Organ Yield from Deceased Donors: Initial Experience of an Organ Procurement Unit in Iran

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To promote organ transplantation in Iran, organ procurement from deceased donors should be supported. For this policy, some organ procurement units have been established in university hospitals. Further researches in these activities are warranted to better elucidate the role of cadaveric organ transplantation in Iran.

We retrospectively studied deceased organ donation from June 2005 through December 2007 in Organ Procurement Unit of Shariati Hospital in Tehran. We analyzed a total of 141 organs that were retrieved from 46 brain-dead organ donors.

The median age of all donors was 29 years (min: six, max: 63). Two third of them were males. The average of harvested organs was 3.06 per donor and four organs per month. The main cause of brain death was head trauma (n=33, 72%). Organ yield per donor was correlated to the time of the organ procurement unit activity and increased during the three years (r=0.261, \( P=0.017 \)). Other variables were not changed during this period. Donor characteristics such as age, sex, blood group, and causes of brain death impacted on the organ yield.

This study showed that organ procurement units can improve organ yield and both experience and donor characteristics influence on the number of harvested organs.

Keywords: Organ procurement • brain death • organ retrieval • transplantation

Introduction

Transplantation is considered as the best therapeutic option for patients with end-stage organ failure. The best source of transplanted organs is deceased organ donors. Following the legislation of the organ transplantation from brain-dead donors act by the parliament, Iranian Network for Transplant Organ Procurement (IRANTOP) was established. This network consists of Organ Procurement Units (OPUs) in some university hospitals. One of them was established in 2005 in Shariati Hospital, affiliated to Tehran University of Medical Sciences. The tasks of these OPUs are:

• Brain death determination
• Family approach and obtaining the consent
• Donor maintenance
• Donor global assessment and evaluation;
• Organ viability assessment
• Coordination for organ retrieval
• Assistance with surgical organ retrieval team
• Tissue extraction
• Local organ allocation
• Donor’s family support

After establishment of these OPUs in Iran, organ transplantation from brain-dead donors has become a reality. In this initial period, evaluation of the OPU activities and the process of organ procurements are necessary in order to develop the rate of cadaveric transplantation. There are many issues involved in the success of organ recovery for transplantation, but the most important ones could be categorized in OPU performance, and the characteristics of the deceased organ donor. In this study, we evaluated the three-year activity of
Shariati Hospital OPU and the characteristics of the brain-dead donors.

Materials and Methods

From June 2005 through December 2007, a total of 141 organs were recovered from 46 brain-dead donors in OPU of Shariati Hospital. Donor management or maintenance according to our protocol was initiated as soon as brain death was identified and continued for at least 24 hours. This time is necessary for brain death re-evaluation and reconfirmation of the diagnosis by a group of specialists as legal authorization.

In this retrospective study, we analyzed the characteristics of the brain-dead donors and their impacts on organ yield.

Data distribution was assessed with the one-sample Kolmogorov-Smirnov test. We analyzed the quantitative variables with Pearson correlation or Spearman correlation as their distributions. Mann-Whitney U and t-tests were used to assess the differences between the groups after categorizations. Significance was set at $P<0.05$. Statistical analysis was performed by SPSS (version 15.0).

Results

During the three-year activity of Shariati Hospital OPU, 59 brain-dead patients were admitted to the Intensive Care Unit (ICU) of this hospital as potential donors. The median age of all donors was 29 years (min: six, max: 63). Two third of them were males.

Almost all of these brain-dead patients were transferred from other hospitals (Tehran or even other cities) after initial diagnosis of brain death. Finally 46 (80%) cases were effective donors, whose organs were retrieved.

The rate of organ yield in this OPU was four organs per month and 3.06 organs per donor. The maximum organ recovered per donor was six organs consisting of two kidneys, heart, liver, lung, and pancreas. The frequency of retrieved organs is shown in Figure 1.

All of the suitable kidneys (N=84) and livers (N=30) were harvested, but the other suitable organs were not because of the limitation of transplantation of other organs in Iran. These organs were transplanted either in Shariati Hospital or were sent to other sharing centers in IRANTOP.

The rate of organ yield per donor was correlated to the time of OPU activity ($r=0.261, P=0.017$) and increased during the three years, while other conditions were not changed in this period.

The main causes of brain death were head trauma (n=33, 72%), cardiac arrest, and intracranial hemorrhage. The mean age of the group with head trauma was 27 years and the group with other causes, 32 years ($P=0.054$). But the number of organ yield per donor differed significantly between these groups (brain trauma: 3.4, other causes: 2.84, $P=0.033$).

Important donor characteristics are shown in Table 1.

Discussion

In this study, we present the results of initial experience of cadaveric organ procurement with establishment of OPU in one of university hospital.

Table 1. The effects of donor characteristics on organ donor yield.

<table>
<thead>
<tr>
<th>Donor characteristic</th>
<th>The number of harvested organ per donor</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50 years</td>
<td>3.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>≥50 years</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3.4</td>
<td>0.004</td>
</tr>
<tr>
<td>Female</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Blood group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2.7</td>
<td>0.003*</td>
</tr>
<tr>
<td>B</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>Brain death causes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head trauma</td>
<td>3.4</td>
<td>0.033</td>
</tr>
<tr>
<td>Others</td>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

Kruskal-Wallis test.

Figure 1. The frequency of retrieved organs per donor.
in Iran. The rate of organ procurement was four per month. Although the total rate was low, but it depended on many factors. We think that this result of the OPU activity in the initial phases was acceptable. The rate of organ yield per donor was 3.06. This rate for organ procurement organizations in the United States of America during the same time was 3.13 (range: 2.63 – 3.89). But our results could be more increased, if we harvested all suitable organs. We harvested only all suitable kidneys and livers, but some of the other suitable organs were wasted because of our limitation in other transplantations. The number of organ yield was changed significantly during the three-year activity of this OPU. This means that organ yield may depend on the experience of persons involved in all steps of organ procurement.

In this study, some characteristics of donors were also investigated and the impact of these variables on organ yield and kidney transplanted outcomes was shown. Donor age affects on organ yield. Although the maximum donor age was 63 years, the mean of harvested organs was two per donor in the group of donors more than 50 years, which is significantly lower than the mean for donors aged under 50 years (3.4 organs per donor, \( P<0.001 \), Table 1). This finding is consistent with the findings of some other studies.\(^2\)\(^{-6}\) In large studies done on registry data of United Network for Organ Sharing (UNOS),\(^2\) organ yield depended significantly on donor age, but in a concave manner that donors at 38 years of age yielded the highest number of organs, and the yield declined as the age either increased or decreased.

We also analyzed the effect of gender on organ procurement. Two third of the donors in our study were males. It may be related to the cause of brain death and societal situation in Iran; because 72% of brain death causes was head trauma and car accident.

Also, sex affected on organ yield in this study, which was more in males (Table 1). However, we could not explain the exact mechanism.

Donor blood group influenced the number of organ yield and in blood group A was lower than the others. The brain death causes influence organ yield and the rate for donors with head trauma was higher than donors with other causes (Table 1). It may be related to better general condition of the first group.

This study describes the initial experience of deceased donors’ organ retrieval with set up of OPU in a university hospital. Both the experience of OPU and donor characteristics such as age, sex, blood group, and cause of brain death affect on organ yield.

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**References**