operative day
- course of the thrombocyte count till the tenth post-operative day, and the use of anti-coagulative therapy. Thrombocytosis means a thrombocyte count above $350 \times 10^9/l$
- results of a splenectomy performed on children with immune thrombocytopenic purpura (ITP)
- mortality
- long-term complications from the hospital notes

This clinical information was completed with information from general practitioners (G.P.'s). The G.P.'s of 73 patients filled in a questionnaire about prophylaxis with antibiotics and the incidence of infections after discharge from hospital.

Results

Indications related to age are shown in Table 1. Eleven children younger than 5 years of age underwent a splenectomy. The most frequent indication was hereditary spherocytosis ($n = 24$) and Hodgkin's disease ($n = 23$). Short-term complications are shown in Table 2: Respiratory tract infections are the most frequent post-operative complication (10%). Two patients had postoperative hemorrhages (2 times continued bleeding of operation wound, both ITP patients). Fever 5 days after operation was seen in 33 of 77 patients (46%) in whom this information was obtained. In 18 of these cases no obvious cause for this fever was found; 11 of these were patients suffering from Hodgkin's disease. If a cause was found ($n = 15$), it concerned respiratory tract infection ($n = 9$), pancreatitis ($n = 3$), or wound infection ($n = 3$).

Figure 1 shows the post-operative course of the platelet count. It reveals a clear rise in the first 9 postoperative days. The course of

the thrombocyte count after a splenectomy for ITP did not differ from other indication groups.

Of the 13 patients who underwent splenectomy for severe ITP, one died of an intracranial hemorrhage on postoperative day 3. This patient was admitted in critical condition, whereupon a splenectomy was performed. He turned out to suffer from the syndrome of Wiskott Aldrich. In 8 of the 12 remaining patients splenectomy gave the desired result which meant a platelet count above $100 \times 10^9/l$. One of them had a relapse one year later, that responded well to corticosteroids. In another patient, who developed a relapse, an accessory spleen was found five years after operation. After extirpation of this accessory spleen the thrombocyte count became normal. The remaining 4 patients, whose platelet count stayed low postoperative, had a spleen scan carried out, in order to trace any potential accessory spleens. These were not found.

Fourteen of the 91 patients died. Three patients suffered from OPSI, two of them died. The remaining 12 patients died of underlying diseases. The 2 patients who died of OPSI underwent a splenectomy

Table 1 Indication for splenectomy in relation to age ($n = 91$).

Indication	No.	< 2 yrs.	2–5 yrs	> 5 yr
1. Hemolytic anemia				
a) autoimmune	6			6
b) congenital	29			
– hereditary spherocytosis			2	22
– pyruvate kinase deficiency			2	1
– glycolyse enzyme deficiency				1
– beta thalassemia			1	
2. Immune thrombocytopenic purpura	13	1	2	10
3. Trauma	10		3	7
4. Malignancy	26			
– Hodgkin's disease				23
– CML				2
– Non Hodgkin's lymphoma				1
5. Splenorenal shunt	6			6
6. Misc: abscess in spleen	1			1
Total	91	1	10	80

Table 2 Short term complications after splenectomy.

Indication	Mort.	WdInf	RTI	Pancr	Hem	Misc*
Autoimmune hemolytic anemia						1
Congenital hemolytic anemia		1	2	3		2
Immune thrombocytopenic purpura	1	1	2		2	
Trauma	3					2
Malignancy			1			1
Splenorenal shunt		1	4			
Misc: abscess in spleen						
Total	4	3	9	3	2	6

*

- Mort. mortality, their information is not used in the results: $n = 87$
 WdInf wound infection
 RTI respiratory tract infection
 Pancr pancreatitis
 Hem hemorrhagical complications
 Misc. miscellaneous: In group AIHA a digitalis intoxication was found, In group congenital hemolytic anemia a patient developed a stomach retention and another got a gallstone attack
 In group trauma a patient developed an osteomyelitis and another got measles at the ward
 In group malignancy a CML patient developed a pericarditis on day 24 postoperative.

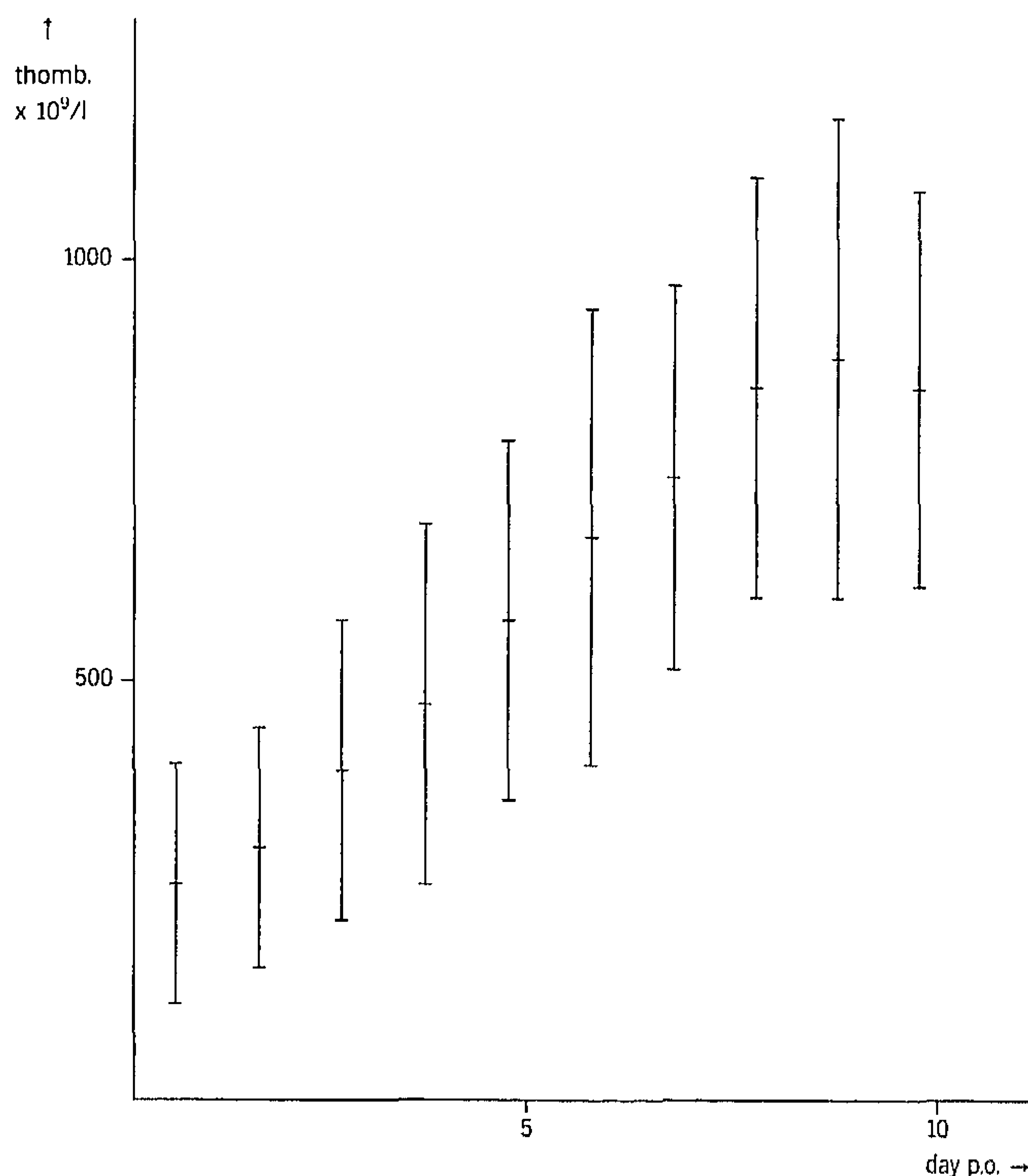


Fig. 1 Course of thrombocyte count after splenectomy, mean \pm SD, $n = 82$.

Table 3 Composition of the group of general practitioners who completed and returned the questionnaire.

Total	91 G.P.'s of patients
Died, cause of death known	14 patients
Emigrated	2 patients
Recently operated	2 patients
Notified	73 G.P.'s about patients
Response	70 G.P.'s
Unknown (moved, address unknown, no further information obtained)	10 patients
Information received about	60 patients

in the second period (1981–1990) because of chronic myeloid leukemia (CML) and auto immune hemolytic anemia (AIHA) with ITP respectively. The patient who recovered from OPSI underwent a splenectomy in the first period (1971–1980) because of an AIHA. He developed pneumococcal meningitis 7 years after operation.

After notifying 73 G.P.'s, information about 60 patients was obtained (Table 3), thus covering a post-operative one to 18-year-period. After splenectomy severe infection was seen five times (once meningitis, 4 times pneumonia) in 5 patients, 10 patients suffered from a minor infection (tonsillitis, otitis). The patient with meningitis was treated in hospital, as was a patient with a severe otitis media with effusion. All the patients suffering from pneumonia were treated with antibiotics as amoxicillin ($n = 2$) and erythromycin ($n = 1$).

Discussion

Indications for splenectomy did not alter much during the observation period, only splenectomy for trauma showed a decrease. In the first period traumatic rupture of the spleen was the reason for a splenectomy in 8 patients (8/41,

20%), in the second period only two patients underwent a splenectomy after traumatic rupture (2/49, 4%). An explanation is the more conservative management of splenic rupture; only occasionally is splenectomy performed when a patient is not hemodynamically stable.

The most frequent short-term complication was respiratory tract infection which was found to occur in 9 out of 87 patients (10%), whereas *Ziemski* (20) found an incidence 14.5%. Hemorrhagic complications occurred in 2%: *Ziemski* found postoperative hemorrhages in 15.1% of his population. Fluctuations of postoperative body temperature was examined because splenectomy could give rise to fluctuations of body temperature without an obvious cause (20). This was found to occur more often after splenectomy for lympho- and myeloproliferative disorders. In our patient population fever without an obvious cause occurred most frequently in patients with *Hodgkin's* disease (11/23, 48%). It is not clear whether the underlying disease is more likely to be an explanation for this phenomenon, rather than the splenectomy itself. Excluding the patients suffering from *Hodgkin's* disease, in 4 out of every 5 patients a reason for the fever could be found, either respiratory tract infection, pancreatitis, wound infection or fever caused by associated pathology.

In this population thrombocytosis was found in 84% (69/82) of the patients. In the first period 15 patients (36%) used salicylates ($n = 12$) or cumarine derivatives ($n = 3$) as a prophylaxis against thrombosis. In the second period 14 patients (28%) used only salicylates as prophylaxis. In the University Hospital of Nijmegen low-dose salicylates are started if the platelet count is higher than $1000 \times 10^9/l$ and stopped if this falls below $700 \times 10^9/l$ (after approximately 1 to 3 months). No thrombo-embolic complications occurred (1, 11). It may well be questioned whether anti aggregation therapy for platelet counts just above $1000 \times 10^9/l$ is necessary.

Splenectomy for ITP gave the desired result in 8 out of 12 patients (66.6%) which means a thrombocyte count above $100 \times 10^9/l$. Below the age of 10 this was found to occur in 62.5% (5/8), in the group older than 10 years of age this occurred in 75% (3/4). This is comparable with data from other publications: 65% and 88% (6). Splenectomy at a young age is only performed in case of emergency after failing of all other treatments and if the patient's life is threatened by hemorrhages or by the risk of these occurring. In 4 children the thrombocyte count did not rise above $100 \times 10^9/l$ after splenectomy. In 2 of these no rise at all was found, the platelet counts of the other 2 only showed a slight increase to $60-90 \times 10^9/l$. But even a small increase of the platelet count can make a big difference for the patient because by decreasing the risk of hemorrhage.

Children under the age of 2 are at the highest risk of developing OPSI and children under the age of 5 have an increased risk (4, 5, 8). In the patient population 11 of the 91 children (12%) were younger than 5 years of age at the time of splenectomy. None of them developed pneumococcal sepsis.

Morbidity of OPSI was found to be 3.8% (3/79), which is low compared to the literature (7–12%) (3, 7, 12, 15). One patient developed pneumococcal meningitis 7 years after splenectomy. He was not vaccinated against pneumococci as this was not available at that time. He recovered completely. Two other patients (2.5%) died of OPSI. This is comparable with literature: 1.8 to 5% (3, 12, 15). Both received the usual antibiomatic prophylaxis and pneumococcal vaccination before the operation. This leads to the conclusion that OPSI can not be

prevented by vaccination combined with antibiomatic prophylaxis (19). *Eraklis* (9) found that mortality of OPSI occurred mainly in patients with severe underlying diseases which undermine the immune system. This was also found to occur in our study. One of the children who died of OPSI suffered from CML, the other who died had AIHA and he developed an ITP as well. Of the eleven patients with AIHA two got OPSI, one of whom died. In this patient population AIHA seems to predispose to OPSI (morbidity 2/11).

Eraklis (8) found a morbidity of OPSI of 5.4 % in 1967, *Ein* et al (7) 3.2 % in 1977 and *Posey* et al (15) 1.8 % in 1983. The risk of death from OPSI seems to decrease. This may be due to better knowledge about the risks of OPSI in both patients and the medical staff and improved antibiotic therapy. Because of the risk of OPSI, vaccination against pneumococci is advised in the Netherlands (14). By preference the vaccination is given before splenectomy because of a higher level of antibodies that is reached (17). For patients suffering from *Hodgkin's* disease the efficiency is thought to be higher if the vaccination is given before the start of chemotherapy (16). Vaccination does not make sense if after the splenectomy immunosuppressive therapy is started. Immunity acquired through vaccination is limited in children under the age of two, because their ability to produce antibodies has not yet fully developed. In the vaccine nowadays 23 types of capsides are represented, responsible for 85 % of the infections caused by pneumococci. Furthermore OPSI is only caused in half of the cases by pneumococci, for the remaining 50 % other bacteria with capsides are responsible, e.g. meningococci and haemophilus influenzae B. This is a reason antibiotic prophylaxis is advised next to the vaccination. Also the possibility exists to vaccinate against H. influenzae B and meningococci (2).

Apart from patients who developed OPSI the questionnaire completed by G.P.'s showed that 4 patients suffered a major infection, and 10 suffered minor infections. It is not clear to what extent this is a late complication of the splenectomy or related to the underlying disease and if the incidence is significantly higher than in normal population.

References

¹ *Boxer MA*, et al: Thromboembolic risk of postsplenectomy thrombocytosis. *Arch. Surg.* 113 (1978) 808-809

- ² *Cartwright KAV*: Vaccination against haemophilus influenzae b-disease; Should almost eradicate the disease if uptake is high. *Br Med J* 305 (1992) 485-486
- ³ *Chaikof EL*, et al: Fatal overwhelming postsplenectomy infection. *Am J Surg* 149 (1985) 534-539
- ⁴ *Chaimoff C*, et al: Serum immunoglobulin changes after accidental splenectomy in adults. *Am J Surg* 136 (1978) 332-333
- ⁵ *Claret I*, et al: Immunological studies in the postsplenectomy syndrome. *J Pediatr Surg* 10 (1975) 59-64
- ⁶ *Coon WW*: Splenectomy for idiopathic thrombocytopenic purpura. *SG & O* 164 (1987) 225-229
- ⁷ *Ein SH*, et al: The morbidity and mortality of splenectomy in childhood. *Ann Surg* 185 (1977) 307-310
- ⁸ *Eraklis AJ*, et al: Hazard of overwhelming infection after splenectomy in childhood. *N Eng J Med* 276 (1967) 1225-1229
- ⁹ *Eraklis AJ*, et al: Splenectomy in childhood, a review of 1413 cases. *J Pediatr Surg* 7 (1972) 382-388
- ¹⁰ *Gopal V*, et al: Fulminant pneumococcal infections in "normal" asplenic hosts. *Arch Intern Med* 137 (1977) 1526-1530
- ¹¹ *Gordon DH*, et al: Postsplenectomy thrombocytosis. *Arch Surg* 113 (1978) 713-715
- ¹² *Horan M*, et al: Relation between splenectomy and subsequent infection. *Arch Dis Child* 37 (1962) 398-414
- ¹³ *King H*, et al: Splenic studies. 1. Susceptibility to infection after splenectomy performed in infancy. *Ann Surg* 136 (1952) 239-242
- ¹⁴ Letter from "Staatszucht op Volksgezondheid" to all doctors in The Netherlands: Letter 215367, Ministry of Health, The Hague (1982)
- ¹⁵ *Posey DL*, et al: Overwhelming postsplenectomy sepsis in childhood. *Am J Surg* 145 (1983) 318-321
- ¹⁶ *Schellong G*, et al: Therapiestudie HD 85; Universitätsklinik, Münster (1986)
- ¹⁷ *Siber GR*, et al: Antibody response to pretreatment immunisation and posttreatment boosting with bacterial polysaccharide vaccines in patients with Hodgkin's disease. *Ann Intern Med* 104 (1986) 467-475
- ¹⁸ *Tamminga RYJ*, et al: Het gevaar van asplenie: een foudroyante sepsis. *Ned Tijdsch Geneesk* 136 (1992) 257-259
- ¹⁹ *Waghorn DJ*: Prevention of postsplenectomy sepsis. *The Lancet* 341 (1993) 248
- ²⁰ *Ziemski JM*, et al: Evaluation of early postsplenectomy complications. *SG & O* 165 (1987) 507-513

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