Hyperbaric Oxygen Therapy for Hepatic Artery Thrombosis After Liver Transplantation in Children

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Early hepatic artery thrombosis (HAT) after pediatric orthotopic liver transplantation (OLT) can cause significant morbidity and mortality, leading to liver failure or septic complications requiring urgent retransplantation. Experimental evidence that hyperbaric oxygen (HBO) may ameliorate hepatic ischemic-reperfusion injury led to this study of HBO in pediatric liver transplant recipients who developed HAT. Children undergoing OLT under primary tacrolimus immunosuppression and University of Wisconsin organ preservation between August 1, 1989, and December 31, 1998, who developed HAT were the basis for this study. Patients who developed HAT between March 1, 1994, and December 31, 1998, were treated with HBO therapy until signs of ischemia resolved (absence of fever, normalizing liver injury test results) or for 2 weeks. The pediatric OLTs performed from August 1, 1989, to February 28, 1994, who developed HAT served as a control group. Primary outcome measures were survival, retransplantation rate, time to retransplantation, incidence of hepatic gangrene, and days to collateral formation. Three hundred seventy-five consecutive pediatric patients underwent 416 OLTs between August 1, 1989, and December 31, 1998. Thirty-one patients (7.5%) developed HAT at a mean time of 8.2 days (range, 1 to 52 days) post-OLT. In 17 patients, HBO treatment was begun within 24 hours of HAT or immediately after the revascularization attempt and performed twice daily for 90 minutes at 2.4 atmospheres pressure. Fourteen patients were treated without HBO. None of the HBO-treated patients developed hepatic gangrene. Eight HBO patients (47%) were bridged to retransplantation at a mean time of 157 days (range, 3 to 952 days) after initial OLT and all survived. Mean time to retransplant in the control group was 12.7 days (range, 1 to 64 days). HBO was well tolerated without significant complications. Although there was no significant difference in survival or retransplantation rates, HBO significantly delayed retransplantation, potentially by hastening the development of hepatic artery collaterals.

Hepatic artery thrombosis (HAT) after orthotopic liver transplantation (OLT) can result in hepatic gangrene and liver failure in as many as 1 of 3 patients.[1] This syndrome, a consequence of the lack of oxygen-saturated arterial blood and translocation of gas-forming bacteria, is fatal unless immediate retransplantation is performed.[2] More commonly after HAT, septic complications related to bile leak, biloma, abscess, or cholangitis force urgent or remote retransplantation. In either case, the continuing organ shortage and current lack of effective bioartificial support place patients with HAT at risk for serious morbidity and early post-OLT mortality. Historical experience with hyperbaric oxygen (HBO) therapy for organ preservation in clinical human liver allografts[3] and recent experimental evidence that HBO may ameliorate hepatic ischemic-reperfusion injury[4] led to this study of HBO in pediatric liver transplant recipients who developed HAT.

Materials and Methods

Pediatric patients who received a liver transplant under primary tacrolimus immunosuppression and University of Wisconsin organ preservation between August 1, 1989, and December 31, 1998, who developed HAT

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