Partial splenectomy in cystic fibrosis patients with hypersplenism

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We report three cystic fibrosis (CF) patients with hypersplenism who underwent partial splenectomy. The postoperative course was uneventful in two patients; one patient developed a complication necessitating resection of the rest of the spleen. Haematological parameters improved and oesophageal varices regressed in all patients. On follow-up, one patient showed a normal spleen, the other a normally functioning accessory spleen; the third patient again developed splenomegaly with hypersplenism. Partial splenectomy is a promising therapeutic option for CF patients with hypersplenism.

**CASE REPORTS**

**Patient 1**

AE is male, born 1985, homozygous for $\Delta F508$, with pancreatic insufficiency. In 1998, a computed tomography (CT) scan showed hepatomegaly with secondary splenomegaly ($16 \times 8 \times 17$ cm). Gastroscopy revealed oesophageal varices grade 0–1. Laboratory tests showed decreased white blood cell (WBC) and platelet counts, and normal levels of serum transaminases. Because of increasing hypersplenism and abdominal discomfort, partial splenectomy was performed at the age of 12.9 years. The size of the remaining part of the spleen was $8 \times 6 \times 11$ cm. Compared to preoperative values, the postoperative WBC and platelet counts were found to be considerably improved. At the present time, 2.8 years after surgery, the patient experiences hardly any abdominal discomfort.

The remaining spleen is now of normal size ($11.5 \times 7.8 \times 10$ cm). Laboratory tests indicate a stable situation with an only slightly decreased WBC count, a normal platelet count, and normal levels of serum transaminases.

**Patient 2**

CO is male, born 1979, homozygous for $\Delta F508$, with pancreatic insufficiency. Splenomegaly gradually developed in the second decade of life. At age 15, the patient chronically suffered from discomfort and severe abdominal pain; laboratory tests revealed a modest elevation of serum transaminases, and decreased WBC and platelet counts. A CT scan showed hepatic cirrhosis, ascites, and massive splenomegaly ($24 \times 16 \times 22$ cm); oesophageal varices were grade 1.

Partial splenectomy was performed at the age of 15.3 years; about four fifths of the spleen (3 kg) was removed. Laboratory tests after surgery showed normal WBC and platelet counts, and slightly raised serum transaminases. At the present time, 6.8 years after surgery, the patient does not report any discomfort, although splenomegaly (spleen size $16 \times 11 \times 15$ cm) with mild hypersplenism has recurred.

**Patient 3**

CE is female, born 1979, homozygous for $\Delta F508$, with pancreatic insufficiency. Since 1995, while gradually developing massive splenomegaly and showing laboratory evidence of hypersplenism, she reported increasing dyspnoea, abdominal discomfort, and pain. At the age of 19.5 years, a preoperative CT scan revealed liver cirrhosis, splenomegaly ($23 \times 7.5 \times 17$ cm), and an accessory spleen with a diameter of approximately $3.8$ cm. Oesophageal varices were grade III. Laboratory tests before surgery showed moderately decreased WBC and platelet counts, and a slight elevation of serum transaminase levels.

The operation was without complications, but four hours after partial splenectomy the patient developed severe abdominal pain; a consecutive CT scan showed a large haematoma at the operation site and thrombosis of the remaining spleen vessels. At reoperation, the remaining spleen had to be completely removed. Postoperative laboratory tests revealed normal WBC and platelet counts, and near normal serum transaminase levels. At the present time, 2.7 years after surgery, the patient reports only minimal abdominal discomfort. Oesophageal varices are grade I–II; the accessory spleen has increased to a size of $4.9 \times 6 \times 5$ cm. Results of laboratory tests show no signs of hypersplenism; serum transaminase levels are slightly increased.

**METHODS**

Preoperatively, the patients’ lung disease was treated intensively by intravenous antibiotics and vigorous chest physiotherapy for 10 days. All children underwent a preoperative CT scan and selective angiography of the splenic artery. The objective of the procedure was a subtotal resection of the spleen, leaving as little as possible of the upper pole. The resection line depended on the upper polar vessels of the spleen; these were selectively dissected and retained as supply vessels. After the vascular supply of the lower and middle segments of the spleen had been interrupted, the sections of the parenchyma to be resected were found to be clearly demarcated. Details of the spleen resection technique have been described previously.

**DISCUSSION**

Portal hypertension, a severe complication in CF patients, is responsible for splenomegaly, dilated portal and collateral veins.

Abbreviations: CF, cystic fibrosis; CT, computed tomography; TIPS, transjugular intrahepatic portosystemic shunting; WBC, white blood cell.
veins such as oesophageal varices, and ascites. Splenomegaly leads to discomfort and pain, increased dyspnoea caused by elevation of the diaphragm, and thrombocytopenia and leukopenia associated with hypersplenism.

The indications for surgical intervention for portal hypertension in CF patients are not clearly defined. Treatment of portal hypertension and splenomegaly includes a variety of methods ranging from shunting procedures to liver transplantation. The best treatment strategy is still a subject for discussion.

Surgical portosystemic shunting is effective in preventing variceal bleeding in patients with severe portal hypertension. However, such shunts are complicated by an increased risk of portal hypertension and thrombocytopenia. Further, portocaval or portorenal shunting does not consistently improve hypersplenism. As an alternative, transjugular intrahepatic portosystemic shunting (TIPS) may be performed as a temporary palliative procedure in patients with variceal bleeding, but experience with this approach is limited in children.

Endoscopic injection sclerotherapy has also been reported to be effective in controlling variceal bleeding in children with CF. Morbidity and mortality were shown to be lower than with portosystemic shunt surgery, and the incidence of complications was reported to be less than 10%. Recently, endoscopic variceal ligation was found to be effective in controlling variceal haemorrhage, and was thus suggested as a preferable alternative to endoscopic variceal sclerotherapy. Both procedures, however, have to be repeated regularly, and do not solve the problem of hypersplenism.

Partial splenic embolisation is a safe and effective alternative to partial splenectomy. It decreases splenic blood flow, and thereby reduces portal pressure and improves peripheral cytopenia. In the majority of patients this improvement in cytopenia is persistent, thus effectively controlling hypersplenism before liver transplantation. However, fever and severe abdominal pain often necessitate a continuous infusion of morphine after surgery. This again might produce a badly controllable risk situation in patients with advanced respiratory disease.

Liver transplantation may be a therapeutic option for the treatment of end stage liver disease; it may be done as a single or a triple organ transplant—that is, liver, lungs, and heart—if the cardiac and pulmonary lesions are also severe. Immunosuppression after liver transplantation has not been shown to be associated with an increase in infection, and respiratory function usually improves after transplantation.

Splenectomy is an established technique that promptly results in an improvement of leucopenia and thrombocytopenia, but also carries a mortality of up to 15% and the long term postoperative risk of postsplenectomy sepsis. Removal of a massively enlarged spleen is associated with higher death and complication rates than the removal of smaller spleens; associated cardiopulmonary abnormalities contribute to morbidity and mortality. The incidence of postsplenectomy sepsis is higher in children and may range from 1% to 25%; postsplenectomy sepsis is rapid in onset and course, and carries a mortality as high as 50%. Thus, every possible effort to preserve splenic tissue should be made.

Partial splenectomy has been performed in children with a variety of diseases. In children with CF, experience with partial splenectomy is extremely limited. After partial splenectomy, splanchnic blood flow is decreased, and this results in reduced portal pressure and a diminution of oesophageal varices; in addition, peripheral blood cells increase promptly in numbers because of reduced splenic sequestration. Up to 95% of the spleen can be safely removed, reducing the blood supply of the residual spleen tissue to peripheral polar vessels. Partial splenectomy can thus decrease the spleen’s volume and blood supply while maintaining its functions; immunological functions of the spleen in particular are preserved or at least restored after some time. These beneficial effects have also recently been shown in an animal model. A further advantage of partial splenectomy is that liver transplantation, should it become necessary in the later course of the disease, remains possible. Louis and Chazalette described their experience with partial splenectomy in six CF patients. They did not provide detailed information about their patients with regard to spleen size but reported that the weight of the splenic tissue resected varied between 0.6 and 1.2 kg. Among the postoperative complications were three scar ruptures requiring two surgical interventions. During follow up for 2.5–7 years, a normal sized spleen and corrected hypersplenism were found in all patients. Five patients also showed diminution of oesophageal varices. Our results are somewhat comparable to those of the above series. While the postoperative course was uneventful in two of our patients, one patient developed a thrombosis of the upper polar vessels necessitating removal of the rest of the spleen. Fortunately, this patient had an accessory spleen; thus this complication did not lead to the functional end result of total splenectomy. Initially, haematological parameters improved, and oesophageal varices disappeared or regressed in size in all patients. None of our patients showed an increased incidence of infections. During follow up, one patient showed a spleen of normal size, and one patient a normally functioning accessory spleen; both remained without signs of hypersplenism. One patient again developed splenomegaly with mild hypersplenism but so far has not required further surgical intervention. This is in contrast to the results reported by Louis and Chazalette. The better outcome with regard to spleen size and hypersplenism in their series might be the result of a somewhat different patient population. Our patients apparently had more massive splenomegaly, leading to the resection of up to 3 kg of splenic tissue; thus the results of partial splenectomy might differ with differing preoperative disease state.

Liver cirrhosis is a potentially life threatening complication in CF. However, current medical and surgical treatments allow for both a comfortable life and a prolonged life expectancy. Partial splenectomy appears to have a number of benefits that by far outweigh a few reported complications. The preliminary results of others and our own experience encourage us to continue using partial splenectomy in selected patients.

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The natural history and outcome for children with cystic fibrosis has improved with modern methods of pulmonary therapy leading to the increasing recognition that cystic fibrosis liver disease, cirrhosis, and portal hypertension, is now the second commonest cause of death. In many children, the liver disease remains well compensated, but portal hypertension with bleeding oesophageal varices and hypersplenism is a major concern in a minority of cases.

In general, treatment for portal hypertension for children with cystic fibrosis liver disease is dependent on their symptomatology such as oesophageal varical bleeding, the development of ascites, or significant hypersplenism leading to recurrent epistaxis or life threatening infections or bleeds. It is not our experience that hypersplenism alone is a major concern. In over 200 patients with CF liver disease attending our unit, 12 of whom underwent liver transplantation, severe hypersplenism requiring such aggressive management was not a feature.

Thalhammer et al have documented their experience with partial splenectomy in cystic fibrosis patients with hypersplenism. The authors document three children with cystic fibrosis with moderate hypersplenism in whom the indications for partial splenectomy were related to abdominal discomfort but not to haemorrhage or infection. No details on the severity of the hypersplenism or of the associated liver disease were provided, including no liver histology. None of the children had significant symptoms related to portal hypertension, such as bleeding oesophageal varices, although one child had ascites.

The authors report a prolonged improvement in hypersplenism as evidenced by a rise in white cell and platelet count (data not given) in only two of the three patients, one of whom required a total splenectomy because of postoperative complications. Of the two children who actually underwent partial splenectomy, one continued to have a decreased white cell count, suggesting that mild hypersplenism is still present, and thus only one child has sustained correction of hypersplenism after partial splenectomy. Overall these data suggest that the primary goal of the operation was not achieved.

It is not clear whether oesophageal varices were always diagnosed endoscopically or by CT scan, but grade 3 varices were diagnosed in one patient and grade 1 varices in the other two. No information was provided about postoperative evolution of varices in the two patients who had partial splenectomy, but in the child who had a total splenectomy, varices regressed from grade 3 to grade 1–2 after the operation. This regression may have been a result of the total splenectomy as suggested by the authors, but also to the partial thrombosis of the remaining splenic vessel, which is comparable to gastric devascularisation and splenectomy, a well known operation for controlling varices, and not to the planned “partial splenectomy”.

We would take issue with the choice of procedure in this group of patients. None of the children were symptomatic from hypersplenism or portal hypertension. Surgery was indicated for subjective complaints only and was probably not justified in view of the potential complications of such major surgery in this group of patients, which include: hepatic decompensation, pulmonary complications, splenic vein thrombosis with possible extension of the thrombus to the portal system, postoperative bleeding related to portal hypertension and thrombocytopenia, and excessive resection of splenic parenchyma leading to risk of infection or fulminant sepsicaemia.

Finally, for children with cystic fibrosis and decompensated cirrhosis, liver transplantation alone (that is, without heart and lung) is effective therapy. Partial splenectomy may increase the technical difficulties of the transplant operation, and infection rates before and after transplantation, or, worse, if the patient develops extensive thrombosis of the portal system after partial (or total) splenectomy makes transplantation impossible.

We are doubtful that this operation can be justified in patients with cystic fibrosis in view of modern methods for controlling portal hypertension such as oesophageal band ligation, portocaval intrahepatic portosystemic stent shunt, and the questionable benefits detailed in this small series. We would advocate a more detailed analysis of the
morbidity related to hypersplenism in cystic fibrosis patients before proposing potentially risky procedures.

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**Sexual health of teenagers**

The rate of births to teenagers in the UK is twice that of Germany, three times that of France, and six times that of the Netherlands. The incidences of both gonorrhoea and genital chlamydial infection rose 2.5-fold between 1995 and 2000. A review of cases at a London genitourinary clinic (Sex Transm Infect 2002;78:349–51) has illustrated some aspects of the problem.

The review included all clients aged 16 years or under attending the clinic during two months (March and October) in 1998. There were 144 females and 18 males (median age 15.4 years, range 12–15.9 years). About half of the females attended because of symptoms of sexually transmitted infection (STI) and almost two thirds had an STI (chlamydia 34, gonorrhoea 13, pelvic inflammatory disease 15, other STI (genital warts, trichomonas vaginalis, herpes simplex, pediculosis pubis) 32). Less than a third of older women attending the clinic had an STI (40% attended as contacts). Twenty-seven teenagers were pregnant and all but one requested termination. Of the 117 non-pregnant females three quarters were not using contraception at the time of attendance and over half had no documentation of contraceptive advice in their notes. Almost half of the teenage females failed to attend for follow up.

Staff at another London genitourinary clinic (Sex Transm Infect 2002;78:342–5) developed a questionnaire with the help of a focus group of local school teenage pupils. Seven hundred and forty-six questionnaires were distributed to pupils at six schools and a pupil exclusion unit and all were completed. The teenagers wanted more frequent clinics, after-school and on Saturdays, and walk-in rather than appointment. Many (37%) would prefer a waiting area solely for young people and only 20% would go in the first place to their general practitioner. Staff sensitivity and confidentiality were important to them.

Sexual health services for teenagers need to be sensitive to their needs and to provide contraceptive advice.