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Acute Renal Failure After Living-Related Liver Transplantation

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ACUTE renal failure (ARF) is a common and severe complication of liver transplantation (LT) with an incidence ranging from 21% to 70%.[1–5] The etiology of ARF is multifactorial,[2,6,7] including preoperative, intraoperative, and postoperative factors. This study reports our experience with living-related liver transplant recipients who developed ARF.

PATIENTS AND METHODS

Between June 1994 and November 2001, 87 patients underwent living-related liver transplantation at our hospital. Forty-seven of the patients were men and 40 women, with a mean age (± standard deviation) at the time of transplantation of 13.0 ± 18.7 years. The 87 recipients presented with the following indications: biliary atresia ($n = 53$), hepatitis B-related liver cirrhosis ($n = 8$), hepatitis B-related liver cirrhosis with hepatocellular carcinoma ($n = 6$), glycogen storage disease ($n = 5$), primary biliary cirrhosis ($n = 5$), neonatal hepatitis ($n = 6$), hepatitis C-related liver cirrhosis ($n = 2$), alagille ($n = 1$), and Wilson's disease ($n = 1$). The donors included 43 mothers, 18 fathers, 9 wives, 6 sons, 3 aunts, 3 husbands, 2 grandmothers, 1 grandfather, 1 brother, and 1 daughter. Seventy-five patients received triple drug immunosuppression consisting of cyclosporin (CsA), azathioprine, and steroids and 12, a combination of tacrolimus (FK506) and steroids. All data are presented as mean ± SD.

RESULTS

The clinical data for the 7 (8.0%) patients who developed ARF after living-related LT are presented in Table 1. The mean age at the time of ARF diagnosis was 42.4 ± 15.5 years, with the mean postoperative interval to ARF of 24.8 ± 37.5 days (range 3 to 112). The mean baseline serum creatinine was 0.89 ± 0.29 mg% (range 0.7 to 1.3). The mean peak serum creatinine was 2.78 ± 0.83 mg% (range 1.5 to 3.8). Five patients were diagnosed with hepatitis B-related liver cirrhosis, one patient with primary biliary cirrhosis, and one with biliary atresia. Five patients were receiving CsA treatment and two, FK506.

The ARF etiology was multifactorial for the majority of patients. Patients 3, 4, and 6 experienced severe biliary tract infections and sepsis. Patient 3 developed a disturbance of consciousness concomitant with ARF diagnosis. Acute hyponatremia (serum sodium 118 mEq/L) apparently due to gastrointestinal loss was treated with infusion of 0.9% normal saline. The serum sodium returned to normal without complication 3 days later. Renal sonography was performed for seven ARF patients; none had a definite obstructive uropathy. Six of the seven cases (except Patient 4) did not display an oligouria or anuria history during the admission, but five had concomittant biopsy-proven rejection. ARF treatment included fluid replacement, avoiding exposure to nephrotoxic drugs, decreasing or altering immunosuppressive agents, and adjusting antibiotic dosages.

All except Patient 4 returned to normal renal function at 1 to 3 weeks after ARF diagnosis, with six of the seven (except Patient 2) receiving blood transfusions of around 1275 ± 736.3 g (range 390 to 2265) on admission. Patient 4 experienced two ARF episodes and received temporary hemodialysis. Eventually this woman died due to biliary tract infection with intractable septic shock. Patient 5 died of hepatic vessel dysfunction after repeat living-related LT.

DISCUSSION AND CONCLUSION

For patients undergoing LT, the reported ARF-incidence ranges from 21% to 70%.[1–5] The incidence in our sample

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Table 1. Clinical Data of Seven Living-Related Liver Transplant Recipents With ARF after LT

Patient (No/Age/Sex)	Underlying Disease	Onset of ARF After LT (days)	Etiology of ARF	Level of Immunosuppressive Agent During ARF (ng/mL)	Serum Cr (Baseline)	Serum Cr (Peak)	Biopsy-proven Rejection	Blood Loss During Operation (mL)	Outcome of ARF and Patients
1/45/F	HBV-related liver cirrhosis	7	Multifactorial	CsA around 90.1–304.0	0.9	2.3	Yes	1000	Complete recovery, survival
2/46/M	HBV-related liver cirrhosis	3	Multifactorial	CsA around 110–517	0.7	1.8	No	900	Complete recovery, survival
3/54/F	HBV-related liver cirrhosis	43	Biliary tract infection with sepsis	CsA around 184–376	1.0	3.3	Yes	220	Complete recovery, survival
4/50/F	Primary biliary cirrhosis	12	Multifactorial	CsA around 111–372	0.9	2.8	No	2150	Partial recovery (renal insufficiency)
		112	Biliary tract infection with sepsis	CsA around 67.5–78.3	1.3	3.4			Tempory hemodialysis, expired
5/8/F	Biliary atresia	10	Multifactorial	CsA around 125–567	0.4	3.3	Yes	475	Complete recovery, expired
6/46/M	HBV-related liver cirrhosis	4	Biliary tract infection with peritonitis	FK506 around 3.4–8.1	1.2	3.8	Yes	1200	Complete recovery, survival
7/48/F	HBV-related liver cirrhosis	7	Multifactorial	FK 506 around 19.0–26.5	0.7	1.5	Yes	1330	Complete recovery, survival

Abbreviations: ARF, acute renal failure; HBV, hepatitis B virus; CsA, cyclosporine; FK506, Lacrolimus; LT, liver transplantation; Cr, creatinine.

was lower at 8.0%. The ARF etiology is multifactorial, including preoperative, intraoperative, and postoperative factors. Although LT techniques have improved significantly over the last few years, the procedure continues to be difficult. Further, hypotension from massive blood loss, long surgery duration, circulatory instability, and many other perioperative factors provide a well-recognized clinical environment for ischemic renal damage.[6,7] Postoperatively, the use of many potentially nephrotoxic drugs (CsA, FK 506, antibiotics etc.,[8–10] volume depletion, severe infection, and repeated rejections[2,6] are some of the many predisposing factors for the development of ARF.[11] In our study, the etiology of ARF was multifactorial, including massive ascites loss, gastrointestinal and surgical wound bleeding, CsA or FK506 nephrotoxicity, and severe infection. Five ARF patients had a history of liver cirrhosis, which may be a risk factor for postoperative ARF. Six patients received blood transfusions. Repeated biliary tract infection is an important risk factor for ARF. Fluid replacement must be the first consideration if ARF occurs in LT. Transient, high CsA or FK506 blood levels may also be a risk factor for ARF. Six of the ARF patients were adults; only one case of ARF was noted among our pediatric biliary atresia patients. Between 10% and 18% of patients require dialysis after LT.[1] The associated mortality for this group of patients is high, reportedly ranging from 39% to 90%.[1–3] In our study, only Patient 4 underwent temporary hemodialysis because of anuria and fluid overload. Six patients regained normal renal function, with Patients 4 and 5 expiring as a consequence of severe sepsis and hepatic vessel dysfunction, respectively. The mortality rate for our seven ARF cases was 28.6%. We conclude that preoperative evaluation, surgical technique, and postoperative care are important for LT cases, influencing eventual renal function and patient prognosis. Further, early detection and treatment of ARF are necessary.

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