Clinical Investigation

Why Referred Potential Heart Donors Aren't Used

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Heart donor demand far exceeds supply. We evaluated donor referrals to 1 organ procurement agency in an attempt to determine why many potential cardiac donors are not used. Of 430 referrals between September 1989 and August 1991, 169 hearts (39%) were harvested. In potential donors ultimately not yielding a heart, 38.7% were unavailable because the family refused to consent to organ donation, 36% were medically unsuitable, and 16.1% did not meet standard brain death criteria. Of the 94 donors not used for medical reasons, 43.6% had cardiac arrest, 17% had hypotension, 12.8% were drug abusers, 6.4% had sepsis, 5.3% had hepatitis, 5.3% had an acute myocardial infarction, 3.2% had low ejection fraction levels, and 2.1% tested positive for human immunodeficiency virus or syphilis (4.3% were not specified). A significant difference (p=0.001) in racial distribution surfaced; Blacks and Hispanics constituted 27.2% of the donor group but 46.3% of the non-donor group. These data confirm that strategies must be created to continue educating the public and physicians in order to increase consent rates, optimize donor selection, and improve physician awareness of brain death criteria. ***(Texas Heart Institute Journal 1993;20:218-22)***

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It is well known that the demand for cardiac donors far exceeds the supply. The United Network of Organ Sharing (UNOS) indicated that in June 1991, 2,129 patients were waiting for a cardiac donor.[1] This represents a 229.6% increase from the number listed in December 1987. Strategies to increase donor acquisition have generally focused on public and physician education and on the requesting technique. Previous studies have not focused specifically on the potential heart donors and, in fact, the number of cardiac donors has not increased. Indeed, the International Society for Heart and Lung Transplantation Registry indicates a substantial decrease in the number of heart transplants performed in 1991 compared with those performed in 1988, 1989, and 1990.[2] We find this information profoundly disturbing.

Results of the National Cooperative Transplantation Study[3] suggest that the potential supply of total donors is between 6,900 and 10,700 annually. However, only about 37% to 58% of available referrals actually become organ donors, depending on the criteria established for donor acceptability.[3] The number of cardiac donors is even lower, since not all kidney or liver donors are suitable as heart donors. To create effective strategies for improving the utilization rate of referred potential cardiac donors, more insight into the overall potential donor pool was needed. Therefore, this study was initiated in 1 organ procurement organization to evaluate the demographics of referred potential cardiac donors and thus provide information that could help develop methods of increasing cardiac donor supply.

We studied data from LifeGift (Southeast) Organ and Tissue Donation Center, the organ procurement organization in Houston, Texas, which serves portions of the Gulf Coast region of the United States. The records of all potential cardiac donors who were referred to LifeGift between September 1989 and August 1991 were reviewed retrospectively.

The LifeGift list of brain death criteria uses standard definitions. There can be no clinical evidence of cortical or brain stem function, and the injurious process must be irreversible. Apnea tests are routinely performed. Hypothermia (body temperature below 90° F) or drug intoxication cannot be present when brain death is declared. Observation periods for absence of cortical and brain stem function are 12 hours when no confirmatory testing is used and 6 hours when ancillary testing is used. Ancillary tests include electroencephalography, radionuclide cere-

bral blood-flow imaging, and cerebral angiography. The observation period is 24 hours when anoxic brain injury is the cause of brain death. Absence of cortical function is documented by the patient's being comatose, unreceptive, and unresponsive. Absence of brain stem function is documented by lack of pupillary, corneal, or gag and cough reflexes, and absence of spontaneous respiration or extraocular movements.

For our study, patient characteristics—including age, race, sex, cause of death, pertinent medical history, and hospital course—were recorded for each potential donor. Reasons for non-use as a cardiac donor were assigned and tabulated. Demographic characteristics of donors whose referrals resulted in cardiac harvest and those whose referrals did not were compared using χ^2 analysis for noncontinuous observations and the Student's *t*-test for continuous variables.

Results

LifeGift received 430 referrals of potential cardiac donors during the identified 24-month span; 169 (39.3%) of those referred became cardiac donors. When patients were excluded because they did not meet standard brain death criteria, the percentage increased to 43.6% (169/388). Table I summarizes the baseline demographic variables of referred cardiac donors whose hearts were used (Group 1) compared with those whose hearts were not used (Group 2). The mean donor age was 32.9 years in Group 1 versus 35.8 years in Group 2 ($p > 0.05$). In each group, there were more males than females (64.5% in Group 1 and 65.5% in Group 2), but the proportion of males in each group was not statistically significant ($p > 0.05$).

The data reveal a difference in racial distribution between the 2 groups. More hearts came from Caucasian donors (72% in Group 1 and 51% in Group 2), and there were more Blacks in Group 2 compared with those in the group undergoing heart harvest (26% vs 12%, respectively; $p < 0.001$). A similar trend was noted in the Hispanic population as well, but this did not reach statistical significance. Together, Blacks and Hispanics accounted for 27.2% of heart donors used and 46.3% of the group not used (Table I).

Table II shows the causes of referral in the potential donors. In Group 1, the most frequent was closed head injury, followed by cerebrovascular accidents and gunshot wounds to the head. Much less frequent causes included other trauma, medication overdoses, and medical difficulties such as respiratory arrest due to asthma. Similarly, in Group 2, gunshot wounds to the head, cerebrovascular accidents, and closed head injuries were the most frequent reasons for referral. There was no significant difference in the cause of brain death between the 2 groups, with the exception of donors referred with primarily medical problems. In Group 2, there were significantly more potential donors who were affected by medical illnesses than there were in Group 1 (39 vs 5, respectively). That result is to be expected, because, in general, medical difficulties are more likely to cause substantial impairment of myocardial function.

TABLE I. Demographic Baseline Characteristics in 430 Potential Cardiac Donors

Patient Characteristics	Group 1: Donors Used (n=169)	Group 2: Donors Not Used (n=261)	P Value
Mean age (years)	32.9	35.8	NS
Sex			
Male	109 (64.5%)	171 (65.5%)	NS
Female	60 (35.5%)	90 (34.5%)	NS
Race			
Caucasian	122 (72.2%)	133 (51.0%)	<0.001
Black	20 (11.8%)	68 (26.1%)	<0.001
Hispanic	26 (15.4%)	53 (20.3%)	NS
Other	1 (0.6%)	7 (2.7%)	NS

NS = not statistically significant

TABLE II. Reasons for Referral to Organ Procurement Agency

Reason for Referral	Total Referrals (n=430)	Donors Used (n=169)	Donors Not Used (n=261)
Cerebrovascular accident	119 (27.7%)	52 (30.8%)	67 (25.7%)
Gunshot wound to the head	124 (28.8%)	48 (28.4%)	76 (29.1%)
Closed head injury	121 (28.1%)	56 (33.1%)	65 (24.9%)
Other trauma	15 (3.5%)	6 (3.5%)	9 (3.4%)
Overdose	7 (1.6%)	2 (1.2%)	5 (1.9%)
Medical	44 (10.3%)	5 (3.0%)	39 (15.0%)

Figure 1 illustrates reasons for non-use of referred cardiac donors. Of the 261 potential donors not used, the principal reason was refusal of permission by the family (101 cases; 38.7%), followed by medical unsuitability in 94 (36%). Surprisingly, the 3rd most frequent reason for not using a referred donor was that brain death criteria were not met (42 cases; 16.1%).

The reasons for medical unsuitability are shown in Figure 2. As might be expected, cardiac arrest ranked first as a medical reason for not harvesting the heart of a referred donor (43.6%). Prolonged hypotension accounted for 17% of non-use, followed by active illegal and parenteral drug abuse (12.8%).

Discussion

In our study, family refusal was the main reason for non-use of referred potential cardiac donors and medical reasons ranked 2nd. The 3rd-ranked reason for non-use was that patients did not meet standard brain death criteria.

Refusal of Permission by the Family

Racial Differences. This study demonstrates that baseline characteristics were similar between potential cardiac donor referrals used (Group 1) and those not used (Group 2), with the exception of race. Specifically, the percentage of Blacks and Hispanics together was significantly lower in Group 1 than in Group 2 (27.2% vs 46.3%, respectively). These data corroborate previous reports suggesting that race plays a significant role in organ procurement. A 1991 review of this topic indicated that Blacks are less likely to become organ donors than are Caucasians (11.3 vs 21.8 donors per million, respectively).[4] The suggestion that Blacks might be less willing to donate organs for transplantation was initially investigated in 1982 at Howard University Hospital.[5] That study disclosed 5 main reasons for less frequent organ donation in the Black community: 1) lack of transplant awareness; 2) religious and cultural beliefs; 3) distrust of the medical community; 4) fear of premature declaration of death after signing an organ donor card; and 5) preference for assurance of Black receivership.[5] Furthermore, our observation, taken in conjunction with other reports, indicates that the difficulty is not limited to just 1 geographic region. Since 1982, local grassroots-level educational programs oriented to the Black population have been developed in the Washington, DC, area. The success of these initial efforts has led to the development of a nationally directed educational system: the Minority Organ/Tissue Transplant Education Program. It is to be hoped that funding and implementation of this program will increase the number of organ donations in minority populations.

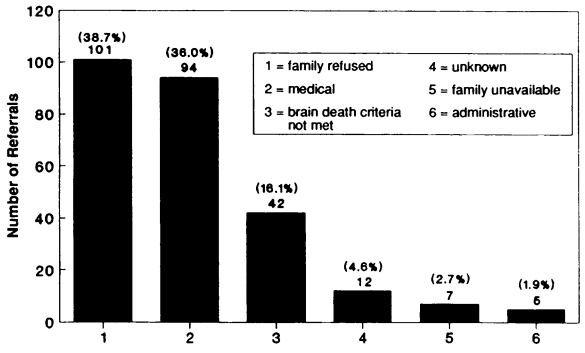

Fig. 1 *Reasons for non-use of 261 referred cardiac donors.*

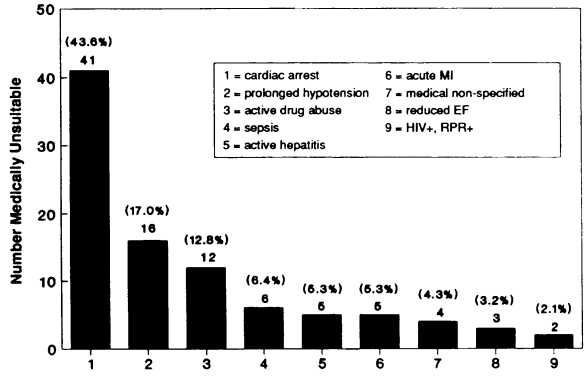

Fig. 2 *Medical reasons for non-use of 94 referred cardiac donors.*

Organ Donation Education. Because our study provides further documentation that family refusal is the principal reason for non-use of potential donors, the issue of public education and its ability to increase organ donation is raised once again. Public surveys indicate that more than 90% of the U.S. population is aware of organ transplantation; however, this does not appear to have increased the access to potential donors.[6] A 1987 Gallup poll indicated that 84% of the public was knowledgeable about organ donor cards, yet only 20% had completed one.[6] Inability to locate family members to discuss organ donation was not a significant problem in our experience. Therefore, in our opinion, strategies for improving efficiency in locating family members are unlikely to have a noticeable impact on donor supply.

Public education about organ donation can be accomplished through the mass media, community organizations, and organ procurement personnel at the time of a potential donor's death. Each type of communication plays a distinct role in increasing donor supply. Various types of mass media have been effective in initiating public awareness; indeed, the majority of education seems to have been through radio and television programs and advertise-

ments. However, this exposure plays a limited role in depicting the benefits of organ transplantation. It appears that a more detailed description of organ donation, including the concept of brain death, is necessary to assist the public in understanding the process.

These issues may be more effectively presented through community programs and interpersonal contacts. For example, the mass media have effectively communicated the need for blood donors; but it is at the community level, via schools, colleges, and work sites, that most blood drives are initiated. The United Network for Organ Sharing and local organ procurement agencies are excellent vehicles for education at the community level. Interestingly, a recent review of educational programs available in 1991[7] suggests that most transplant-related organizations have focused more on professional education and administrative concerns than on public education.[7] Although these approaches are important, it is crucial for local agencies to design educational programs that present information to the public in an easily understandable format. These programs should be standardized and their efficacy evaluated periodically.

Effective mass media and community-level educational programs should better prepare family members of potential cardiac donors for the suggestion of organ donation. In addition, donor coordinators must be trained carefully so that they can be relied upon to present the information to the families clearly and compassionately.

Medical Unsuitability of the Donor

Medical reasons ranked 2nd for exclusion of potential cardiac donors. Medical difficulties also marked the primary difference between our 2 groups with respect to cause of death. This might have been anticipated, because patients with primary medical illnesses who are referred as potential donors are more likely to be hospitalized for a prolonged period, are often hemodynamically unstable, or have other contraindications to organ donation.

Recently, the high donor rejection rate due to medical illnesses has been studied with regard to extending donor criteria. Specifically, reports now detail the use of donors from a wider age range and with greater allograft ischemic time, as well as the use of hearts from donors with transient hemodynamic instability. More donors who have been adequately treated for infection are also being used. In addition, heterotopic transplantation has increased the use of small donors in large recipients.

Age Restrictions. Age restrictions (<35 years) in cardiac donors are being relaxed because of limited donor supply. A retrospective study in 1989[8] reviewed 314 cases comparing heart transplant recipients whose donors were younger than 35 years of age versus those whose donors were older than 35. Fifteen percent of the recipients received hearts from donors between the ages of 35 and 49 years. The overall survival rates were similar between the groups, with graft function and development of coronary artery disease being essentially the same.[8] Others[9,10] have also demonstrated that older cardiac donors provide acceptable grafts.

Prolonged Ischemic Time. The increasing practice of long-distance cardiac procurement has provided more data on the resultant prolonged ischemic periods. Studies suggest that an ischemic period of 4 to 6 hours may not increase perioperative mortality or adversely affect graft function.[11-13]

Hemodynamic Instability. The effects of hemodynamic instability in the potential donor are difficult to evaluate systematically. Factors such as level of inotropic support, periods of hypotension, and the need for cardiopulmonary resuscitation have been reviewed with respect to recipient outcome. Initial studies[10,12-14] have shown that short-term, high-dose catecholamine requirements, transient hypotension, and brief periods of cardiopulmonary resuscitation do not adversely affect short- and long-term recipient survival. Therefore, the specific causes and effects of hemodynamic instability should be considered for each potential donor, in order to avoid unnecessary exclusion.

Donor Infection. Potential transmissible disease from the donor organ is one of the contraindications for organ harvesting and subsequent transplantation. In the era of acquired immunodeficiency syndrome (AIDS), the use of hearts from potentially HIV-positive donors poses a hazard. The AIDS epidemic allegedly has reduced the number of potential donors by 10%.[15] More sensitive and specific tests need to be developed for early detection of the human immunodeficiency virus and of other potentially transmissible infections, such as hepatitis. Such tests might increase the likelihood that high-risk donors, such as parenteral drug abusers and homosexuals, might yield viable hearts if they were to receive test results that were negative for these viruses. The use of donors who have bacterial infections prior to harvesting has also been studied. Donors with positive blood cultures, high fevers, and leukocytosis have been used in at least 1 transplant center for critically ill recipients,[16] but outcome has been compromised. Nevertheless, none of the deaths have appeared to be caused by infectious organisms cultured in the donor prior to transplant. Although use of potentially infected donors should be regarded with caution, such donors should be given more than perfunctory consideration.

Weight Differential. Ideally, the donor-to-recipient weight differential should be less than 10% to maxi-

mize graft function in the new cardiovascular environment. When this is not possible, heterotopic transplantation of an undersized heart provides a solution. However, 1 study involving the use of cardiac allografts from donors weighing less than 20% of the recipient suggests that such a large weight differential can contribute to impaired graft function.[14] Using oversized donor hearts does not seem beneficial either; in fact, their use might be related to excess mortality.[17] Therefore, a large weight differential between donor and recipient should most likely remain a relative contraindication to organ transplantation.

Unmet Brain Death Criteria

Surprisingly, 16.1% of patients not used as donors in this study were excluded because they did not meet standard brain death criteria. Adequate physician awareness of brain death criteria is essential and can be accomplished with further medical education.

Conclusions

Close examination of the potential cardiac donor pool is necessary to understand and alleviate the shortage of these donor organs. Clearly, obtaining donor hearts is closely linked to identifying cadaveric solid organ donors in general. Moreover, it is important to remember that all organ donors will not be optimal heart donors. A review of our data indicates that extending donor criteria may be one method of increasing the use of potential cardiac donors. Further experience with the use of the so-called marginal donor is needed before exact guidelines can be established. Another important focal point should be the development of educational strategies to increase consent rates, optimize donor selection, and improve physician awareness of brain death criteria.

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