

R. Lüsebrink  
G. Blumhardt  
R. Lohmann  
S. Bachmann  
M. Knoop  
H. P. Lemmens  
P. Neuhaus

## Does concomitant splenectomy raise the mortality of liver transplant recipients?

R. Lüsebrink (✉) · G. Blumhardt  
R. Lohmann · S. Bachmann · M. Knoop  
H. P. Lemmens · P. Neuhaus  
Department of Surgery,  
University Hospital Rudolf Virchow,  
Free University of Berlin,  
Augustenburger Platz 1,  
D-13353 Berlin, Germany

**Abstract** Within a 17-month period, 130 orthotopic liver transplantations were performed in our hospital. Nine of these were retransplantations and were not included in our analysis. In the remaining 121 patients, splenectomy was performed in 34 patients, either synchronously with the transplant procedure (27 patients) or in the postoperative period (7 patients). Indications for splenectomy were lienalis-steal syndrome in 15 patients and hypersplenism in 15 cases. The number of rejection episodes was fairly equal in both

groups (splenectomized vs. non-splenectomized, 61.7% vs. 63.9%, respectively). There was a marked difference in the frequency of infectious episodes (61.7% vs. 25.3%) that resulted in a decreased survival rate (77.5% vs. 95.4%) for splenectomized patients. Therefore, we recommend splenectomy only for very selected patients and investigate the banding of the splenic artery as an alternative.

**Key words** Liver transplantation  
Splenectomy · Infection

### Introduction

Splenectomy has been combined with solid organ transplantation for various reasons in the past including altered immune response and increased tolerability of immunosuppressive medication [1, 2]. We observed an improved graft function after splenectomy when there was a persistence of lienalis-steal syndrome after orthotopic liver transplantation. Therefore, we included routine examination for the presence of lienalis steal syndrome in our preoperative work-up for liver transplant candidates. Splenectomy was performed when indicated by clinical considerations. This retrospective study compares the long-term course of splenectomized vs. non-splenectomized patients in respect of rejection and infectious episodes and its influence on survival.

### Materials and methods

#### Patients

Within a 17-months period between September 1990 and January 1992, we performed 130 orthotopic liver transplantations (OLT) at our centre. Indications for OLT were posthepatic cirrhosis in 53 patients, 21 were transplanted due to primary sclerosing cholangitis (PSC) or primary biliary cirrhosis (PBC), 20 patients suffered from alcoholic cirrhosis, 3 from Budd-Chiari syndrome and 15 from various diseases (e. g. Morbus Wilson, auto-immune hepatitis etc.). There were nine acute liver failures and nine retransplantations. The nine retransplantations were excluded from this study. Of the remaining 121 patients, 61 were female and 60 were male.

#### Operation

The transplantations were performed in a standardized manner using a veno-venous bypass technique, standard vascular ana-

stomosis and side-to-side anastomosis of the common bile duct except for patients suffering from PSC, were roux-en-Y choledochojejunostomy was used [3, 4]. The splenectomy was done either synchronously (27 cases) or metachronously (7 cases).

#### Indications for splenectomy

Indications for splenectomy were angiographically proven lienalis steal syndrome in 15 patients, hypersplenism in 15 patients, and haemorrhage and splenic infarction in 1 patient. Splenectomy was performed due to the site of arterial anastomosis in two patients. Immunosuppression was achieved either by quadruple therapy using ATG, cyclosporin A, azathioprine and prednisolone or by the administration of FK 506 plus prednisolone.

## Results

### Rejection episodes

In the total group of 121 patients there were 76 rejection episodes registered (63.3%) with a fairly equal incidence in the splenectomized (21/34) and the non-splenectomized (55/87) patients (61.7% and 63.9%, respectively).

### Infectious episodes

Only severe infections (e. g. pneumonia, sepsis or disseminated infection leading to multi-organ failure) were considered. The incidence for the entire group was 43/121 (35.5%). Splenectomized patients experienced markedly more (21/34) infections than the non-splenectomized (22/87) patients (61.7% and 25.3%, respectively).

### Survival

Letal complications were due to tumour recurrence in two patients, cardiac failure in one and hypoxia in one patient.

The remaining eight were due to infectious complications, namely *Pneumocystis carinii* pneumonia or sepsis in three patients, and CMV pneumonia, uro-sepsis, fungal infection, sepsis and fulminant hepatitis B reinfection in one patient each. The 18-month survival was 90% for the whole group with a marked difference between splenectomized (77.2%) and non-splenectomized (95.4%) patients.

## Discussion

When splenectomy is combined with orthotopic liver transplantation it may promptly correct leucopenia and/or thrombocytopenia caused by hypersplenism. It may also correct the maldistribution of arterial blood when lienalis-steal syndrome persists after OLT. In the present study, splenectomy was combined with OLT when indicated by clinical criteria.

The incidence of rejection episodes was comparable for the entire group and for splenectomized vs. non-splenectomized patients. Treatment protocols using more potent immunosuppressive agents would appear to have replaced the use of splenectomy to achieve a reduced immune response. Although the higher susceptibility of splenectomized patients to infections has been known for some time, the mechanism remains unclear [5–7]. The number of infectious episodes was markedly higher for splenectomized patients, and this corresponds to results obtained when splenectomy is performed in combination with renal transplantation [8, 9] or bone marrow transplantation [10]. Due to the late adverse effects of splenectomy in respect to infection and survival we have abandoned our previous regime and now recommend splenectomy only for highly selected patients. A randomized investigation for banding of the splenic artery as an alternative to splenectomy is currently under way.

## References

1. Megison SM, McMullin ND, Andrews WS (1990) Selective use of splenectomy after liver transplantation in children. *J Pediatr Surg* 25:881–884
2. Fryd S, Sutherland DER, Simmons RL, Ferguson RM, Kjellstrand CM, Najarian JS (1981) Results of a prospective randomized study on the effect of splenectomy versus no splenectomy in renal transplant recipients. *Transplant Proc* 13:48–56
3. Neuhaus P, Blumhardt G, Bechstein WO, Steffen R, Keck H (1990) Side to side anastomosis of the common bile duct is the method of choice for biliary tract reconstruction after liver transplantation. *Transplant Proc* 22:1571

4. Neuhaus P, Blumhardt G, Bechstein WO, Steffen R, Platz KP, Keck H (1993) Technique and results of biliary reconstruction using side-to-side choledocho-choledochostomy in 300 orthotopic liver transplants. (submitted to *Ann Surg*)
5. King H, Schumacker HB (1952) Splenic studies: susceptibility to infection after splenectomy performed in infancy. *Ann Surg* 136:239-242
6. Llende M, Santiago-Delpin EA, Lavergne JL (1986) Immunobiological consequences of splenectomy: a review. *J Surg Res* 40:85-94
7. Traub A, Giebink GS, Smith C, Kuni CC, Brekke ML, Edlund D, Perry JF (1987) Splenic reticuloendothelial function after splenectomy, spleen repair, and spleen autotransplantation. *N Engl J Med* 317:1559-1564
8. Alexander JW, First MR, Majeski JA, Munda R, Fidler JP, Morris MJ, Suttman MP (1984) The late adverse effect of splenectomy on patient survival following cadaveric renal transplantation. *Transplantation* 37:467-470
9. Shofer FS, London WT, Lyons P, Simonian SJ, Burke JF, Jarrell BE, Grossman RA, Barker CF (1986) Adverse effect of splenectomy on the survival in patients with more than one kidney transplant. *Transplantation* 42:473-478
10. Paulin T, Ringden O, Nilsson B, Lönnqvist B, Gahrton G (1987) Variables predicting bacterial and fungal infections after allogeneic marrow engraftment. *Transplantation* 43:393-398