



Perioperative findings and postoperative complications in living donor liver transplantation recipients with high MELD scores

MELD skoru yüksek canlı vericili karaciğer nakli alıcılarında perioperatif bulgular ve postoperatif komplikasyonlar

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Background and Aims: We aimed to investigate the effect of the high MELD score on perioperative recipient/graft ischemia times and postoperative complications. **Materials and Method:** One hundred and seventy-two patients who underwent living-donor liver transplantation for end stage liver cirrhosis were included in the study. The patients were grouped and examined according to their MELD score under and above 20. Anhepatic phase, cold ischemia time, operation time, blood product transfusion, total hospital and intensive care unit staying time rates, biliary complications, hepatic vein thrombosis, portal vein thrombosis, postoperative hemorrhage, sepsis, and primary graft dysfunction were analyzed statistically. **Results:** Cold ischemia time ($p = 0.046$) was statistically longer in patients with MELD >20 . A result very close to the statistically significant P value regarding perioperative blood transfusion was obtained. **Conclusion:** Cold ischemia time increases with increasing MELD. The MELD score must be taken into consideration when preparing the patient and making a treatment plan.

Key words: MELD, liver, transplant, cold ischemia, complication

Giriş ve Amaç: Yüksek MELD skorunun perioperatif alıcı/graft iskemi süreleri ve postoperatif komplikasyonlar üzerine etkisini araştırmayı amaçladık. **Gereç ve Yöntem:** Çalışmaya, son dönem karaciğer sirozu nedeniyle canlı vericiden karaciğer nakli yapılan 172 hasta dahil edildi. Hastalar MELD skorları 20'nin altında ve üstünde olanlara göre gruplandırılarak incelendi. Anhepatik faz, soğuk iskemi süresi, operasyon süresi, kan ürünü transfüzyonu, toplam hastane ve yoğun bakım ünitesinde kalış süresi, safra komplikasyonları, hepatik ven trombozu, portal ven trombozu, postoperatif kanama, sepsis ve primer greft disfonksiyonu istatistiksel olarak analiz edildi. **Bulgular:** MELD >20 olan hastalarda soğuk iskemi süresi ($p = 0,046$) istatistiksel olarak daha uzundu. Perioperatif kan transfüzyonuna ilişkin istatistiksel olarak anlamlı P değerine çok yakın bir sonuç elde edildi. **Sonuç:** MELD arttıkça soğuk iskemi süresi de artmaktadır. Hasta hazırlanırken ve tedavi planı yapılırken MELD skoru dikkate alınmalıdır.

Anahtar kelimeler: MELD, karaciğer, nakil, soğuk iskemi, komplikasyon

INTRODUCTION

Although living donor liver transplantation is the most effective treatment method for end-stage liver failure, one of the important factors affecting the success of surgery is the Model for End-Stage Liver Disease (MELD) score (1). A high MELD score

increases both perioperative and postoperative morbidity and mortality rates. Preoperative planning and treatments, perioperative support treatments and close postoperative follow-ups may be necessary to reduce the MELD score (1,2).

Perioperative findings such as anhepatic phase and cold ischemia times, postoperative morbidity-causing complications such as bleeding, bile stenosis and leaks, hepatic artery, portal vein and hepatic vein thrombosis, postoperative bleeding and infections causing sepsis are important for post-transplant and graft survival in recipients (2). A low MELD score may be effective in reducing those postoperative complications (2). In our study, we aimed to investigate the effect of the high MELD score on perioperative recipient/graft ischemia times and postoperative complications.

MATERIALS and METHOD

The collected liver transplantation (LT) database was retrospectively reviewed. One hundred and seventy-two patients who underwent living-donor liver transplantation (LDLT) for end stage liver cirrhosis between July 2021 and July 2023 were included in the study. The patients were grouped and examined according to their MELD scores (3). At first, those with a MELD score below and above 20 were evaluated and were compared in terms of perioperative findings and postoperative complications. The recipients were statistically analyzed in terms of cold ischemia time, anhepatic phase, operation time, blood product transfusion according to the MELD groups. Also, age, etiology, hospital stay and intensive care unit (ICU) staying time were statistically analyzed in terms of MELD score groups. Biliary complications, hepatic vein thrombosis, portal vein thrombosis, postoperative hemorrhage, sepsis, and primary graft dysfunction were analyzed statistically in terms of those with a MELD score under and above 20. The patients were informed about the study and their consent forms were obtained. All procedures were conducted in accordance with the ethical standards of the committees concerned with human experimentation (institutional and national) and the 1964 Decla-

ration of Helsinki and its later editions. This study was approved by the İstanbul Aydın University Non-invasive Clinical Research Ethics Committee with decision number 2023/114.

Statistical Analysis

Nominal and ordinal parameters were described with frequency analysis, whereas scale parameters were described with means and standard deviations. Chi-Square Test and Chi-Square Likelihood tests were used for differences between categorical parameters. Kolmogorov-Smirnov test was used for normality of scale parameters. Mann-Whitney U test was used for difference analysis, since distributions were non-normal. SPSS 17.0 for Windows was used at 95% Confidence Interval. When referring to SPSS versions prior to the IBM acquisition, authors should cite 'SPSS Statistics for Windows, version 17.0 (SPSS Inc., Chicago 3., USA).

RESULTS

The mean age was 53.9 (range: 18 - 78 years). 44% of the patients were female and 56% were male. The rate of blood group A was 45%, group B was 20%, group 0 was 28%, group AB was 7%. 21% of the patients were Child A, 42% were Child B, and 37% were Child C. The mean MELD score of adult patients was 16.2. Hepatitis B virus (HBV) was the most common known etiologic factor with 22%, hepatocellular carcinoma (HCC) was the second most common with 18%, and nonalcoholic steatohepatitis (NASH) was the third most common with 15%. The autoimmune rate was 6%, alcohol-induced cirrhosis rate was 5%, HBV + hepatitis D virus (HDV) rate was 4%, Budd-Chiari rate was 2%. 23% of the patients had cryptogenic cirrhosis. Other known etiological factors included familial cholestasis, primary hyperoxaluria, hemochromatosis, Wilson's disease, and hepatitis C virus (HCV) each with a rate of 1% (Table 1).

Table 1 Rates and average values of demographic, perioperative findings and postoperative complications in recipients

Rates and Average Values	
Age (median)	53.9 (18 - 78)
Gender	
• Female	44%
• Male	56%
Blood group	
• A	45%
• B	20%
• AB	21%
• O	28%
MELD (mean)	16.2
Etiology	
• HBV	22%
• HCC	18%
• NASH	15%
• Autoimmune hepatitis	6%
• Alcohol	5%
• HBV + HDV	4%
• Budd-chiari syndrome	2%
• Familial cholestasis	1%
• Primary hyperoxaluria	1%
• Hemochromatosis	1%
• Wilson's Disease	1%
• HCV	1%
• Cryptogenic cirrhosis	23%
Anhepatic phase (minute)	89.5
Cold ischemia time (minute)	68.6
Operation time (minute)	468.1
Hospital stay (day)	14.9
ICU Stay (day)	2.2

MELD: The Model for End-Stage Liver Disease, HBV: Hepatitis B virus, HDV: Hepatitis D virus, HCV: Hepatitis C virus, HCC: Hepatocellular cancer, NASH: Nonalcoholic steatohepatitis, ICU: Intensive care unit.

The mean anhepatic phase duration was 89.5 minutes, and the mean cold ischemia time was 68.6 minutes. The mean operative time was 468.1 minutes, the mean ICU stay was 2.2 days and the mean hospital stay was 14.9 days. In patients with MELD >20, mean anhepatic phase duration was

91.5 minutes, mean cold ischemia time was 72.1 minutes, mean operation time was 468.5 minutes, ICU stay was 2.1 days and hospitalization time was 14.6 days (Table 1). Cold ischemia time ($p = 0.046$) was statistically longer in patients with MELD >20 (Table 2). There was no statistically significant difference between those with MELD >20, and MELD <20 in terms of perioperative blood product transfusion ($p = 0.05$), operation time ($p = 0.560$), anhepatic phase ($p = 0.448$), postoperative ICU stay ($p = 0.176$), hospital stay ($p = 0.216$), biliary complications ($p = 0.166$), portal vein ($p = 0.208$) and hepatic vein ($p = 0.453$) thrombosis/occlusions, postoperative hemorrhage ($p = 0.380$), sepsis ($p = 0.980$), and primary graft failure ($p = 0.374$) (Table 2). Postoperative hepatic artery thrombosis or insufficiency was not detected in any recipient.

DISCUSSION

According to the study results, although there is no significant result related to MELD regarding postoperative complications and survival, increased cold ischemia time in recipients with a MELD score of 20 and above may indirectly be a warning in terms of graft survival and postoperative complications.

The MELD score is one of the most effective indicators of mortality after liver transplantation and is a guide for surgeons in terms of graft and patient survival (4). Studies based on elevations at different cut-off values regarding the MELD score have produced different results. It is very difficult to say that there is a consensus regarding perioperative findings and postoperative complications according to the MELD score (2,5,6).

As the MELD score increases, the need for perioperative blood transfusion increases (1,6) and the duration of surgery increases (1,5,8,9). Considering the perioperative findings that the anhepatic phase and cold ischemia time increase with increasing

Table 2 Statistical findings of perioperative findings and postoperative complications in recipients with MELD <20 and MELD ≥20

	MELD <20	MELD ≥20	P value
Cold ischemia time (mean/minute)	58.1	72.1	0.046
Anhepatic phase (minute)	83.4	91.5	0.448
Operation time (minute)	466.9	468.5	0.550
Peroperative blood product transfusion	15.3%	27.1%	0.050
Hospital stay (day)	14.6	15.7	0.216
ICU stay (day)	2.1	2.7	0.176
Bile complication	12.5%	21.8%	0.166
Postoperative PVT	0%	3.2%	0.208
Hepatic vein thrombosis	0%	2.4	0.453
Intraabdominal hemorrhage	8.3%	4.8	0.380
Sepsis	8.1%	16.7	0.098
Primary graft dysfunction	1.6%	0%	0.374

MELD: The Model for End-Stage Liver Disease, ICU: Intensive care unit, PVT: Portal vein thrombosis

MELD (6,7,9). However, we should not ignore the studies showing that the perioperative findings we mentioned above have no relationship with MELD, among the heterogeneous results (6,8,10). In our study, it was observed that cold ischemia time increased with increasing MELD score. Considering the effect of increasing cold ischemia time on graft survival, the effect of increasing MELD score on survival may also be an issue that needs to be investigated in this regard.

In our study, it was observed that as the MELD score increased at different cut-off values (4,7,10,11-14), postoperative intensive care and hospital stay lengthened. No statistical difference was observed between the total ICU and hospital stay times in the groups with MELD values below 20 and above 20.

However, in a group of studies evaluating postoperative complications, no relationship was observed between biliary complications, postoperative intra-abdominal bleeding, infections (15), postoperative hepatic vein thrombosis and portal vein thrombosis (PVT) and MELD elevation (9,14,16,17).

In another group of studies, it was observed that intra-abdominal infections (8) and sepsis (18) increased with increasing MELD score.

Again, in different studies, primary graft dysfunction has not been shown to be associated with increasing MELD scores (8,14).

In our study, no statistical difference was observed between patients with MELD values below 20 and above 20 in terms of postoperative complications such as biliary complications, PVT, hepatic vein thrombosis, sepsis and intra-abdominal bleeding. However, the p value for perioperative blood transfusion ($p = 0.05$) showed that the need for perioperative blood transfusion may statistically increase with increasing MELD score in studies with a larger number of patients.

The limitations of the study are that these parameters were not evaluated according to different MELD scores. Additionally, statistical studies conducted with a higher number of patients in recipients with a much higher MELD score may change the course of the findings. The strength of the

study is that it was conducted with a high number of patients with a MELD cut-off value of 20.

MELD score, as an important factor affecting graft and patient survival, should be carefully examined both in the preoperative preparation process and in the postoperative treatment and support period, and care should be taken in terms of perioperative graft follow-up parameters and postoperative complications in patients with high MELD scores. In addition, considering that cold ischemia time increases with increasing MELD, the importance of preoperative treatment and preparation beco-

mes more evident. The MELD score must be taken into consideration when preparing the patient and making a treatment plan.

Ethics: *This study was approved by the İstanbul Aydın University Non-invasive Clinical Research Ethics Committee with decision number 2023/114.*

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