



## Evaluation of reasons for rejecting candidates for living donor liver transplantation

Living donor selection

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Ali Ozer<sup>1</sup>, Hikmet Aktaş<sup>2</sup>, Meltem Güner<sup>3</sup>, Ercument Gurluler<sup>1</sup>, Remzi Emiroglu<sup>1</sup>  
<sup>1</sup>Organ Transplantation Department, Acibadem Atakent University Hospital, Istanbul,  
<sup>2</sup>Organ Transplantation Department, Acibadem Bursa Hospital, Bursa,  
<sup>3</sup>Anesthesiology Department, Acibadem Atakent University Hospital, Istanbul, Turkey

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### Abstract

**Aim:** The shortage of cadaveric donors has sparked an interest in living donor transplantation in Eastern countries. Obtaining an optimal graft for a recipient and avoiding jeopardizing the health of a donor is the main concern in this procedure. **Material and Method:** A three-step assessment protocol was used to select the appropriate donor. The reasons for rejected candidates were analyzed to refine donor selection and minimise complications. **Results:** Between January 2016 and October 2017, 290 volunteers were evaluated for living liver donation, and 88 were rejected. At each step of donor evaluation, the individuals were excluded based on laboratory, imaging or liver biopsy results. Volumetric measurement results were the most detected reason (40.9%) to reject a candidate. **Discussion:** Ensuring donor safety in living donor liver transplantation is fundamental for transplant teams. Therefore, using systematic evaluation is the principal concern in this procedure.

### Keywords

Donor Selection, Living Donor, Liver Transplantation

DOI: 10.4328/JCAM.5635

Received: 22.12.2017 Accepted: 05.01.2018 Published Online: 09.01.2018

Corresponding Author: Ali Özer, Acibadem Atakent University Hospital, Turgut Ozal Bulvarı, Halkalı, Küçükçekmece, Istanbul, Turkey.

GSM: +905332122324

## Introduction

Although there has been a partial improvement in organ donation, the scarcity of deceased organs is still a problem in our country, and the frequency of living donor liver transplantation (LDLT) is increasing for expanding the donor pool and reducing waiting list mortality. The donor and recipient outcomes in LDLT have become substantial in the last decade due to advances in surgical techniques and the sophisticated evaluation process of living donor candidates. However, the procedure still poses an undeniable risk for the healthy organ donor that leads to concerns about the ethical dilemma. The early surgical complication rate reported in the literature is 12–29%, with a mortality rate of 0.1–0.8%. Beyond any doubt, donor safety is the prime concern and, therefore, a definitive international consensus has been composed to emphasize the importance of evaluating the psychosocial and medical suitability of a live donor [1].

In Eastern countries, including our country, deceased donor organs are rare, and patients come to transplant centers with their last hope regarding LDLT. However, to obtain an optimal graft for a recipient and to avoid jeopardizing the health of a donor, a systematic approach to the evaluation of the living donor is necessary [2,3]. With these concerns, a distinct preoperative assessment has been practiced compared to conventional patient care in our center.

Despite the many patients and their donor candidates who are mostly relatives that apply with a great motivation for LDLT, we refuse some of them for conditions in which LDLT is unsuitable. In this report, we analyzed the reasons for refusing live donors in different stages of evaluation.

## Material and Method

The study was approved by the Institutional Review Board at Acibadem University. We evaluated the individuals who were rejected as donors for LDLT between January 2016 and October 2017 in our center.

We have a strict three-step assessment process, starting from potential donors' application. Satisfactory results on all tests at each step were required before proceeding to the next step. The assessments must uncover any unknown medical condition that might pose any risk for the donor.

The recipient and the donor candidate are informed in detail about the evaluation process and the procedure. A transplant coordinator conducts the first interview for a basic assessment. According to the law, individuals within four degrees' consanguinity are allowed to be organ transplant donors. In case of other candidates willing to be an organ donor, the approval of an authorized ethical committee is required. If the donor is married, the written consent of conjoint is essential. The minimal age for acceptance is 18, and the upper age limit is 55. ABO blood group compatibility is investigated, and non-invasive tests are performed for first-step evaluation. The potential risks, success, and morbidity-mortality rates are explained to both the recipient and donor by a physician. Before progressing to the next step, a psychiatric assessment is performed for all candidates. In addition, an independent psychologist called a "patients' rights defender" interviews recipients and donors at certain intervals to support them throughout the entire process. If doubtful results are detected from the standard protocol,

more testing and consulting may be necessary. In the second step, detailed laboratory tests are performed. Additionally, candidates older than 40 years undergo cardiologic and pulmonary assessments routinely while the others are only evaluated in case of a suspected cardio-pulmonary disease. Endoscopy is performed depending on the presence of a questionable medical history, test results and physical examination findings. Then the radiological examination begins with ultrasonography (US) to assess the liver and the other abdominal organs and continues with computerized tomography (CT) angiography to evaluate the liver vascular structure and, more importantly, to make volumetric measurements for a graft and remnant liver. We take notice of the percentage of remnant liver volume to total liver volume (> 30%) and graft to recipient body weight ratio (GRBW) aiming for > 0.8. If the volumetric assessment is eligible for both the donor and recipients, then magnetic resonance cholangiopancreatography (MRCP) is performed to evaluate the biliary structure.

In the third and last step, a liver biopsy is applied to all donor candidates to investigate steatosis and possibly other covered liver diseases. US-guided liver biopsies are evaluated by the same experienced pathologist. We consider  $\leq 20\%$  steatosis acceptable in association with GRBW.

While practicing all three steps, the candidates can be rejected for any of these aforementioned reasons. Our donor evaluation protocol is presented in Table 1. Absolute exclusion criteria were withdrawing the willingness to donate, ABO incompatibility, serious co-morbidities that can pose risks for donors, recent detected illness, positive hepatitis serology, inadequate liver volume and/or calculated GRBW <0.8, significant steatosis and/or fibrosis, underlying liver disease detected by laboratories and liver biopsy.

Table 1. Evaluation protocol for candidates of living donor liver transplantation

First step	<ul style="list-style-type: none"> <li>• Interview with transplant coordinator: confirmation of willingness and awareness</li> <li>• Age <math>\geq 18</math> and <math>\leq 55</math></li> <li>• Within four degrees of consanguinity (ethical committee approval if necessary)</li> <li>• Interview with a transplant surgeon and examination</li> <li>• Laboratory: blood group, hematology, chem 12, coagulation profile, thyroid function tests, serology (hepatitis A, B, C, and HIV), pregnancy test</li> <li>• Imaging: chest X-ray, abdominal ultrasound</li> <li>• Consultation for psychiatric evaluation</li> </ul>
Second step	<ul style="list-style-type: none"> <li>• Laboratory: sedimentation, iron, copper, alpha-1-antitrypsin, ceruloplasmin, transferrin, ferritin, tumor markers (AFP, CEA, CA19-9), fecal occult blood test</li> <li>• Serology: cytomegalovirus antibody, Epstein-Barr virus antibody, herpes simplex virus antibody, VDRL</li> <li>• Electrocardiogram, pulmonary function tests: &gt; 40 routinely and if necessary &lt; 40</li> <li>• Endoscopy: If there are questionable results and findings</li> <li>• CT angiography and MRCP (volumetric assessment)</li> </ul>
Third step	<ul style="list-style-type: none"> <li>• Liver biopsy (steatosis <math>\leq 20\%</math>, no underlying liver disease)</li> <li>• Interview with transplant surgeon with final results, written informed consent</li> </ul>

## Results

We evaluated 290 candidates and 88 of them were considered improper donors for LDLT. Some recipients had more than one rejected candidate. Sixty-four candidates were male, and 24 were female.

The mean age was 34.1 years (19–55). Of 88 candidates, 60, 24 and 4 were first-, third- and second-degree relatives, respectively.

The most established reason preventing donation was lower GRBW (23 candidates). Thirteen candidates had an inadequate graft size for the recipient. Eight candidates had steatosis, and 10 candidates had steatosis and fibrosis. Vascular and/or biliary variation preventing a safe hepatectomy was detected in seven candidates. In four candidates, their hepatitis B virus serology was positive. Nine candidates changed their mind about donation, and two candidates of this group did not give their consent. Four candidates were rejected due to ABO blood group incompatibility. Unfortunately, two oncologic disorders were demonstrated in two candidates (lymphoma and renal cell carcinoma). All the reasons leading to the rejection of the candidate were listed in Table 2.

Table 2. Rejecting reasons of 88 candidates for living liver donation

Reason	N
ABO blood group incompatibility	6
Refusal to donate (during each step)	9
Hepatitis B virus carrier	4
Hypercoagulability disorder	1
Hematochromatosis	1
Wilson disease	1
Sarcoidosis	1
Pancreatic mass	1
lymphoma	1
Renall cell carcinoma	1
Hemangioma (4cm located in left lobe)	1
Steatosis >10%	8
Steatosis+fibrosis	10
Inadequate liver volume, GRBW <0,8	36
Vascular/biliary variation preventing lobectomy	7

## Discussion

The scarcity of cadaveric donors remains an unsolved problem that leads to increasing LDLT in our country. Donor safety is recognized as an absolute prerequisite in LDLT, and a well-designed system to evaluate potential donors is essential [4].

Donor candidates must be legally competent, have the capacity for autonomous decision-making and enter the donation process of their own free will. The donation involves a complex interplay of psychosocial and family dynamics; therefore, an explicative information by the transplant team plays a key role in proceeding with the process. Respect for the autonomy and free will of the candidate is fundamental [5]. Following an initial interview, a psychiatric consultation is routinely performed in our center, and a psychologist supports the candidates during the entire process. In our study, four of nine refuser candidates have decided not to donate after a psychiatric consultation that emphasizes the importance of the autonomy of the decision.

In the present study, the most detected reason for rejection depends on radiological assessment (36 cases, 40.9%). The graft size is inversely related to the risk of small for size syndrome. Moreover, the ratio of the remnant liver volume to the total liver volume is an important predictive risk factor.

Most transplant centers still consider >35% a safe percentage [6,7], but a great number of studies have presented >30% as an acceptable ratio [8,9]. Our current limit of GRBW is 0.8 like the literature, although some recent studies have recommended 0.6 [10].

It is supposed that each percentage of fat in the graft decreases the functional liver mass by 1%. Up to 12% of donor candidates have been rejected due to biopsy findings alone. The threshold of steatosis has not been conclusively established, and the decision should be given regarding multi-factors such as donor age, graft size and GRBW [11,12]. We routinely performed liver biopsies in our center, and 18 of 88 (20.4%) rejected cases were based on biopsy results, which are >20% steatosis and/or fibrosis.

## Conclusion

In our country, the demand for LDLT will continue due to a shortage of cadaveric donors. Donor safety is of paramount importance in LDLT. It is obviously necessary to maintain a systematic donor assessment involving the highest medical and ethical standards to achieve optimal outcomes for both donors and recipients.

## Competing interests

The authors declare that they have no competing interests.

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## How to cite this article:

Ozer A, Aktaş H, Güner M, Gurluler E, Emiroglu R. Evaluation of reasons for rejecting candidates for living donor liver transplantation. *J Clin Anal Med* 2018; DOI: 10.4328/JCAM.5635.