Current status and outcome of liver transplantation in South Korea

Running head: LT in South Korea

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Abbreviations: ALF, acute liver failure; DAA, direct acting antiviral agents; DDLT, deceased donor liver transplantation; HCC, hepatocellular carcinoma; KONOS, Korean Network for Organ Sharing; LC, liver cirrhosis; LDLT, living donor liver transplantation; LT, liver transplantation; MELD score, Model for End-stage Liver Disease score; NAFLD, nonalcoholic fatty liver disease; NASH, nonalcoholic steatohepatitis; PSC, primary sclerosing cholangitis

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In South Korea, liver transplantation (LT) began in 1988 when the first deceased donor liver transplantation (DDLT) of a child with Wilson's disease was successful. And living donor liver transplantation (LDLT) was first attempted in 1994. In 1999, the Korean Network for Organ Sharing (KONOS) was established as the national institution to carry out these transplant-related tasks such as organ allocation. The Model for End-stage Liver Disease (MELD) score has been used as a criterion for long-term distribution in many countries, including the United States and Europe, since 2002. In South Korea, allocation system for emergency LT were based on the MELD score, since June 2016.

Since the 2010s, DDLT rate has continued to rise, accounting for more than 20% of all liver transplants and 34.5% in 2016. However, since 2017, as DDLT has decreased again, it’s proportion accounting for 25% of the total number of LT. In 2019, brain-death organ donors were 8.7 per million people. This is much lower than Spain's 49.6 per million people and the United States' 36.1 per million people, and it's far less than France, United Kingdom and Australia with 20 or more per million people. Due to the shortage of brain-death donors in South Korea, DDLT is being performed with the average MELD score as high as 36.5 points. Since DDLT is performed when the MELD score is too high, there is a concern that the number of cases with poor prognosis after DDLT may increase. Therefore, LT in South Korea, like other East Asian countries, has been largely dependent on LDLT in a situation where there is a shortage of brain-death donors.

A common indication for LT is an acute or chronic liver disease in which liver function is deteriorated severely and does not respond to other treatments and can only be treated with a LT. Liver cirrhosis caused by viral hepatitis (hepatitis B or C) or alcohol, autoimmune hepatitis, primary sclerosing cholangitis (PSC), biliary atresia, Wilson disease, and hepatocellular carcinoma (HCC) are chronic liver diseases requiring LT. Due to the development of surgical technique, postoperative care, and the expansion of LDLT, the indications for LT are gradually expanding. However, LT is still contraindicated in patients with severe heart and lung disease, extrahepatic malignancy, and uncontrolled sepsis.

Hepatitis B and herbal medicine are the most common causes of acute liver failure requiring LT in South Korea. Until 2000, the incidence of acute hepatitis A has declined, but after that, the number of hepatitis A-induced fulminant liver failure patients increased as the hepatitis A antibody positive rate decreased in the younger age group under 30 years of age.
For chronic liver disease, in the past, more than 70% of adult LTs in South Korea were performed for cirrhosis and/or HCC caused by hepatitis B virus. However, in recent years, the proportion is decreasing due to the development of antiviral agents. The proportion of patients receiving LT for liver cirrhosis or HCC due to hepatitis C has been increasing, but after treatment with direct acting antiviral agents (DAA) in 2014, its proportion has been declining again. However, as viral hepatitis has decreased, the number of LT with alcoholic liver disease is increasing. Also, like other countries, the number of LT for NASH or NAFLD is steadily increasing. And the number of patients receiving LT as a treatment for HCC is gradually increasing because LDLT is being actively implemented in South Korea.3

Recently, the 1-year survival rate of DDLT has reached 77.9%, and the 1-year survival rate of LDLT has reached 89.9%. The 1-year survival rate of all LT is reported to be good enough to reach 86.9% due to improved surgical technique and patient management, and the appropriate use of various immunosuppressants. In addition, postoperative mortality is directly related to the severity of recipients, so it is important to prepare for transplantation in a timely manner.4 The 3-year and 5-year survival rates are excellent, reaching 83.7% and 80.9% for LDLT and 72.3% and 68.9% for DDLT (total, 80.8% and 77.9%). The long-term survival rate after LT in South Korea is also excellent, and the 10-year survival rate after transplantation reached 70%, which is comparable to the 10-year survival rate of 63% in other foreign countries.4, 5

The survival rate of LT in patients with HCC may vary depending on the size and number of tumors, and tumor biology. So far, LT has shown the best survival rate among the treatment methods for HCC. However, LT for HCC patients have problems that need to be addressed, such as a shortage of donors and ethical issues. This is because LT in HCC is almost entirely dependent on LDLT. Liver resection for living donor is an operation that requires a high degree of surgical skill, and in foreign countries, the mortality rate is reported to be 0.2-0.5%.6 In South Korea, one death out of about 7,000 donors has been reported. In addition, minimal invasive surgery such as laparoscopic or robotic surgery is actively performed for donor hepatectomy in Korea than any other country. This helps the donor's early recovery.
Reference


Figure Legends

Figure 1. Current status of LT in South Korea

Figure 1A. The number of living and deceased donor liver transplantations and the proportion of DDLT for the past 10 years.

Figure 1B. Changes in indications of liver transplantation over the past 10 years