A comparative study of partial vs total splenectomy in thalassemia major patients

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ABSTRACT

Background: In this study, we show the advantages of partial splenectomy (PS) over total splenectomy (TS) regarding the chances of overwhelming postsplenectomy sepsis (OPSI).

Materials and Methods: From February 1991 to December 1999, 143 cases of β-thalassemia underwent PS. 1/3, 1/4 of the splenic tissue was preserved. One hundred and ten cases were followed for an average of 5 years. None of the patients received vaccination or prophylactic antibiotics. Pre- and postoperative hematological profiles, IgM levels, recurrence of hypersplenism and septic episodes were compared among the data of 60 cases TS; all these cases have been operated in the same hospital.

Results: Hematological profile significantly increased and transfusion requirement approximately reduced to three-fold. After 3 years, 22.7% in PS and 13.3% in TS groups required the same amount of preoperative transfusion. After 5 years, these percentages were 27.3 and 18.3%, respectively. Two patients in PS and six in TS group developed signs of sepsis. Conclusion: Vaccination or prophylactic antibiotics are not necessary after PS. The risk of sepsis in PS without antibiotics is less than that in TS with antibiotics, and resplenectomy after PS is not associated with serious complications.

KEY WORDS: Hypersplenism, partial splenectomy, prophylactic antibiotics, total splenectomy

INTRODUCTION

Several articles have been published on partial splenectomy (PS) in thalassemic patients. However, either the number of cases is not significant or the follow-up is too short and recurrence of hypersplenism after PS and total splenectomy (TS) has not been compared on large scale. Majority of the patients with thalassemia major ultimately develop hypersplenism and require TS for the reduction of transfusion regimen. In spite of vaccination and prophylactic antibiotics, patients are prone to postsplenectomy sepsis. Partial splenectomy with various methods has been performed as an alternative method, and it has been shown that PS reduces the transfusion requirement and infection rate. In this study, we compare the postoperative infection rate and the rate of recurrent hypersplenism in patients with PS vs. TS in thalassemic patients.

MATERIALS AND METHODS

From February 1991 to December 1999, a nonrandomized control clinical trial was performed on 143 patients with thalassemia major™ and thalassemia intermediate. The mean age of the patients was 5.8 years (range: 2-12 years) and they underwent PS in comparison to the data of 60 age-matched thalassemic children (range: 3-13 years) who underwent TS on the same transfusion regimen with pneumococcal vaccination and prophylactic antibiotic in this center. This study was approved by the Ethical Committee of Shiraz University of Medical Sciences and an informed written consent was obtained from the parents before the operation.

Surgical procedure

Through a laparotomy or left subcostal incision, upper or lower polar artery and vein were isolated and preserved. Subsequently, 1/3, 1/4 of splenic length was measured, and the remaining tissues were removed through a fish mouth incision. At the beginning of the study, a part of the patients (n = 40) underwent the preservation of the upper pole artery; however, because of the anatomic preference of lower pole artery (n = 103) and its adequate length, it was selected as the preferred method. All patients were on low transfusion regimen to maintain their hemoglobin (Hb) around 8
gram percent. The indication for PS was the transfusion requirement of more than 25 ml/kg/month.

**Postoperative work-ups**

(1. Complete blood count (CBC); on day 2, 7 and 14 and each follow-up visit; 2. IgM level, two weeks and three months later; 3. Splenic isotope scan (Tc-99 m) two weeks later (in the first 60 cases), color Doppler ultrasonography in the remainder cases; 4. Howell-Jolly bodies on day 2 and 2-3 months later by peripheral smear stained with H&E), for the detection of functional splenic tissue. None of the patients received pneumococcal vaccination or prophylactic antibiotics. The parents were asked to immediately refer their children to the hospital or local physician if they had fever or confusion. Student’s t-test and Fisher’s exact test were used for data analysis.

**RESULTS**

One hundred forty and three cases (92 male, 51 female) with a mean age of 5.8 (range: 2-12 yrs), underwent PS. The mean operation times for the upper and lower pole were 95 and 75 minutes, respectively (P < 0.005). In five patients, TS was performed due to bleeding few hours after the operation (three upper and two lower pole preservation); however, there was no mortality or morbidity. Twenty-eight patients did not return to follow-up. From the remaining 110 cases, 12 followed up for 2 years, 23 for 2-4 years, 53 for 4-6 years and 22 for more than 6 years.

The mean Hb, RBC and platelets significantly increased after PS (P < 0.001) [Table 1]. There was no significant difference in hematologic parameter after TS and PS [Table 2]. The transfusion requirement reduced three-fold from 10-25 ml/kg every 1-2 weeks (before the operation) to every 4-6 weeks (average 35 days) following PS. The mean weekly Hb reduction changed from 1.92 gram percent preoperatively vs 0.62 gram percent postoperatively (P < 0.005). Howell-Jolly body was detected in 106 cases (96.3%) and the IgM level was within the normal range in all the patients.

TS group were followed up for a mean duration of 4.5 years (range: 3-6 years), and postoperative blood requirement decreased to 10-15 ml/kg every 8-11 weeks. After 3 years, 25 patients (22.7%) of the PS group and 8 patients (13.3%) of the TS group required the same amount of preoperative transfusion every 2-3 weeks and TS was performed for the PS patients (P < 0.02). After 5 years, for 30 cases of PS group [n = 110] (27.3%) and 11 cases of TS group (18.3%), the transfusion requirement reached up to 10-15 ml/kg every 1-2 weeks, and TS was performed for the PS group and the mean operation time was 104 min. Two patients (1.4%) in the PS group and six (10%) in TS group developed postsplenectomy infection (P = 0.009) and one patient in TS group died. The remaining patients responded to medical treatment.

**DISCUSSION**

Different methods of PS have shown reduction in the transfusion requirement. Pringle et al.[3] partially embolized the spleen (partial splenic embolization (PSE)) of six patients with 2 years follow-up. The postoperative transfusion indices reduced significantly. Pinca et al.[2] compared the 7 years follow-up of nine patients after PSE and six patients after TS, the transfusion requirements of both the groups were similar postoperatively. Banani et al.[1] reported 61 cases of PS vs 38 cases of TS with 2 years follow-up and concluded that PS reduces the postoperative transfusion need. Politis[4] followed six patients of PS and seven patients of TS for 5 years and showed that the transfusion requirements of both the groups are similar. For the 30 cases of PS, Montalembert[5] revealed that thalassemic patients on high transfusion regimen responded to PS better than those at low transfusion regimen.

Although the studies of Pinca[2] and Politis[4] are limited with respect to the cases, they concluded that PS is a good alternative in β-thalassemia. Montalembert[5] reported 37.5% hypersplenism after 2 years, excluding the TS patients. Banani[1] reported 13.9% hypersplenism after 2 years in PS; however, after the same period, for the majority of the TS patients, the transfusion requirement increased up to the same amount as that for the PS patients. In our study, after 3 years, the transfusion requirements for eight out of 60 patients

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### Table 1: Comparison of pre- and postoperative hematological parameters in 143 cases of partial splenectomy

<table>
<thead>
<tr>
<th>Variables</th>
<th>Preoperative mean ± SD</th>
<th>P value</th>
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<tbody>
<tr>
<td></td>
<td>PS</td>
<td>TS</td>
</tr>
<tr>
<td>Hb (g/dl)</td>
<td>7.45 ± 0.83</td>
<td>7.6 ± 1.4</td>
</tr>
<tr>
<td>RBC (x10^6/ml)</td>
<td>3.19 ± 0.61</td>
<td>3.32 ± 0.59</td>
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<tr>
<td>Platelets (x10^3/ml)</td>
<td>171 ± 60.52</td>
<td>169 ± 75.03</td>
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</tbody>
</table>

*NS: Not significant, PS - Partial splenectomy, TS - Total splenectomy

### Table 2: Postoperative hematological parameters for 143 cases of partial splenectomy vs 60 cases of total splenectomy

<table>
<thead>
<tr>
<th>Variables</th>
<th>Partial splenectomy</th>
<th>Total splenectomy</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb (g/dl)</td>
<td>9.50 ± 1.21</td>
<td>9.55 ± 1.09</td>
<td>NS*</td>
</tr>
<tr>
<td>RBC (x10^6/ml)</td>
<td>3.42 ± 0.55</td>
<td>3.52 ± 0.34</td>
<td>NS</td>
</tr>
<tr>
<td>Platelets (x10^3/ml)</td>
<td>309 ± 158</td>
<td>465 ± 193</td>
<td>&lt;0.001</td>
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</table>

*NS: Not significant
(13.3%) of the TS group and 25 out of 110 cases in the PS group (22.7%) increased to the same level as that before the operation. After 5 years, the percentages for 30 PS and 11 TS cases were 27.3% and 18.3%, respectively; these values were not statistically significant.

The origin of the causes of hypersplenisms after PS and TS is not clear. Craig et al. observed lymphadenopathy in three parts of the abdomen in his patients with erythroidopoicic centers. The lymphoid hyperplasia and extramedullary hemopoietic centers may play a role in hypersplenism after TS. Hypersplenism rate after PS is different in reports and may be related to the remaining splenic tissue, mode of transfusion and age of the patient. The intraoperative estimation of preserved splenic tissue is not accurate and the reports vary from 25-75%.[7]

Montalembert preserved half of the normal spleen, but we preserved 1/4-1/3 of it. This difference may be the reason for different rates of post PS hypersplenism in these studies. The effect of the transfusion regimen on hypersplenism after PS is not yet well defined. Montalembert concluded that patients on high transfusion regimen had late hypersplenism. All of our patients were on low transfusion regimen.

The age of our patients was less than that in the study of Montalembert (mean age: 5.8 vs 7.9 years). In younger children, hypersplenism may appear later. However, the causes and the rate of hypersplenism after TS and PS require more investigation. Based on our data, hypersplenism will occur after PS and TS, and the rates are not significantly different. Although, resplenectomy after PS is time consuming (104 min), but is thalassemia, younger age and first year after splenectomy ranging from 1.2-24.1%. This wide range may be due to differences in follow-up, definition of infection, age of the patient, lymphoid tissue involvement and duration of postoperative antibiotics. All the patients after PS in the reported series (except one) have received pneumococcal vaccination, prophylactic antibiotics or both. In our study, 110 cases of PS neither received vaccination nor prophylactic antibiotics and only two patients developed signs of sepsis, while six patients developed this complication in the TS group (10%) and one patient expired. Although we are not sure whether the patients had received their antibiotics regularly, however appears that the incidence of infection in PS is significantly lower than that in the TS patients on prophylactic antibiotics.

Presence of Howell-Jelly bodies, normal IgM and detection of splenic tissue in the isotope scan or Color Doppler ultrasonography indicated normal splenic functions in these patients.

**CONCLUSION**

Recurrence of hypersplenism after PS and TS is not significantly different. Pneumococcal vaccination and prophylactic antibiotics are not required after PS. It appears that the infection risk after PS without antibiotics is less than that in TS with antibiotics. Resplenectomy after PS is not associated with serious complications.

**REFERENCES**


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