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Impact of local donor and regionalization on a German transplantation center

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Abstract Optimal allocation of donor organs is an ongoing matter of debate. We report on the impact of the foundation of UNI NRW, a close transplant collaboration of seven university centers with the intention of improving donor organ allocation, on the heart transplant program in Münster. All donor organs retrieved were offered first to the patients within this region before going into the Eurotransplant (ET) Foundation pool. The heart transplant program data were prospectively (for 1997) and retrospectively (for 1996) analyzed with regard to donor organ availability and allocation. There was a slight decrease in the number of donor hearts offered and accepted within the UNI NRW region in 1997 as compared to in 1996. However, due to the significantly lower organ export rate, the number of heart transplantations performed in UNI NRW rose from 47 to 72 procedures. In Münster, only six donor organs (16%) were procured from outside UNI NRW in 1997, and these were, in part, due to special urgency requests. In conclusion, the institutionalization of UNI NRW within the framework of ET offers more flexibility, decreases total ischemic time, and may help to lower costs.

Key words Heart transplantation, allocation · Allocation of organs, heart transplantation

Introduction

In the early 1990s, the number of heart transplant procedures in most European countries reached a maximum. Now, about 500 heart transplantations are performed annually in Germany although the demand for organs is twice as much, judging from the waiting lists. The number of patients who die while waiting for a heart transplantation is largely dependent upon the severity of the disease and the length of time on the waiting list [5]. Consequently, an ever-increasing amount of attention is being focused on the limited supply of donor organs and on cost considerations, and discussion about optimal organ allocation goes on and on.

The use of "local donor" organs is a long-standing tradition that has allowed transplant centers to provide a few severely compromised patients with life-saving organs regardless of time on the waiting list. In 1996, seven university hospitals within North Rhine Westfalia joined and founded the "region" UNI NRW (Universities of North Rhine Westfalia) with the intention of optimizing resource allocation, i.e., of treating patients within regional institutions with donor organs recruited from the same region and of further increasing the flex-

ibility of the transplant centers. The region of North Rhine Westfalia covers an area of 34000 km^2 and comprises a population of 18 million people. A key feature of the altered allocation system is that all transplant centers within North Rhine Westfalia, except for Bad Oeynhausen, are treated as one institution at Eurotransplant (ET). Recently, this allocation system has been praised for its fairness and for its compliance with the German law of transplantation that has come into effect.

We report on the heart transplant program in Münster, with special regard to the impact of local donors and the UNI NRW.

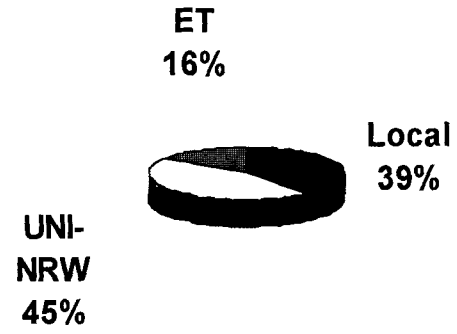

Fig. 1 Donor origin in Münster 1997

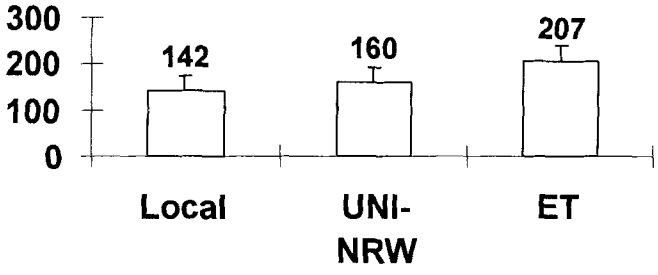

Fig. 2 Ischemic times acccording to allocation in Münster 1997

Materials and methods

Data were collected from all recipients and donors involved in a heart transplant procedure at Münster University in 1996 and 1997. The study was designed in a prospective manner for 1997, whereas patient data from 1996 were collected retrospectively.

First, the transplant data from 1997 were analyzed with regard to the number of transplant procedures, underlying heart disease, previous open heart surgery, and mechanical support of the recipient, as well as to multiple donor variables including allocation, total ischemic time, and donor age. Second, UNI NRW data from 1997 were compared to the corresponding data from 1996. It was assumed that the impact of UNI NRW would only be of minor importance during the first 6 months as UNI NRW was founded in July 1996.

Statistical analysis was performed with Student's *t*-test, where appropriate, and a *P* value below 0.05 was considered significant.

Results

Münster: heart transplantation 1997

During 1997, 38 heart transplantations were performed at the Department of Cardiothoracic Surgery in Münster. These consisted of 33 orthotopic adult, 4 heterotopic adult, and 1 pediatric procedure. The underlying heart disease was dilative cardiomyopathy/ myocarditis in 18 patients, end-stage coronary artery disease / acute myocardial infarction in 17, valvular disease in 2, and congenital heart disease in 1 patient. Sixteen patients (42%) had had previous open heart surgery, and seven of these (18%) were on a long-term mechanical assist device. The mean recipient age was 53 ± 10 years.

Of these 38 hearts, 15 (39%) were procured locally, 17 (45%) within UNI NRW, and only 6 (16%) outside NRW (1 from outside Germany), in part due to special urgency requests (Fig. 1). The locally retrieved organs came from the city of Münster ($n = 7$) and from county hospitals close by ($n = 8$). As for the hearts obtained from UNI NRW, 12 were explanted in institutions that had their own transplant programs while only 5 came from nontransplant hospitals. The mean donor age was 32 ± 12 years; the mean ischemic time for local organs was 142 min as compared to 160 min for UNI NRW and 207 min for organs obtained outside UNI NRW ($P < 0.001$; Fig. 2).

Münster: 1996 versus 1997

The total number of hearts (excluding combined heart and lung donors) offered to our institution by ET decreased from 86 in 1996 to 71 in 1997. Seven organs offered on a secondary basis went to another institution. Waiting time until transplantation did not change during the 2 years: 284 days versus 264 days for 1996 and 1997, respectively (P = NS). When looking at the number of patients with waiting times exceeding 90, 180, and 365 days, there were more patients with long waiting periods in 1997. Nevertheless, the number of heart transplant procedures performed rose from 28 in 1996 to 38 in 1997.

UNI NRW: 1996 versus 1997

Within UNI NRW, there was the same trend with regard to donor procurement as in Münster. The total number of organs retrieved for transplantation declined from 112 in 1996 to 101 in 1997, whereas the cumulative number of transplant procedures clearly rose, from 47 in 1996 to 72 in 1997. This was a consequence of a signifi-

Table 1 Donor hearts within UNI NRW in 1996 and 1997

	1996	1997
Donor hearts offered	112	101
Accepted	84	80
Exported	57%	22%
Imported	23%	14%
Number of heart transplantations UNI NRW	47	72

cantly reduced organ export outside UNI NRW (national and international), as depicted in Table 1.

Special incidents in 1997

Of special interest is the fact that all transplant centers of UNI NRW are treated as one institution at ET. This implies that only one special urgency request at a time is possible for the region and that all centers have to communicate with each other with regard to priority and urgency. In May 1997, two institutions wanted to submit a special urgency request at the same time since both had critical patients on VAD support. Intensive discussion among those involved led to the decision to grant the special urgency request to the patient who seemed to have the better chance of survival. This patient indeed underwent successful transplantation only a few days later, while the other patient, who was denied the transplantation, died shortly afterwards due to cerebral bleeding while still on mechanical support.

In October 1997, a pair of lungs was offered to Münster just prior to departure of the retrieval team for the donor heart. According to ET, it was too late to make a further allocation or to offer the lungs elsewhere. Knowing there was a patient in critical condition in another institution, the lungs were offered by personal communication and procured in time by that institution.

Donor procurement is commonly done by the recipient institution and not by local surgeons. In December 1997, time constraints made it impossible for an explant team to procure a heart. However, because of the excellent relationship among the UNI NRW surgeons, personal communication led to the offer of distant procurement by the local staff, which was later realized.

Discussion

Optimal organ allocation is a demanding task wherever transplantations are carried out. It calls for careful medical judgment in order to provide the maximal benefit to patients [2]. Assuring equitable access of patients to needed organs is a responsibility that must be shared by transplantation teams and society. While it is clearly impossible to foresee and to deal satisfactorily with all circumstances – there will always be assumed justice and injustice – allocation systems are constantly undergoing change in order to improve organ distribution and to give every patient on the waiting list a similar chance to undergo the life-saving transplant procedure [1, 4].

The local donor principle has been applied for many years and for good reason. It renders the local transplant center flexible, i.e., organs are not strictly offered to a certain patient but to the institution. Thus, an organ can be given to whichever patient needs it the most, regardless of time on the waiting list. It is often said that medical considerations should far outweigh the poor criterion of length of time on the waiting list and we agree with this. Yet, there are those who feel that an organ should be given to a patient on a waiting list at home rather than to a desperately ill patient who will doubtlessly die without the operation but whose chances of failure are significantly higher [3]. Special urgency requests are very limited and only provide a tool for "special" situations. Apart from that, it seems ethically more than justified to offer local organs to local patients, rather than to import or export potential life. Moreover, more donor institutions may find it beneficial for their patients if they increase their efforts to get more donor organs. Under certain conditions, a center may relinquish an organ for the sake of a sick patient in a distant hospital that may not be able to submit a special urgency request.

Regionalization, as exemplified in UNI NRW, offers even more advantages. Our data readily demonstrate that three-fourths of all organs can be utilized within a region. This means shorter ischemic times. Opponents cite the ISHLT registry, which indicates only a weak odds ratio for prolonged ischemia; however, there are also several publications indicating the significance of ischemia, especially with regard to older and borderline donor organs [7]. Moreover, transportation costs can be cut dramatically if the organs are transported by car instead of by helicopter. Thus, in certain cases one may have to choose between minimizing ischemic time and lowering costs. The major benefit of regionalization arises from communication and collaboration among the centers. In situations where several patients need urgent transplantation, the "best" patient can be selected, although the decision for or against a special urgency request is rather difficult when more than one patient is critically ill. The interdisciplinary collaboration among surgeons and cardiologists seems to be very helpful in other ways as well. During UNI NRW meetings, difficult cases are presented and treatment modalities discussed from different points of view. Finally, the misuse of "upgrading" to higher urgency can be reduced [6].

Distant procurement by local surgeons is only possible when excellent relationships exist. As more and more organ come from critical and borderline donors, it is hard for most transplant surgeons to rely on other

procurement teams. Especially since procurement procedures are not standardized and transplantation techniques are different. Distant procurement is still a great challenge but it can be best achieved within regions.

Allocation by transplant institution was the initial intention when UNI NRW was founded. However, to avoid distrust and jealousy by other transplant institutions, allocation was later turned over to ET with the request to apply the same criteria to North Rhine Westphalia as it does to all other members of the ET community. Accordingly, after exclusion of a high urgency request to ET, all procured donor organs were offered first to the local center. When they were not used locally, the organs were offered next to the patients of UNI NRW, according to waiting time on the regional waiting list, after matching body size and blood groups. Only thereafter were donor organs offered to the ET pool for allocation within the rest of Germany and abroad. The allocation of an organ that could not be used by ET was certainly an exception, one made possible as a result of the close relationships between the regional centers and their knowledge of sick patients from other institutions.

While emphasizing the advantages of local donors and regionalization in the current allocation system for transplant institutions like Münster, we must admit that there has been a compensatory decline in transplant activities in centers that are not surrounded by a "regional" population and that rely on organ import. Careful analyses of procurement and allocation data in close cooperation with ET have shown that only the two largest heart transplant institutions within Germany are faced with a significant problem of less donor availability. Nevertheless, German authorities will look for new regulations to counter the controversial inequity in those centers.

In conclusion, local donors and regionalization within the framework of the ET Foundation are important tools for transplant centers. They offer more flexibility, decrease total ischemic time, and may help to lower costs.

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