J Surg Med. 2019;3(4):285-287.
DOI: 10.28982/josam.542279

Research article
Araştırma makalesi

Journal of Surgery and Medicine
e-ISSN: 2602-2079

Pediatric living donor liver transplantation: A single center experiences

Pediatrik canlı vericili karaciğer nakli: Tek merkez deneyimi

Gökhan Ertuğrul [1], Burcu Hızarcı [2]

[1] Organ Transplantation Center, Medipol Universty Faculty of Medicine, Istanbul, Turkey
[2] Department of Anesthesiology, Medipol Universty Faculty of Medicine, Istanbul, Turkey

ORCID ID of the author(s)
GE: 0000-0002-8351-4220
BH: 0000-0002-0383-7792

Corresponding author / Sorumlu yazar:
Gökhan Ertuğrul
Address / Adres: Organ Nakli Merkezi, Medipol Üniversitesi, Tıp Fakültesi, TEM Avrupa Otoyolu Göztepe Çıkışı, No: 1, 34214, Bağcılar, İstanbul, Türkiye
e-Mail: mdgertugrul@gmail.com

Ethics Committee Approval: Ethics committee approval was not received because of retrospective design of the study.
Etik Kurul Onayı: Çalışma retrospektif olması nedeniyle etik kurul onayı alınmamıştır.

Conflict of Interest: No conflict of interest was declared by the authors.
Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.
Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 3/25/2019
Yayın Tarihi: 25.03.2019

Abstract

Aim: The only definitive treatment of chronic liver disease (cholestatic, metabolic, autoimmune), acute liver failure and liver tumors are liver transplantation in pediatric patients. The aim of this study was to present the experience of our center on pediatric living donor liver transplantation and review of the literature.

Methods: This is retrospective cohort study. Pediatric patients who receive living donor liver transplantation between December 2014 and December 2017 included in the study. Demographic features, complications after transplantation, and mortality rates were recorded.

Results: A total 29 patients were included in the study. Mean age of cases were 3.1 (1-13) years, 18 (62.1%) of the patients were male. Mean Pediatric End-Stage Liver Disease (PELD) scores were 15.6 (-6-37). Mean follow-up period was 60 months. Complication was detected in 11 patients (37.9%) and 5 patients died (mortality rate: 17.9%). In our study, the causes of death were disseminated intravascular coagulation in three patients and sepsis due to biliary leakage in two patients.

Conclusion: Complications and mortality rates related to pediatric patients with donor liver transplantation in our center are consistent with the literature.

Keywords: Pediatric patient, Living donor liver transplantation

Öz

Amaç: Kronik karaciğer hastalığının (kolestatik, metabolik, otoimmün), akut karaciğer yetmezliği ve karaciğer tümörlerinin pediatrik hastalarda ekin tek tedavisi karaciğer naklidir Bu çalışmanın amacı merkezimizde yapılan pediatrik canlı vericili karaciğer nakillerini değerlendirmek ve literatürü tartışmaktır.

Yöntemler: Bu çalışma retrospektif kohort çalışmadır. Çalışmaya Aralık 2014 ile Aralık 2017 tarihleri arasında canlı vericili karaciğer nakli yapılan pediatrik hastalar alındı. Demografik özellikler, nakil sonrası komplikasyonlar ve mortalite oranları kaydedildi.

Bulgular: Çalışmaya toplam 29 hasta dahil edildi. Hastaların yaş ortalaması 3,1 (1-13) yıl, 18'i (%62,1) erkekti. Hastaların ortalama Pediatrik Son Dönem Karaciğer Hastalığı (PELD) skorları 15,6 (-6-37) idi. Ortalama takip süresi 60 aydı. Komplikasyon oranı %37,9 (11 hasta) ve mortalite oranı %17,9 (5 hasta) olarak saptandı. Çalışmamızda hastalarımızın ölüm nedeni dissemine intravasküler koagülasyon ve safra kaçağına bağlı sepsis idi.

Sonuç: Merkezimizde pediatrik hastalara yapılan canlı vericili karaciğer nakillerinin komplikasyon ve mortalite oranları literatür ile uyumludur.

Anahtar kelimeler: Pediatrik hasta, Canlı vericili karaciğer nakli

How to cite / Atıf için: Ertuğrul G, Hızarcı B. Pediatric living donor liver transplantation: A single center experiences. J Surg Med. 2019;3(4):285-287.

Introduction

The first pediatric liver transplantation was described in 1963 by Starzl et al [1] with congenital biliary atresia. Liver transplantation has become a standard procedure for children with end-stage liver disease [2]. The most common clinical indications for liver transplant in pediatric patients are cholestatic liver disease, which accounts for almost half of the patients; metabolic and genetic disorders; fulminant liver failure; and malignancies [3-5].

Pediatric liver transplant technique can very hard. The care of a pediatric liver transplant patient is optimized through the use of a multidisciplinary team. The aim of our study was to report our experience of pediatric living donor liver transplantation.

Materials and methods

Between December 2014 and December 2017 at Medipol University Medical Faculty Hospital Organ Transplantation Department, Istanbul, Turkey, 29 pediatric patients (0-18 years old) with living donor liver transplantation were studied retrospectively.

Informed consent was obtained from the parents of all pediatric patients.

Twenty-nine pediatric patients with living donor liver transplantation were evaluated demographic features, complication rates and mortality rates.

Post-transplant follow-up

In our center, Immunosuppression regimens were based on calcineurin inhibitor (tacrolimus or cyclosporine), mycophenolate mofetil and corticosteroids in pediatric recipients.

Patients received control once a week for the first month after discharge, and every 15 days for the second month and monthly after that period.

Statistical Analysis

Continuous variables with normal distribution presented as mean (standard deviation). The categorical variables were given as percent and number.

Results

Mean age of pediatric patients were 3.1 (1-13) years, 18 (62.1%) of the 29 pediatric patients were male. Mean PELD scores of pediatric patients were 15.6 (-6-37). Mean body weights pediatric patients were 12.6 (4-42) kilograms. Mean hospitalization time of our patients was 14 days and the mean stay in the intensive care unit was 3 days.

The etiological characteristics of pediatric patients are summarized in table 1. The three most common indications for liver transplantation were; Biliary atresia in 12 (41.4%) patients, acute liver failure in 6 (20.7%) patients, congenital hepatic fibrosis in 3 (10.3%) patients. Another indications in our patients were progressive familial intrahepatic cholestasis in 2 (6.9%) patients, glycogen storage disease in 1 (3.4%) patient, neonatal hepatitis in 1 (3.4%) patient, hepatoblastoma in 1 (3.4%) patient, Alagille syndrome in 1 (3.4%) patient, Crigler Najjar type 1 in 1 (3.4 %) patient, histiocytosis x in 1 (3.4%) patient.

Twenty five (86.2%) patients received left lateral segment living donor liver transplantation, 4 (13.8%) left lobe living donor liver transplantations. Mean graft volume was 293 (140-490) grams; mean graft body weight ratio was 2.8% (1-5).

The complications after liver transplantation are shown in table 2. Complication rate was 37.9% (11 patients) during follow up of 60 months. The observed bleeding at Roux-en-Y jejunojejunal anastomosis was detected in 6 (20.7%) patients, hepatic artery thrombosis in 2 (6.8%) patients, bile leakage in 2 (6.8%) patients and spontaneous intestinal perforation in 1 (3.4%) patients.

Reoperation was performed for bleeding at Roux-en-Y jejunojejunal anastomosis and spontaneous intestinal perforation in 3 patients. Endoscopic sclerotherapy was performed for bleeding at Roux-en-Y jejunojejunal anastomosis in 4 patients, intravascular stent placement was done for hepatic artery thrombosis in 2 patients and percutaneous biliary drainage was made for bile leakage in 1 patient.

Mortality rate was 17.2% (5 of the total 29 patients) during follow up of 60 months. 1-year and 5-year survival rates of our patients were 86.6% and 82.8%, respectively. The cause of death in all cases was disseminated intravascular coagulation in three patients and sepsis due to biliary leakage in two patients.

Table 1: The etiological characteristics of pediatric liver transplant patients

Etiology	n	%
Biliary atresia	12	41.4
Acute liver failure	6	20.7
Congenital hepatic fibrosis	3	10.3
Progressive familial intrahepatic cholestasis	2	6.9
Glycogen storage disease	1	3.4
Neonatal hepatitis	1	3.4
Hepatoblastoma	1	3.4
Alagille's syndrome	1	3.4
Crigler Najjar type 1	1	3.4
Histiocytosis X	1	3.4
Total	29	100

Table 2: The observed complications after liver transplantation

Complications	n	%
Bleeding at Roux-en-Y jejunojejunal anastomosis	6	20.7
Hepatic artery thrombosis	2	6.8
Bile leakage	2	6.8
Spontaneous intestinal perforation	1	3.4
Total	11	100

Discussion

The most common indications for liver transplant in pediatric patients are cholestatic liver disease, metabolic and genetic disorders, acute liver failure and malignancies. Biliary atresia is the most important diagnosis in approximately 30–50 % of pediatric patients who underwent liver transplantation. The majority of patient with biliary atresia undergo Kasai porto-enterostomy to improve biliary drainage, however 20-40% patients develop end stage liver disease and may need to liver transplantation [6-9]. Acute liver failure is a rare indication in underwent pediatric liver transplant patients. Diagnosis and treatment are very challenging in this disease. Some of the etiologies have been attributed to viral hepatitis, drug toxicity or toxin exposure [10].

Congenital hepatic fibrosis is a very rare indication of pediatric liver transplantation. Kerr et al [11] first reported in 1961 that congenital hepatic fibrosis is a hereditary autosomal recessive fibropolycystic disease of the liver. Congenital hepatic fibrosis is defined pathologically by bands of fibrous tissue within the liver, linking the portal area and containing multiple bile ducts [12].

Alagille's syndrome is cholestatic condition that may result in end-stage liver disease requiring liver transplantation. Alagille's syndrome is an autosomal dominant disorder in which there is a paucity of intrahepatic bile ducts [13].

Progressive familial intrahepatic cholestasis is another inherited cholestatic disorder in which bile salt, phospholipid or cholesterol transport genes are mutated such that protein function is either abnormal or absent [14]. Patients with inherited metabolic disorders comprise a large subcategory of pediatric living donor liver transplantation. These disorders are typically a result of mutations that affect amino acid, metal, lipid metabolism or mitochondrial function. Some metabolic diseases such as Wilson's disease, tyrosinemia, α1-antitrypsin deficiency, urea cycle defects and Maple syrupurine disease [15]. Hepatoblastoma is the most common pediatric primary liver tumor and is the most prevalent indication for liver transplantation for malignant disease [16]. In our study, the three most common indications for liver transplantation were; Biliary atresia in 12 (41.4%) patients, acute liver failure in 6 (20.7%) patients, congenital hepatic fibrosis in 3 (10.3%) patients. Other indications in our patients were progressive familial intrahepatic cholestasis in 2 (6.9%) patients, glycogen storage disease in 1 (3.4%) patient, neonatal hepatitis in 1 (3.4%) patient, hepatoblastoma in 1 (3.4%) patient, Alagille's syndrome in 1 (3.4%) patient, Crigler Najjar type 1 in 1 (3.4%) patient, histiocytosis x in 1 (3.4%) patient.

The most common complications after pediatric liver transplant are vascular, biliary and infectious [17]. Hepatic artery thrombosis is most serious technical complication in the pediatric liver transplantation and incidence is 4-8%. The most important predisposing factor is very small caliber of the arterial anastomosis. Portal vein thrombosis is formed in 2-6% of cases. Usually occur in children with hypoplastic portal veins such as those with biliary atresia. Acute hepatic vein outflow obstruction is a very serious complication which can result in Budd-Chiari syndrome, complete graft thrombosis and graft loss [17-19]. The incidence of complications at the biliary system (leakage and stricture) in pediatric liver transplant patients is approximately 10% [20]. The incidence of bleeding at Roux-en-Y jejunojejunal anastomosis is very rare. Only around 3-5% of after liver transplantation gastrointestinal system bleeds are attributed to jejunojejunal anastomotic bleed [21].

In our patients, complication rate was 37.9% (11 patients) during follow up of 60 months. The observed bleeding at Roux-en-Y jejunojejunal anastomosis in 6 (20.7%) patients, hepatic artery thrombosis in 2 (6.8%) patients, bile leakage in 2 (6.8%) patients and spontaneous intestinal perforation in 1 (3.4%) patients respectively.

In the literature the post-transplant mortality rate of pediatric liver transplantation patients was 10-20% [22]. In our patients, mortality rate was 17.2% (5 of the total 29 patients) during follow up of 60 months. 1-year and 5-year survival rates of our patients were 86.6% and 82.8%, respectively. The cause of death in all cases was disseminated intravascular coagulation in three patients and sepsis due to biliary leakage in two patients.

Our study has several limitations. First, this study was retrospective. Second, the number of cases was small.

Conclusion

Despite the limitations described, our morbidity and mortality results concerning pediatric living donor liver transplantations are proper with the results in the literature. It appears that with the development of surgical technique more liver transplantations will be carried out in the future.

References

1. Starzl TE, Marchioro TL, Vonkaulla KN, Hermann G, Brittain RS, Waddell WR. Homotransplantation of the liver in humans. Surg Gynecol Obstet. 1963;117:659–76.
2. Larosa C, Baluarte HJ, Meyers KE. Outcomes in pediatric solid organ transplantation. Pediatr Transplant. 2011;15:128–41.
3. Tiao G, Ryckman FC. Pediatric liver transplantation. Clin Liver Dis. 2006;10:169–97.
4. Otte JB. Pediatric liver transplantation: personal perspectives on historical achievements and future challenges. Liver Transpl. 2016;22:1284–94.
5. Squires RH, Ng V, Romero R, Ekong U, Hardikar W, Emre S, et al. Evaluation of the pediatric patient for liver transplantation: 2014 practice guideline by the American Association for the Study of Liver Diseases, American Society of Transplantation and the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. Hepatology. 2014;60:362–98.
6. Tiao G.Liver transplantation. In: Maritz R GA, Ziegler M, Von Allmen Daniel, Weber Thomas R, editors. Operative Pediatric Surgery. 2014;1:1397.
7. Yazigi NA. Long term outcomes after pediatric liver transplantation. Pediatr Gastro enterol Hepatol Nutr. 2013;16:207–18.
8. Sundaram SS, Mack CL, Feldman AG, Sokol RJ. Biliary atresia: Indications and timing of liver transplantation and optimization of pretransplant care. Liver Transpl. 2017;23:96–109.
9. Davenport M, Ong E, Sharif K, Alizai N, McClean P, Hadzic N, et al.Biliary atresia in England and Wales: results of centralization and new bench mark. J Pediatr Surg. 2011;46:1689–94.
10. Rajanayagam J,Coman D,Cartwright D,Lewindon PJ. Pediatric acute liver failure: etiology, outcomes, and the role of serial pediatric end-stage liver disease scores. Pediatr Transplant. 2013;17:362–8.
11. Kerr DN, Harrison CV, Sherlock S, Walker RM. Congenital hepatic fibrosis. Q J Med. 1961;30:91–117.
12. Shorbagi A, Bayraktar Y. Experience of a single center with congenital hepatic fibrosis: a review of the literature. World J Gastroenterol. 2010;16:683–90.
13. Arnon R, Annunziato R, Schiano T, Miloh T, Baisley M, Sogawa H, et al. Orthotopic liver transplantation for adults with Alagillesyndrome. Clin Transplant. 2012;26:94–100.
14. Mehl A, Bohorquez H, Serrano MS, Galliano G, Reichman TW. Liver transplantation and the management of progressive familial intrahepatic cholestasis in children. World J Transplant. 2016;6:278–90.
15. Oishi K, Arnon R, Wasserstein MP, Diaz GA. Liver transplantation for pediatric inherited metabolic disorders: Considerations for indications,complications,and perioperative management. Pediatr Transplant. 2016;20:756–69.
16. Brown J, Perilongo G, Shafford E, Keeling J, Pritchard J, Brock P, et al. Pretreatment prognostic factors for children with hepatoblastoma results from the International Society of Paediatric Oncology (SIOP) study SIOPEL1. Eur J Cancer. 2000;36:1418–25.
17. D'Alessandro AM, Ploeg RJ, Knechtle SJ, Pirsch JD, Stegall MD, Hoffmann R, et al. Retransplantation of the liver—A seven-year experience. Transplantation. 1993;55:1083-7.
18. Shackleton CR, Goss JA, Swenson K, Colquhoun SD, Seu P, Kinkhabwala MM, et al. The impact of microsurgical hepatic arterial reconstruction on the outcome of liver transplantation for congenital biliary atresia. Am J Surg. 1997;173:431-5.
19. Bucuvalas J. Long term outcomes in pediatric liver transplantation. Liver Transpl. 2009;15:6–11.
20. Ng VL, Fecteau A, Shepherd R, Magee J, Bucuvalas J, Alonso E, et al. Outcomes of 5-year survivors of pediatric liver transplantation: Report on 461 children from a North American multicenter registry. Pediatrics. 2008;122:1128–35.
21. Allamneni C, Kyanam Kabir Baig K, Gray S, Peter S. Bleeding at Roux-en Y jejunojejunal anastomosis after orthotopic liver transplantation. VideoGIE. 2018 May 2;3:179-80.
22. Kim JM, Kim KM, Yi NJ, Choe YH, Kim MS, Suh KS, et al. Pediatric liver transplantation outcomes in Korea. J Korean Med Sci. 2013 Jan;28(1):42-7. doi: 10.3346/jkms.2013.28.1.42.

The National Library of Medicine (NLM) citation style guide is used in this paper.
Suggested citation: Patrias K. Citing medicine: the NLM style guide for authors, editors, and publishers [Internet]. 2nd ed. Wendling DL, technical editor. Bethesda (MD): National Library of Medicine (US); 2007-[updated 2015 Oct 2; cited Year Month Day]. Available from: http://www.nlm.nih.gov/citingmedicine