Research Article

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Is high body mass index a factor that increases postoperative hemorrhage and bile complication rates in right lobe living donor liver transplant recipients?

Yüksek vücut kitle indeksi, sağ lob canlı donörden karaciğer nakli alıcılarında postoperatif kanama ve safra komplikasyon oranlarını artıran bir faktör mü?

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Abstract

Purpose: High Body Mass Index emerges as an important perioperative and postoperative risk factor for liver transplantation. We aimed to examine the effect of increased BMI on perioperative follow-up parameters and per-postoperative complications in liver transplant recipients.

Materials and methods: One hundred and seventy-two patients who underwent living-donor liver transplantation for end stage liver cirrhosis were included in the study. Whether there was a difference between cold ischemia time, operation time, blood product transfusion rates, hospital, biliary complications, hepatic vein thrombosis, portal vein thrombosis, NASH etiology, postoperative hemorrhage, sepsis, and primary graft dysfunction were analyzed statistically in terms of those with a BMI of 25 and above and those below 25.

Results: Anhepatic phase duration (p=0.047) and cold ischemia duration (p=0.009) were statistically longer in patients with BMI >25.

Conclusion: Prolonged anhepatic phase and cold ischemia times may be important in terms of the effect of increased BMI on postoperative graft survival.

Keywords: Obesity, body mass index, liver, transplantation, complication.

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Öz

Amaç: Yüksek Vücut Kitle İndeksi, karaciğer transplantasyonu için önemli bir perioperatif ve postoperatif risk faktörü olarak ortaya çıkmaktadır. Karaciğer transplantasyonu alıcılarında artmış BMI'nin perioperatif takip parametreleri ve postoperatif komplikasyonlar üzerine etkisini incelemeyi amaçladık.

Gereç ve yöntem: Son dönem karaciğer sirozu nedeniyle canlı vericiden karaciğer nakli yapılan 172 hasta çalışmaya dahil edildi. Bunlara göre soğuk iskemi süresi, operasyon süresi, kan ürünü transfüzyon oranları, hastane yatış süresi, safra komplikasyonları, hepatik ven trombozu, portal ven trombozu, NASH etiyolojisi, postoperatif kanama, sepsis ve primer greft disfonksiyonu arasında fark olup olmadığı BMI'sı 25 ve üzeri olan ve 25'in altında olan kişiler açısından istatistiksel olarak analiz edildi.

Bulgular: BMI >25 olan hastalarda anhepatik faz süresi (p=0,047) ve soğuk iskemi süresi (p=0,009) istatistiksel olarak daha uzundu.

Sonuç: Uzamış anhepatik faz ve soğuk iskemi süreleri, artan vücut kitle indeksinin postoperatif greft sağ kalımına etkisi açısından önemli olabilir.

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Anahtar kelimeler: Obezite, vücut kitle indeksi, karaciğer, transplantasyon, komplikasyon.

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Introduction

High Body Mass Index (BMI) and obesity are among the most important risk factors of our age in terms of chronic diseases, but they are also important causes that increase morbidity and mortality during or after surgery. Again, it emerges as an important perioperative and postoperative risk factor for liver transplantation (LT), which is one of the major surgical operations [1]. Factors such as increased operative time and implantation difficulties of the graft, prolongation of organ ischemia times, and risk of embolism in large vessels may adversely affect the surgery. In addition, complications such as thrombosis in large organ vessels, small for size syndrome (SFSS) and graft deficiencies that may occur in the postoperative period are also observed as conditions that obesity might cause [2, 3]. In our study, we examined the effect of increased BMI on perioperative follow-up parameters and per-postoperative complications in liver transplant recipients.

Materials and methods

Collected 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. Demographic data, gender, age, MELD, Child score, (non-alcoholic steatohepatitis) NASH etiology rates were analyzed. Anhepatic phase, cold ischemia time, operation time, blood products transfusion rates were analyzed as perioperative anesthesia findings. The patients were separated and examined in terms of BMI. At first, those with a BMI below 18.5 were evaluated as underweight, those with 18.5-24.9 as normal weight, those with 25-29.9 as overweight, those with 30-34.9 as obese, and those 35 and over as severely obese. In order to compare the under/normal weight and overweight/obese patients in terms of perioperative anesthesia findings and postoperative complications, the recipients were subsequently divided into those with a BMI of 24.9 and below and those of 25 and above. Whether there was a difference between cold ischemia time, operation time, and blood product transfusion rates was statistically analyzed in terms of these BMI groups. Also, hospital stay was statistically analyzed in terms of BMI groups. Biliary complications, hepatic vein thrombosis, portal vein thrombosis, NASH etiology, postoperative hemorrhage, sepsis, and primary graft dysfunction were analyzed statistically in terms of those with a BMI of 25 and above and those below 25. 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 Declaration of Helsinki and its later editions. This study was approved by the Istanbul Aydın University Human Experiments Ethics Committee with an Ethics Committee with decision number on date.

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. Spearman's rho correlation and Cox Regression tests were used for relational analysis. 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 53.7 (range: 18-78 years). 44% of the patients were female and 56% were male. The mean weight was 76, the mean height was 166 cm. The rate of A blood group was 45%, the rate of group B was 20%, the rate of 0 group was 28%, and the rate of AB group was 7%. 30% of the patients were Child A, 38% Child B,

and 32% were Child C. The mean MELD score of adult patients was 16.2. NASH etiology rate was 19%. The mean anhepatic phase duration was 89 minutes, and the mean cold ischemia time was 68 minutes. The mean operative time was 468 minutes, and the mean hospital stay was 14.9 days. In patients with BMI <25, mean anhepatic phase duration was 82.3 minutes, cold ischemia time was 60.1 minutes, operation time was 459.1 minutes, and hospitalization time was 14.2 days; In patients with BMI >25, the mean anhepatic phase duration was 93.2 minutes, cold ischemia time was 73.7 minutes, operation time was 472.2 minutes, and hospitalization time was 15.3 days. Anhepatic phase duration (p=0.047) and cold ischemia duration (p=0.009) were statistically longer in patients with BMI >25 (Table 1). Liver cirrhosis due to NASH was statistically more common in those with BMI >25 (p=0.001). There was no statistically significant difference between those with BMI >25 and BMI <25 in terms of perioperative blood product transfusion (p=0.646), biliary complications (p=0.556), portal vein (p=0.422) and hepatic vein (p=0.169) thrombosis/occlusions, postoperative hemorrhage (p=0553), sepsis (p=0.590), and primary graft failure (p=0.577) (Table 2). Postoperative hepatic artery thrombosis or insufficiency was not detected in any recipient. In addition, in the statistical evaluation of underweight, healthy weight, overweight, obese and severely obese recipients, no significant difference was observed in terms of perioperative findings, hospital stay and complications (p>0.05).

Table 1. Ratio and statistical results of age, length of hospital stay and peroperative phase duration in patients with BMI below 25 and 25 and above

	BMI <25	**BMI ≥25**	***P* value**
Anhepatic phase (minute)	82.3	93.2	**0.047***
Cold ischemia time (minute)	60.1	73.7	**0.009***
Hospital stay (day)	14.2	15.3	0.125*
Operation time (minute)	459.1	472.2	0.324*

BMI: body mass index, *Chi-Square Test and Chi-Square Likelihood tests

Table 2. Statistical results of etiology, perioperative blood product and postoperative complications in patients with BMI Below 25 and 25 and above

	BMI <25	**BMI ≥25**	***P* value**
Etiology			
• NASH	3.8%	96.2%	**0.001***
• Others	26.1%	73.9%	
Peroperative Blood Product	16.5%	20.8%	0.646*
Bile Complication	17%	20.9%	0.556*
Portal Vein Thrombosis	3.8%	1.7%	0.422*
Hepatic Vein Occlusion	1.9%	2.6%	0.169*
Postoperative Hemorrhage	7.5%	5.2%	0.553*
Sepsis	11.3%	8.7%	0.590*
Primary Graft Failure	1.9%	0.9%	0.577*

BMI: body mass index, NASH: nonalcoholicsteatohepatitis, *Chi-Square Test and Chi-Square Likelihood tests

Discussion

Obesity and high BMI increase the risk factors and complication rates of surgical operations as an increasingly common health problem all over the world. This increased risk is also valid for liver transplant recipients, and it can cause morbidity and mortality by creating both perioperative risk factors and postoperative vascular and bile complications [1, 4, 5]. BMI elevation may affect all perioperative and postoperative stages of transplant surgery. Considering that obesity shortens the graft survival, it can be said that the complication rates that increase as the BMI increases may be one of the reasons for this [6, 7]. In addition to the results in which there is no significant difference in terms of operative time, hospital stay or perioperative complications in patients with high BMI [3, 8, 9], there are also studies showing that perioperative hot and cold ischemia times, operative time, and hospital stay increase as BMI increases [1, 2, 10, 11]. In addition, when the relationship between the need for perioperative blood product transfusion, bile complications, postoperative bleeding [1], portal vein and hepatic vein thrombosis/occlusion and increased BMI was examined, in some studies, these rates increase with increasing BMI [2, 12-14], while in others it does not change [3, 7, 8, 15-19]. However, it can be said that the risk of sepsis increases as BMI increases [2, 20-22] but there is no conclusive data that shows that it can increase primary graft dysfunction [15]. When we examine the findings of our study in the light of these heterogeneous results, although the rates of operation time, hospital stay, blood product transfusion requirement, bile and vascular complications, postoperative bleeding, sepsis and primary graft dysfunction rates do not change with increasing BMI, we see that the anhepatic phase and cold ischemia times are prolonged. This may be important in terms of the effect of increased BMI on postoperative graft survival.

Obesity and BMI above normal may be the causes of problems that develop both in the perioperative and postoperative period for liver transplant recipients. It will serve to reduce complications if liver transplant recipient candidates with high BMI undergo an effective preparation process before surgery. High-volume patient studies in terms of BMI elevation will be important to show complications and graft survival after liver transplantation.

A higher number of patients, the ability to conduct detailed BMI group analyzes as the increasing number of patients BMI >30, and taking into clinical follow up weight loss after effective ascites treatment will eliminate the limitations of the current study.

Conflict of interest: No conflict of interest was declared by the authors.

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Authors' contributions to the article

E.A. constructed the main idea and hypothesis of the study. A.O., F.S.T. and H.C. developed the theory and arranged/edited the material and method section. M.B. and E.S. have done the evaluation of the data in the results section. Discussion section of the article was written by E.A. B.U and A.D. reviewed, corrected and approved. In addition, all authors discussed the entire study and approved the final version.