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CASE REPORT

S. E. Cowie
E. M. Yoshida
A. G. Ryan
S. W. Chung
A. K. Buczkowski
S. G. Ho
S. R. Erb
U. P. Steinbrecher
C. H. Scudamore

Hepatic abscesses after liver transplantation secondary to traumatic intrahepatic bile duct injuries in a cadaveric allograft donor

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S. E. Cowie · S. W. Chung
A. K. Buczkowski · C. H. Scudamore
Department of General Surgery,
University of British Columbia,
Vancouver, British Columbia, Canada

E. M. Yoshida · S. W. Chung
A. K. Buczkowski · S. R. Erb
U. P. Steinbrecher · C. H. Scudamore (✉)
British Columbia Transplant Society,
Vancouver, British Columbia, Canada
E-mail: scudamore@uniserve.ca
Tel.: +1-604-8754416
Fax: +1-604-8755869

E. M. Yoshida · S. R. Erb
U. P. Steinbrecher
Division of Gastroenterology,
University of British Columbia,
Vancouver, British Columbia, Canada

A. G. Ryan · S. G. Ho
Department of Radiology,
University of British Columbia,
Vancouver, British Columbia, Canada

S. W. Chung · A. K. Buczkowski
C. H. Scudamore
Section of Hepatobiliary and Pancreatic
Surgery, University of British Columbia,
Vancouver, British Columbia, Canada

C. H. Scudamore
Second floor, 855 West 10th Avenue,
Vancouver, British Columbia,
V5Z 1L7, Canada

Abstract We report the case of an ultimately successful liver transplant recipient whose post-transplant course was complicated by the early development of multiple abscesses in the graft. Post-transplant cholangiography identified multiple shear injuries to the second and third order intrahepatic bile ducts, originating from blunt trauma to the donor liver. Treatment was non-operative following recent reports of the successful management of intrahepatic bile duct injury in the stable trauma patient. This discussion adds to the limited literature available on the transplantation of injured donor livers, despite this being a relatively common practice. Further experience is needed in determining the appropriate criteria for the use of traumatized donor livers. Cholangiography carried out on the back table may help to determine if such injured livers are suitable for transplantation.

Keywords Trauma · Diagnosis · Non-operative management · Endoscopic retrograde cholangiogram (ERCP) · Interventional radiology

Introduction

Few criteria have been established for the appropriate harvesting of a traumatized donor liver. In general, any degree of liver trauma has been considered a relative contraindication to transplantation. Pre-transplantation mortality rates in excess of 10 to 15%, caused in part by the shortage of cadaveric livers, have motivated efforts to expand the donor pool, e.g. through the use of living-related donor livers [1]. Recent reports documented the successful use of traumatized livers, previously considered of marginal quality [2, 3, 4]. Routine pre-operative imaging techniques [ultrasound, computed tomography (CT) scan with three dimensional reconstruction] and macroscopic inspection on the bench are able to accurately identify many of these hepatic injuries [5]. While intra-operative donor cholangiography has been used to identify aberrant biliary anatomy in non-traumatized livers [6], its role has not been defined in determining the suitability for transplant of traumatized livers. We describe a case of an ultimately successful liver transplant in which the donor organ's macroscopic injuries were recognized at the time of transplantation, although cholangiography was later required to determine the full extent of hepatic trauma.

Case report

A 65-year-old Caucasian male originally presented with increasing ascites and was diagnosed with decompensated cryptogenic cirrhosis. The patient was placed on a waiting list for a liver transplant, in the interim period he underwent a transjugular intrahepatic portosystemic shunt (TIPSS) procedure. The patient received a cadaveric liver transplant from a 16-year-old donor; immunosuppression consisted of tacrolimus (Prograf; Fujisawa, Markham, Ontario, Canada), mycophenolate mofetil (CellCept; Hoffmann-La Roche, Mississauga, Ontario, Canada), and tapering corticosteroids. The donor was a passenger involved in a motor accident, cause of death was brainstem compression secondary to subdural hematoma. The focused assessment with sonography for trauma (FAST) ultrasound done in the emergency department revealed no free intraperitoneal or pericardial fluid. Given the critical and clinically apparent nature of the donor's head injuries no further abdominal radiologic investigations were undertaken. The donor organs were harvested 23–24 h after the initial accident, at that time donor transaminases were elevated (AST 241, ALT 243). These enzyme levels were expected due to the injuries described below. The bile ducts were flushed with approximately 100 ml of University of Wisconsin solution at the time of harvesting, hemobilia was observed. The cold ischemic time was between 12 and 13 h; donor and recipient were ABO compatible.

The donor liver was noted on the back table to have several grade 1 injuries according to the Moore scale [7]: one in the left lobe involving segments 2 and 3, one adjacent to the falciform ligament, as well as posteriorly along the retrohepatic cava. The implantation procedure involved a standard hepatic arterial-arterial, duct-duct anastomosis with cholecystectomy, and used the left branch of the recipient portal vein for inflow as the previous TIPSS stent was in the right portal vein branch. An intra-operative cholangiogram was not performed as immediate production of non-blood stained bile was noted. Perfusion was uniform without any areas of hematoma or ischemia noted. There was no hepatic congestion.

Within the first week of transplantation the maximum transaminase levels were ALT 370 and AST 191; on post-operative day 3 the serum amylase was 52, and ALT 346, AST 136. The patient developed a fever on post-operative day 3. Blood cultures were positive for *Morganella morganii*, and the patient was placed on a course of vancomycin (1 g intravenously q18 h) and ciprofloxacin (400 mg intravenously q12 h). Recurrent fever prompted an abdominal ultrasound 9 days post-transplantation; this identified a heterogeneous hypoechoic liver lesion in segment 4 from which an aspirate eventually grew, *Candida albicans*. A CT scan the following day confirmed the presence of abscesses in segments 5, 6 and 7 (Fig. 1). Treatment consisted of amphotericin lipid complex (AmBisome; Fujisawa) 400 mg intravenously, daily for a total of 4 weeks. The ultrasound failed to demonstrate any ductal dilatation and Doppler flows were normal. The subsequent abdominal aortogram, celiac and superior mesenteric

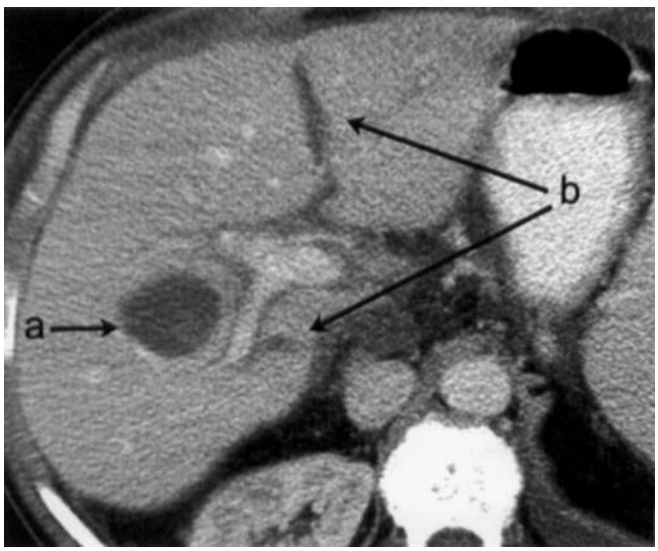

Fig. 1 CT performed 10 days post-transplantation demonstrates an abscess cavity (*a*) and multiple lacerations (*b*)

angiograms showed no evidence of hepatic arterial or portal venous thrombosis.

An endoscopic retrograde cholangiogram (ERCP) was performed 14 days post-transplantation (Fig. 2). There was mild narrowing of the mid common bile duct at the level of the biliary anastomosis; there was no evidence of any intrahepatic biliary dilatations or stenosis. The intrahepatic biliary tree showed multiple second and third order bile duct leaks in both lobes consistent with shear injury. Multiple liver abscesses were present in both right and left hepatic lobes. An 11.5 French 9 cm endobiliary stent (Cotton-Leung) was inserted across the anastomosis. After treatment with a combination of timentin (3.1 g intravenously q8 h) and amphotericin lipid complex (400 mg intravenously daily), a follow-up CT scan confirmed the absence of intrahepatic bile duct dilatation or stenosis and showed continuing resolution of the liver abscesses (Fig. 3). The patient was discharged in good condition 3 weeks postoperatively.

The patient's progress after discharge was uneventful. Cholangiography performed at the time of stent removal 4 months post-transplantation showed normal intrahepatic bile ducts, with a region of focal dilatation in the proximal common bile duct. At 7 months post-transplantation both hepatobiliary kinetics and hepatocellular function were normal on nuclear scanning. Liver function tests were normal, and transaminase levels were also normal (ALT 28, AST 10, ALP 56, GGT 24). There was no evidence of chronic rejection; the patient is alive and well 9 months after transplantation.

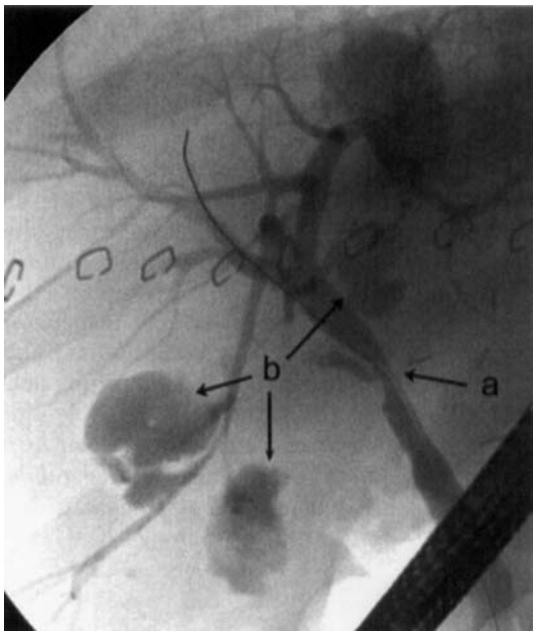

Fig. 2 ERCP 14 days post-transplantation demonstrating narrowed ductal anastomosis (*a*) and filling of multiple intrahepatic abscess cavities (*b*)

Discussion

Donor livers with evidence of trauma are at increased risk of primary non-function and other complications. It is the policy at our institution, as it is elsewhere, not to discard all injured livers but to repair or resect damaged areas on the bench as required. This case report illustrates an unusual form of early injury in a traumatized donor liver in which the pathology was both detected and managed by non-operative methods.

Most biliary tract injuries which complicate liver transplantation involve extrahepatic bile duct leakage or stenosis, and are the result of technical, vascular or immunological factors [8]. By comparison intrahepatic bile duct injury is a relatively rare problem, with an incidence of 5–19% following orthotopic liver transplantation [9]. These lesions are typically characterized by non-anastomotic biliary strictures and dilatations in graft tissue only, and occur within 1 to 4 months after transplantation [10]. The first descriptions of intrahepatic bile duct injuries following liver transplantation were associated with hepatic artery thrombosis. Ischemia has been implicated as a major factor in other

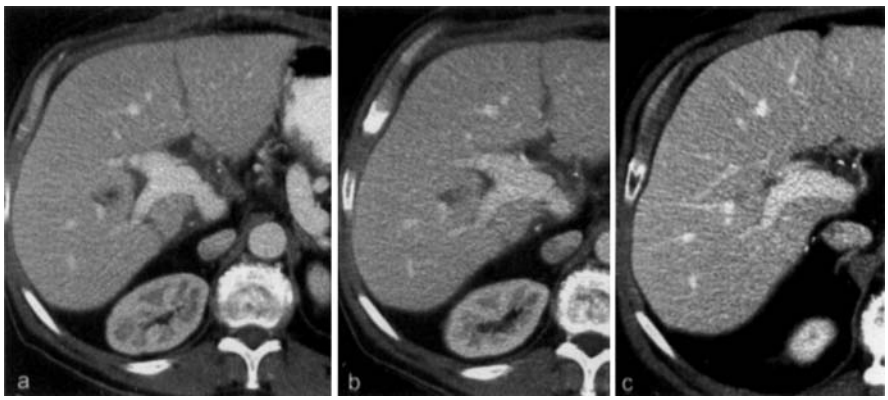

Fig. 3a–c Sequential CTs demonstrating abscess resolution at 6 weeks (**a**), 10 weeks (**b**) and 48 weeks (**c**) post-transplantation

associated etiologies. These include ABO incompatibility, chronic ductopenic rejection, and preservation injury [11]. To our knowledge only one publication has previously documented the presence of intrahepatic bile duct injury secondary to blunt trauma, sustained in the donor prior to harvesting and transplantation [12].

This lack of research is in part related to the fact that intrahepatic bile duct injury is a rare complication of abdominal trauma, although the exact incidence is unknown [13]. Traumatic injury to peripheral bile ducts may go unrecognized and heal without incident [14]. In the trauma patient the detection of major intrahepatic duct injury (first- or second-order hepatic duct) is usually delayed, and made subsequent to the development of complications such as bile fistulae, bile ascites, bilomas, abscesses, or hemobilia. There are no studies regarding the evaluation of intrahepatic bile ducts as part of the early assessment of blunt liver trauma [15].

This is in contrast to the evaluation of potential living liver donors, in many centers the biliary tree is routinely assessed for anomalies [6]. Techniques cited include intra-operative cholangiography, multi-detector computed tomography cholangiography, and magnetic resonance imaging protocols [16]. The detection of shear injury to donor liver intrahepatic bile ducts from acceleration-deceleration trauma could be made in a select number of cases by intra-operative cholangiography during the retrieval process or on the back table. Consequently it could be possible to anticipate the risk of future complications as well as define any therapeutic intervention, including resection or endobiliary stent placement.

In our case these complications manifested themselves initially as bacteremia and sepsis. Given that up to 67% of orthotopic liver transplantations will go on to develop at least one major infection post-operatively the causes of such a presentation are quite numerous [17]. However if a donor liver is known to have suffered physical trauma as part of the process leading to organ donation, consideration should be given to the presence of liver abscesses secondary to intrahepatic duct injury and biloma formation.

In general the methods used to diagnose and salvage this donor liver were similar to the techniques used in the management of blunt liver trauma. There are several case series in the adult literature as well as in the pediatric literature describing the non-operative treatment of intrahepatic bile duct injuries and bilomas, including percutaneous radiologic drainage and stenting as well as therapeutic ERCP [13]. This case demonstrates that treatment of recognized intrahepatic bile duct injury and its complications through percutaneous drainage and rendering the ductal sphincter incompetent can promote healing.

In summary, multiple intrahepatic bile duct leaks and abscesses secondary to pre-transplantation blunt trauma in the donor liver were managed conservatively with therapeutic ERCP and percutaneous drainage. The use of injured donor livers, although widely endorsed, has not been well evaluated in terms of either the criteria used for selection or in terms of post-transplantation outcome. Further experience in this field is required. The criteria used in the evaluation of the traumatized donor liver may, in addition to macroscopic inspection and transaminase levels, include assessment of intrahepatic biliary tree anatomy through cholangiography achieved on the back table. *This evaluation may help in the anticipation, recognition and prompt treatment of potential future complications, as well as to further refine what is considered an acceptable level of trauma to a donor liver.*

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