Liver Failure From Ultra-Short Bowel Syndrome on the Intestinal Transplant Waiting List: A Retrospective Study

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ABSTRACT

Background. Patients with intestinal failure (IF) are candidates for intestinal transplantation (ITx). In Japan, these patients have few opportunities to undergo cadaveric ITx because of low rates of organ donation. The donor criteria and recipient priority for ITx are still unknown. We reviewed our cases of IF to investigate which patients should be prioritized for ITx.

Methods. Patients with IF who were registered as candidates for cadaveric ITx between January 2010 and November 2015 in our institute were included in this retrospective study. Their data were gathered from their charts and analyzed.

Results. Five patients were included. Their primary diseases included total colon aganglionosis (n = 1), chronic idiopathic intestinal pseudo-obstruction syndrome (n = 2), superior mesenteric vein embolization (n = 1), and graft loss after ITx (n = 1). Two patients died of liver failure (LF) during the waiting period. The remaining three are now alive and waiting for transplantation. The lengths of the remaining intestine were more than 20 cm in living cases but less than 20 cm in fatal cases. In the fatal cases, they had several episodes of catheter-related blood stream infection, which caused LF and acute renal failure.

Conclusions. We identified two patients with less than 20 cm residual small bowel who died after acute deterioration of liver function. Patients with ultra-short bowel could have a higher risk of LF. Therefore, they should be referred as soon as possible to a specialized hospital where ITx is a choice of treatment for IF.

PATIENTS with intestinal failure (IF) have been considered as candidates for intestinal transplantation (ITx), owing to the high risk of death from intestinal failure and associated liver disease (IFALD). Some studies showed that significant hepatic fibrosis occurring in patients with IF may regress appreciably after isolated ITx [1,2]. However, patients in Japan have few opportunities for undergoing cadaveric ITx because of the rarity of organ donation.

Historically, patients with short-bowel syndrome (SBS), especially those with shorter residual small intestine, have been closely associated with IF and subsequent worse overall patient outcomes. Despite this correlation, however, there are a few studies that specifically address the outcomes of patients with extremely short bowel lengths, also referred to as ultrashort, which have usually been defined as having less than 20 to 25 cm of small intestine [3–5]. Some of these reports showed that such patients experienced multiple catheter-related blood stream infections (CRBSIs) because they remained parenteral nutrition–dependent [5] and that IFALD is the only significant negative prognostic factor that may require referral for ITx in these patients [3].

The recipient criteria for ITx include some factors, such as the severity of IFALD, the frequency of CRBSI, and the number of residual veins available for central venous access [6,7]. However, even by using such criteria, it is often difficult to decide which patients should be prioritized for

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Table 1. Patient Characteristics

Case	Age at Registration (year)	Sex	Primary Disease	Residual Intestinal Length (cm)	Waiting Time (month)	Outcome
1	31	M	Acute cellular rejection after ITx	15	31	Dead
2	27	F	Total colon aganglionosis	80	36	Alive
3	24	F	SMV embolization	0	14	Dead
4	13	M	CIIPS	70	8	Alive
5	6	F	CIIPS	50	9	Alive

Abbreviation: CIIPS, chronic idiopathic intestinal pseudo-obstruction syndrome.

transplantation and when the best timing for ITx could be, even if we selected a marginal donor.

In this retrospective study, we reviewed our cases of patients who had been registered as candidates for cadaveric ITx to investigate which patients have worse prognoses.

METHODS

Patients with IF who had been registered as candidates for cadaveric ITx between January 2010 and November 2015 in our institute were included in this study. The data of these patients, including outcome (dead or alive), primary disease, sex, age at registration, laboratory data (total bilirubin, albumin, prothrombin time [PT], citrulline, pre-albumin), the pathological status of liver fibrosis, the residual intestinal length at registration, and the duration of being a candidate were collected from their charts and analyzed. We selected those laboratory data to evaluate the status of the liver, small intestine, and nutrition of these patients. Liver fibrosis status was evaluated by use of the new Inuyama classification system (F0, no fibrosis; F1, portal fibrosis widening; F2, portal fibrosis widening with bridging fibrosis; F3, bridging fibrosis plus lobular distortion; F4, liver cirrhosis). Survival was estimated with the use of the Kaplan-Meier method. The survival estimates were compared by use of the log-rank test between the patients with less than 20 cm of small intestine and those with more than 20 cm. The threshold for significance was $P < .05$. Statistical analyses were conducted with the use of EZR (Saitama Medical Center, Jichi Medical University, Saitama, Japan), which is a graphical user interface for R (The R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Five patients (two men and three women) were enrolled in this study. Their demographic characteristics are shown in Table 1. The median age at registration of these patients was 24 years (range, 13–27). The primary diseases were total colon aganglionosis (n = 1), chronic idiopathic intestinal pseudo-obstruction syndrome (CIIPS) (n = 2), superior mesenteric vein embolization (n = 1), and graft loss after ITx (n = 1). The residual length of the small intestine ranged from 0 to 80 cm. Two patients died, and the remaining three patients are still alive. The residual lengths in the dead patients were both less than 20 cm, whereas those in the living patients were more than 20 cm.

The clinical courses of these patients are shown in Fig 1. Liver fibrosis status progressed from F2 to F3-4 despite omegaven and GLP-2 analog administration in case 1, remained at F2 in case 2, rapidly progressed from F2 to F4 with repetitive infections in case 3, and remained at F2

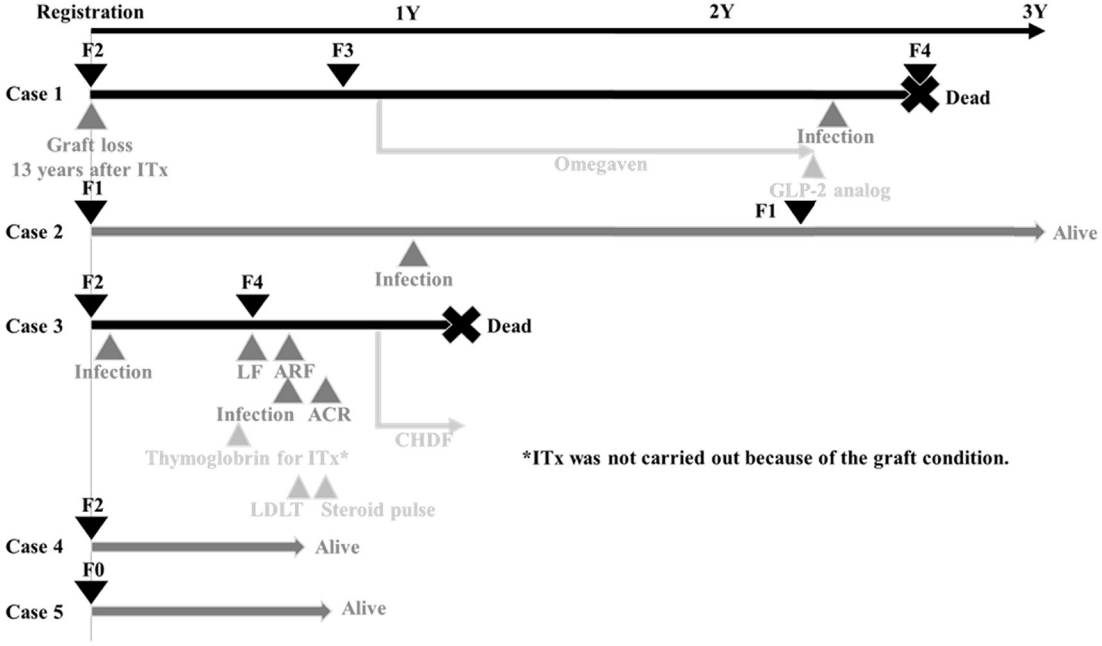

Fig 1. Patients' clinical course and results of liver biopsy. Abbreviations: F, liver fibrosis status evaluated with the new Inuyama classification system; ACR, acute cellular rejection; ARF, acute renal failure; CHDF, continuous hemodiafiltration; ITx, intestinal transplantation; LDLT, living donor liver transplantation; LF, liver failure.