

123

# Liver Replacement after Massive Hepatic Trauma

CARLOS O. ESQUIVEL, M.D., PH.D., ANGEL BERNARDOS, M.D.,  
LEONARD MAKOWKA, M.D., PH.D., SHUNZABURO IWATSUKI, M.D., ROBERT D. GORDON, M.D.,  
AND THOMAS E. STARZL, M.D., PH.D.

**Two patients sustained massive hepatic injuries from blunt trauma in motor vehicle accidents. At the time of operation, nonreconstructable injuries to the porta hepatis were found in addition to destruction of the right lobe. Life-threatening hemorrhage was controlled, but both patients were left with nonfunctional or inadequate hepatic remnants. Liver transplantation was performed. Both patients recovered after liver replacement. One died 7 weeks later of cytomegalovirus infection. The other recipient is well 16 months later. Liver transplantation is a reasonable option in patients with lethal hepatic injuries or unreconstructable injuries to the porta hepatis.**

Orthotopic liver transplantation is an accepted method of therapy for patients with end-stage liver disease (5). The number of hepatic transplants and centers capable of doing this operation continue to proliferate worldwide. The indications for hepatic replacement are constantly changing in order to benefit more patients who otherwise would inevitably die of liver failure.

The liver is one of the organs most frequently injured by penetrating and blunt abdominal trauma. The mortality after hepatic injuries has decreased from 60% in the first half of this century to approximately 15% at the present time (2). Hepatic trauma from blunt injury is associated with a higher mortality and the prognosis is poor after injury of the porta hepatis (2, 4).

Hepatic replacement for traumatic liver injuries has not yet been described. We report here two patients with unreconstructable hepatic injuries treated with liver transplantation on an emergency basis.

## CASE REPORTS

**Case 1.** A 24-year-old man was injured in a motor vehicle accident on 1 October 1984. At initial exploration at a community hospital, injury to the porta hepatis was noted as well as devitalization of most of the right liver lobe. Debridement lobectomy was performed. However, bleeding could not be controlled and the patient was transferred to our university hospital where hemostasis was obtained at re-exploration. Postoperatively the patient developed acute cholangitis, a bile fistula, and jaundice. Two weeks later he underwent a 12-hour

operation at which nothing could be accomplished. A sump drain was placed in the hilum and the patient was then transferred to our institution for further management. A sinogram showed communication with the intrahepatic duct (Fig. 1).

An exploratory laparotomy was performed 66 days after the original injury. There were dense adhesions in the right upper quadrant. The right branch of the portal vein was found to be tied off but the left branch was patent. The left lobe of the liver received its arterial supply from an anomalous branch of the left gastric artery. The liver remnant was friable dark green. After 12 hours of tedious dissection, the area of the left hepatic duct was identified but the tissue was necrotic and unsuitable for a biliary reconstruction. In the meanwhile a potential liver donor had been identified in the Boston area and arrangements were made for removal of the liver. While waiting for the organ, right colectomy and ileocolostomy were performed in the recipient because of numerous colonic perforations. The recipient



FIG. 1. Sinogram showing a bile leak and a poorly visualized left hepatic duct. At operation, the duct was necrotic and unsuitable for the biliary reconstruction.

From the Department of Surgery, University Health Center of Pittsburgh, University of Pittsburgh, and the Veterans Administration Medical Center, Pittsburgh, Pennsylvania.

This study was supported by Research Project Grant No. AM-29961 from the National Institutes of Health, Bethesda, Maryland.

Address for reprints: Carlos O. Esquivel, M.D., Ph.D., Department of Surgery, 3601 Fifth Avenue, Room 218 Falk Clinic, Pittsburgh, PA 15213.

was then closed for 5 hours until the new liver arrived from Boston, almost 24 hours after the beginning of the operation. The transplantation and the postoperative course were uneventful. The patient was discharged on the third week post-operatively with normal function tests (Fig. 2).

**Case 2.** A 17-year-old male sustained a blunt trauma to the abdomen in an automobile accident with no clinical evidence of head injury. At emergency laparotomy at a local hospital, the right lobe of the liver was necrotic. The portal vein was torn and required ligation for control of hemorrhage. The

common bile duct was also destroyed but the arterial supply to the left lobe of the liver was intact.

The patient developed hepatic insufficiency and was transferred to our institution for consideration of a liver transplant 3 days later. A liver donor was found the same day. Before the transplantation, the patient was in hepatic coma responding with reflexes only to painful stimuli. The liver enzymes and bilirubin were elevated (Fig. 3). After transplantation, there was no improvement, leading to a decision for retransplantation 3 days later.

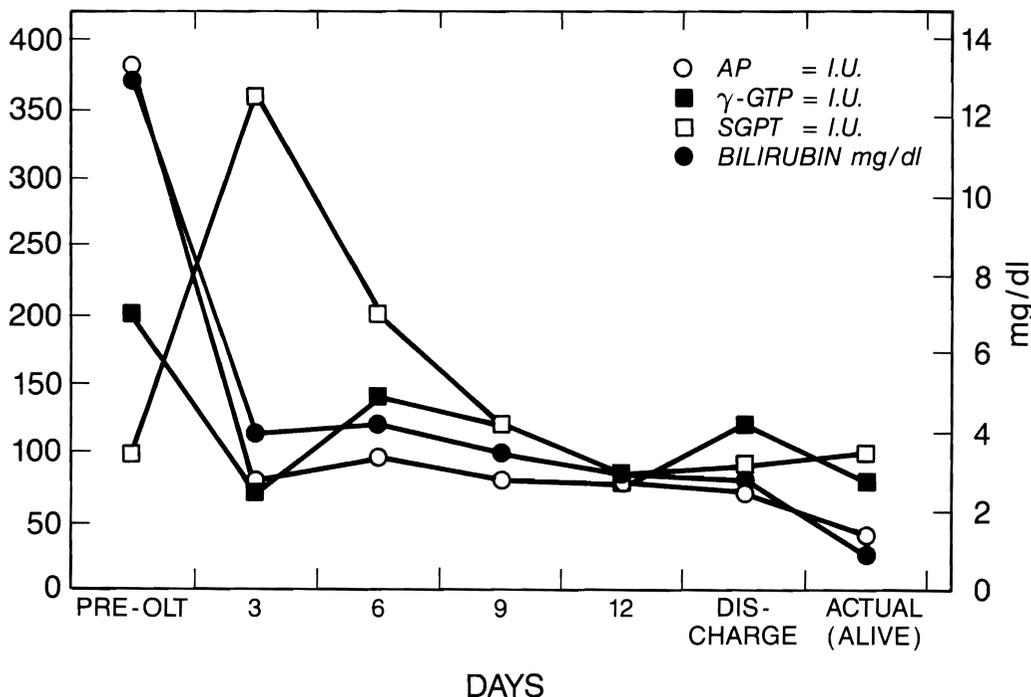


FIG. 2. Hospital course of Case 1. Note the rapid normalization of the liver chemistries.

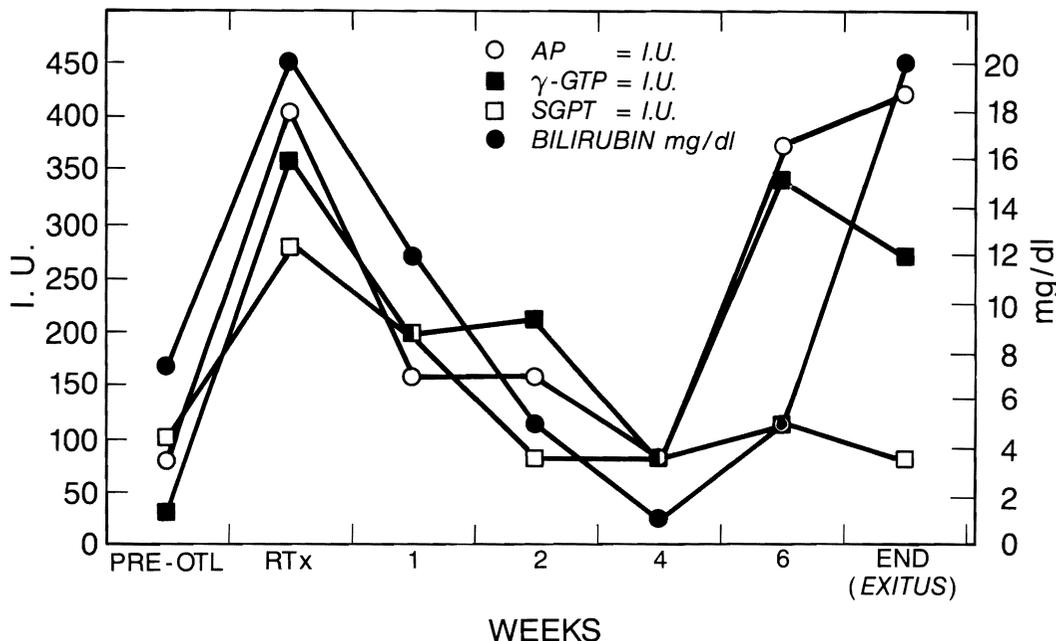


FIG. 3. Hospital course of Case 2. Normalization of liver chemistries occurred slowly over a 5-week period following retransplantation. Numerous pulses with steroids, in addition to administration of azathioprine and monoclonal antibody (OKT-3), were necessary to control rejection. The patient developed a systemic cytomegalovirus (CMV) infection with pulmonary insufficiency and hepatitis.

The postoperative period was complicated by several episodes of rejection requiring pulses of steroids and a course with a monoclonal antibody (OKT-3). Normalization of the liver function tests was not achieved until the fifth postoperative week. By this time, the patient was fully ambulatory on the ward. However, 2 weeks later the patient developed a generalized cytomegalovirus infection with pulmonary and hepatic failure that led to death a few days later.

Histologic examination of the original hepatic remnant showed thrombosis of the portal vein and parenchymal necrosis. The first allograft showed ballooning of the hepatocytes and marked mononuclear infiltrates consistent with severe rejection in spite of the fact that it had been in place only for 3 days. Two biopsies of the second graft revealed CMV hepatitis. An autopsy was not performed.

### DISCUSSION

Penetrating injuries to the liver such as stab wounds from knives or low-velocity gunshot wounds sometimes have very little morbidity and mortality if debridement and drainage are carried out effectively. In contrast, injuries secondary to high-velocity gunshot wounds or to blunt trauma are associated with a mortality rate of 30–50% (2, 4). The prognosis is even worse when there is an injury to the porta hepatis. The latter usually presents with formidable intra-abdominal hemorrhage such as in the two patients reported here. Both arrived in the emergency room in profound shock. Frey et al. (1) have reported an 80% mortality rate in patients with hepatic trauma who had a systolic pressure of less than 80 mm Hg on admission.

The treatment of choice of most of the hepatic injuries consists of hemostasis, debridement, and drainage. Re-

section may be performed when large areas of devitalized tissue are encountered (3). If the portal triad structures are injured, repair of the vessels and Roux-en-Y reconstruction of the biliary system should always be attempted. Reconstruction on our two patients was not possible and hepatic transplantation was offered as the only chance for survival.

The first patient had a postoperative course free of complications and now he lives a normal life. Reversal of hepatic coma was observed in the second patient. However, his postoperative course was plagued with episodes of rejection which required more immunosuppression and he died of cytomegalovirus infection 7 weeks after the original accident.

Patients with lethal injuries to the liver can survive only if they are referred to a transplantation center promptly. The feasibility of the transplantation approach has been shown by our experience.

### REFERENCES

1. Frey, C. F., Trollope, M., Harpster, W., et al: A fifteen-year experience with automotive hepatic trauma. *J. Trauma*, **13**: 1039–1049, 1973.
2. Lim, R. C., Jr.: Injuries to the liver and extrahepatic ducts. In Blaisdell, F. W., Trunkey, D. D. (eds): *Trauma Management: Abdominal Trauma, Vol I*. New York, Thieme-Stratton, Inc. 1982, pp. 123–147.
3. Mays, E. T.: Lobectomy, sublobar resection, and resectional debridement for severe liver injuries. *J. Trauma*, **12**: 309–314, 1972.
4. Morton, J. R., Roys, G. D., Bricker, D. L.: The treatment of liver injuries. *Surg. Gynecol. Obstet.*, **134**: 298–302, 1972.
5. National Institutes of Health Consensus Development Conference Statement: Liver transplantation. June 20–23 1983. *Hepatology*, **4** (Suppl 1): 1075, 1984.