SPECIAL ARTICLE

Spanish Registry on Heart Transplantation. 14th Official Report of the Working Group on Heart Failure, Heart Transplantation and Other Therapeutic Alternative of the Spanish Society of Cardiology (1984-2002)

Luis Almenar Bonet, on behalf of the Working Group on Heart Transplantation

Sección de Insuficiencia Cardíaca, Trasplante Cardíaco y Otras Alternativas Terapéuticas de la Sociedad Española de Cardiología, Madrid, Spain.

This report describes the general characteristics and outcomes of heart transplantation in Spain after data from 2002 were added to the registry. In 2002, 310 heart transplantations were performed. Since 1984, a total of 4,096 procedures have been performed.

The average clinical profile of patients receiving a heart transplant in Spain is that of a man about 50 years old, blood group A, with nonrevascularizable coronary artery disease and functional status IV/IV (NYHA).

The percentage of emergency heart transplantations was 26%, which is higher than the previous year (19%) and the mean for the preceding five years (22%). The early mortality rate was 10%, which is significantly lower than the mean for the preceding five years (14%).

After combining the 2002 results with those of previous years, an increase in survival rate was seen. Thus, the probability of survival in the first, fifth and tenth years was 76%, 66%, and 54%, respectively. When survival rates for separate periods were considered, a clear improvement was seen from the first year (80%) to the fifth year (72%). The most frequent causes of death were acute graft failure in the first month, infection and rejection in the first year, and tumors and the combination of vascular disease of the graft with sudden death in the long term.

Comparative analysis of survival rates shows that our long-term results are slightly better than those published worldwide, with a clear tendency for survival rate to improve as a consequence of the experience acquired in all stages of this cross-disciplinary procedure.

Key words: *Transplantation. Registry. Survival.*

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Registro Español de Trasplante Cardíaco. XIV Informe Oficial de la Sección de Insuficiencia Cardíaca, Trasplante Cardíaco y Otras Alternativas Terapéuticas de la Sociedad Española de Cardiología (1984-2002)

En este artículo se describen las características generales y los resultados obtenidos con el trasplante cardíaco en España tras incluir los datos del año 2002. El año pasado se realizaron 310 trasplantes que, junto con los realizados desde 1984, hacen un total de 4.096.

El perfil clínico medio del paciente que recibe un trasplante en España corresponde a un varón de aproximadamente 50 años, grupo sanguíneo A, enfermedad coronaria no revascularizable y situación funcional IV/IV (NYHA).

El porcentaje de trasplantes cardíacos urgentes fue del 26%; esta cifra es superior a la del año previo (19%) y a la media de los últimos 5 años (22%). La mortalidad precoz fue del 10%, cifra significativamente inferior a la media de los últimos 5 años (14%).

Al incorporar los resultados del pasado año a los previos se aprecia un incremento de la supervivencia. Así, la probabilidad de supervivencia al primer, quinto y décimo años es del 76, 66 y 54%, respectivamente. Al separar las curvas de supervivencia por períodos se aprecia la importante mejoría en los últimos 5 años, con valores al primer y quinto años del 80 y 72%, respectivamente. La causas más frecuentes de fallecimiento son: en el primer mes el fallo agudo del injerto, en el primer año la infección y el rechazo, y a largo plazo los tumores y la combinación de enfermedad vascular del injerto con muerte súbita.

El análisis comparativo de la supervivencia muestra que los resultados a largo plazo son ligeramente superiores a los publicados en la bibliografía mundial, con una clara tendencia a mejorar la supervivencia debido a la gran experiencia acumulada en todas las fases de este procedimiento multidisciplinario.

Palabras clave: *Trasplante. Registro. Supervivencia.*

Correspondence: Dr. L. Almenar Bonet.
Avda. Primado Reig, 189-37. 46020 Valencia. España.
E-mail: Lu.almenarb5@comv.es

TABLE 1. **Spanish Registry on Heart Transplantation, 1984-2002. Centers reporting**

1. Hospital Santa Cruz y San Pablo, Barcelona
2. Clínica Universitaria de Navarra, Pamplona
3. Clínica Puerta de Hierro, Madrid
4. Hospital Marqués de Valdecilla, Santander
5. Hospital Reina Sofía, Córdoba
6. Hospital La Fe, Valencia
7. Hospital Gregorio Marañón, Madrid
8. Fundación Jiménez Díaz, Madrid
9. Hospital Virgen del Rocío, Sevilla
10. Hospital 12 de Octubre, Madrid
11. Hospital Juan Canalejo, La Coruña
12. Hospital de Bellvitge, Barcelona
13. Hospital La Paz, Madrid
14. Hospital Central de Asturias
15. Hospital Clínic, Barcelona
16. Hospital Virgen de la Arrixaca, Murcia
17. Hospital Miguel Servet, Zaragoza
18. Hospital Clínico, Valladolid

INTRODUCTION

We report herein the results of our annual update analysis of the Spanish Society of Cardiology (Sociedad Española de Cardiología) Working Group on Heart Transplantation. This report presents the results of heart transplants performed in Spain between May 1984, when the first transplantation was performed, and 31 December 2002, when the current data set was closed.[1-13]

This comprehensive Registry report presents data on all heart transplants performed by teams at all centers in Spain. Consequently, it accurately portrays the status of heart transplantation in this country. The reliability of the report is based on the use of a database constructed on mutually agreed principles, which unifies responses and standardizes variables.

TABLE 2. **Spanish Registry on Heart Transplantation, 1984-2002. Procedure types**

Procedure	No.
Orthotopic heart transplants	3938
Heart retransplantations	82
Simultaneous transplantations	
Heart-lung	43
Heart-kidney	28
Heart-liver	4
Heart-liver-pancreas	1
Total	4096

HEART TRANSPLANTS PERFORMED

The Registry currently includes 18 heart transplantation centers (Table 1), although only 17 of them performed transplants in 2002. The number of active centers remained stable last year, in contrast to 2001. On the whole, the transplantation centers are opposed to opening new units because the benefits of reducing the distance patients need to travel do not outweigh the disadvantages inherent in the fact that new centers are very slow to acquire sufficient experience with the procedure.

In the 18 years that heart transplantation procedures have been performed in Spain, the total number of operations has reached 4096. Figure 1 presents the distribution of heart transplants (96% were isolated orthotopic heart transplants) by year. Table 2 shows the distribution of transplants by procedure type.

HEART TRANSPLANT RECIPIENT PROFILE AND UNDERLYING HEART DISEASE

In Spain, the profile of the average heart transplant recipient is that of a man approximately 50 years of

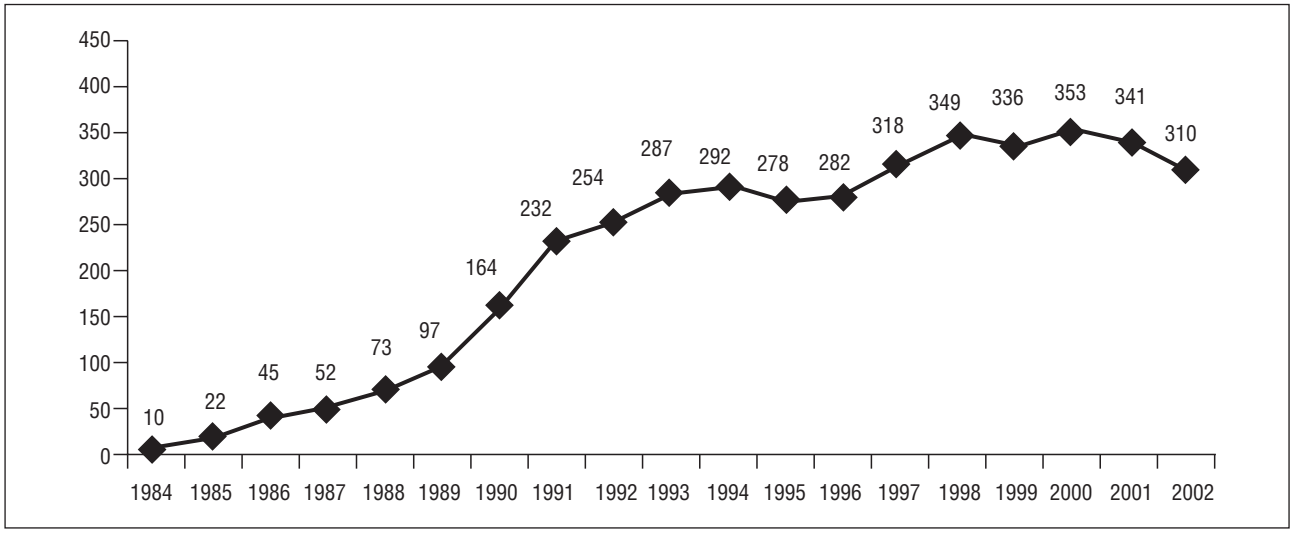

Fig. 1. Number of heart transplants by year.

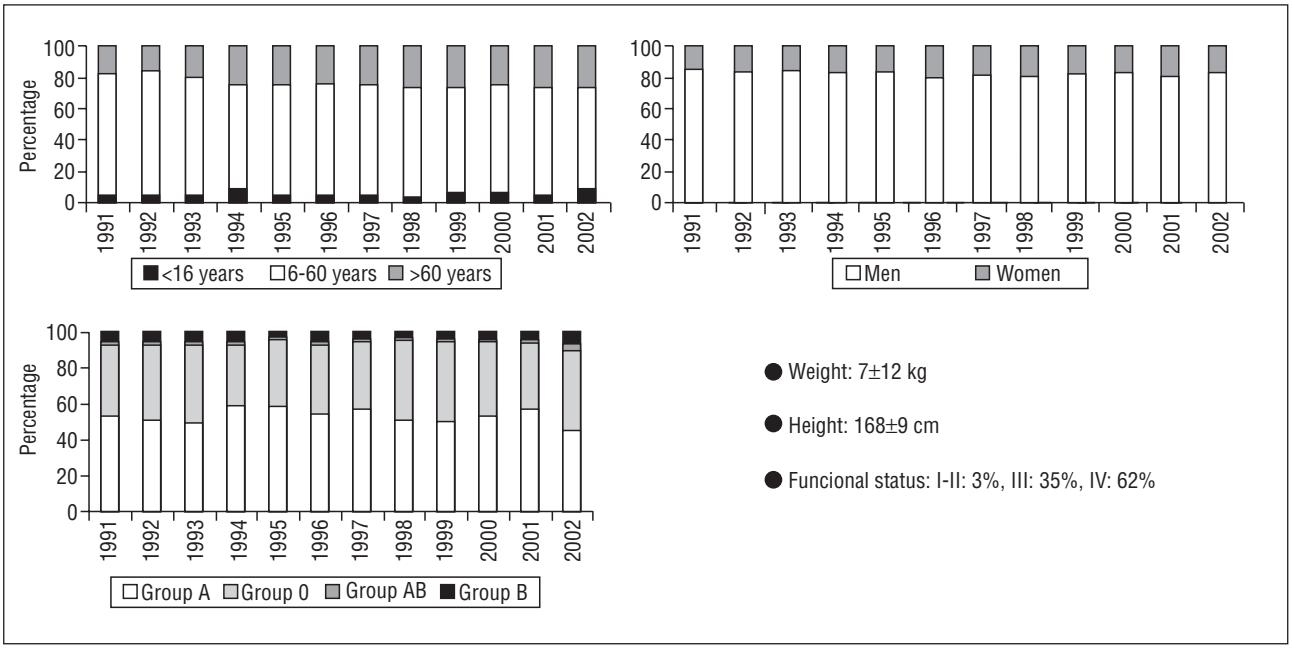

Fig. 2. Annual distribution by age, blood group and sex. Weight, height and recipient functional status.

age, belonging to blood group A. The percentage of children, older adults or women who received a heart transplant is extremely low. Figure 2 presents the general characteristics of transplant recipients.

The most frequent indication for heart transplantation is ischemic heart disease, followed by idiopathic dilated cardiomyopathy. These two diagnoses make up 78% of all causes. With the exception of valvular heart disease(9% of the recipients), other specific causes are relatively infrequent. Figures 3 and 4 show the distribution of pathologic processes that are indications for heart transplantation.

WAITING LIST MORTALITY AND URGENT TRANSPLANTATION

In 2002, waiting list mortality was slightly lower than 10%. The percentage of patients excluded from transplant after placement on the waiting list was 16%. Figure 5 shows the annual percentage of waiting list patients who eventually received a transplant, were subsequently removed from the list, or died before receiving a transplant.

Over the years, the percentage of indications for urgent transplantation has varied, sometimes to a great extent and often for no apparent reason. In 2002, 26% of the patients received urgent transplants, a substantial increase over 2001 (19%) and slightly above the average for the last 5 years (24%). Figure 6 illustrates the evolution of indications for urgent transplantation since 1984.

RESULTS

Survival

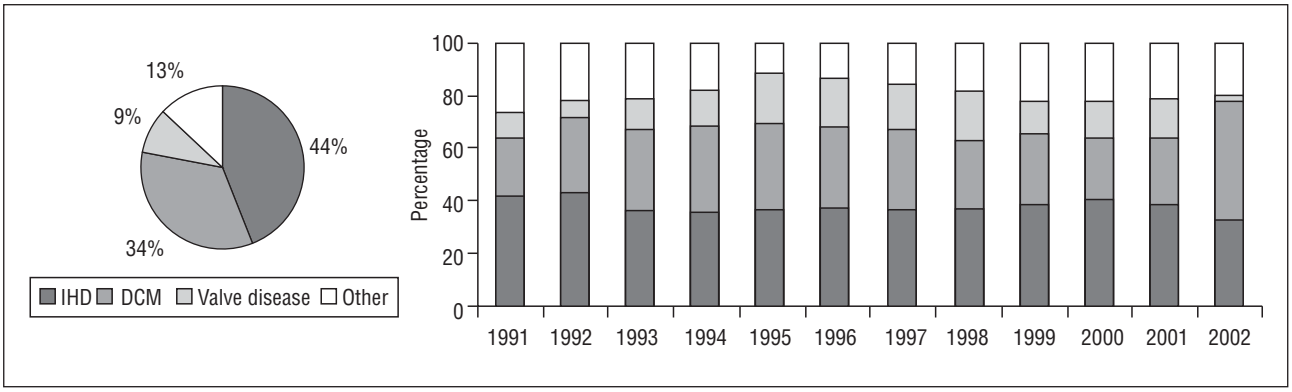

Fig. 3. Underlying disease indicating transplantation and their annual distribution. IHD indicates ischemic heart disease; DCM, idiopathic dilated cardiomyopathy.

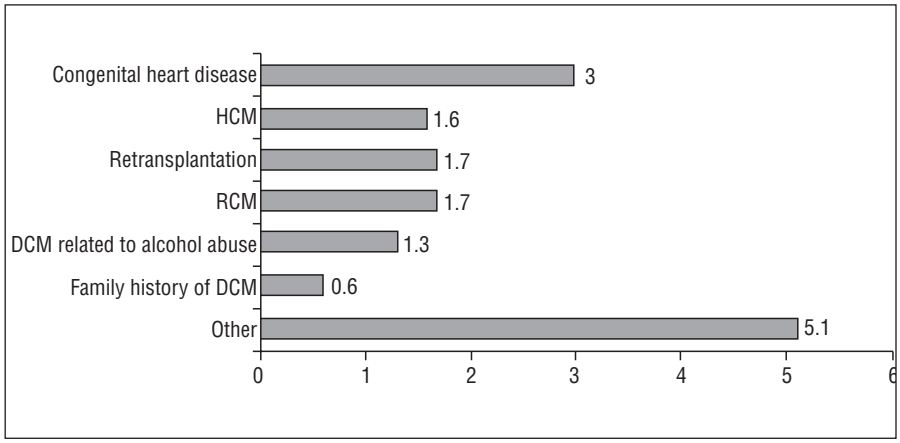

Fig. 4. Less frequent diseases that are indications for transplantation. The number at the end of each column represents the percentage with respect to the total. HCM indicates hypertrophic cardiomyopathy; RCM, restrictive cardiomyopathy; DCM, dilated

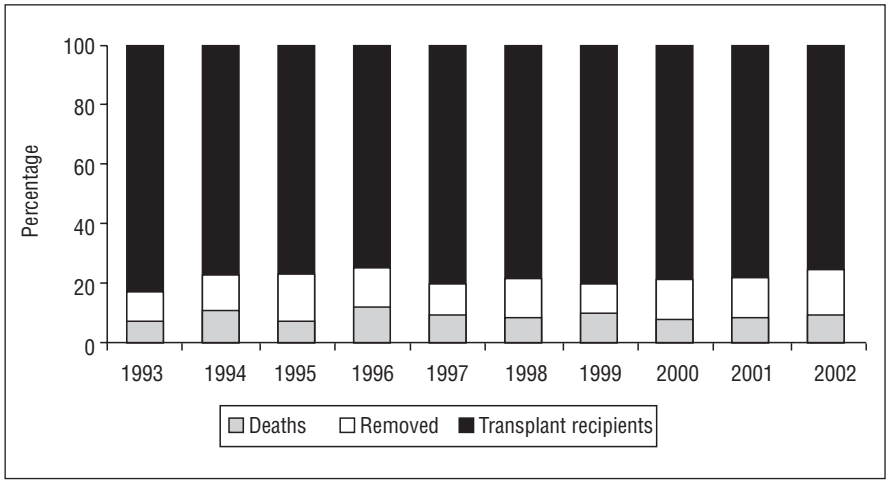

Fig. 5. Percentage annual distribution of transplant recipients, patients who died, and patients removed from waiting lists.

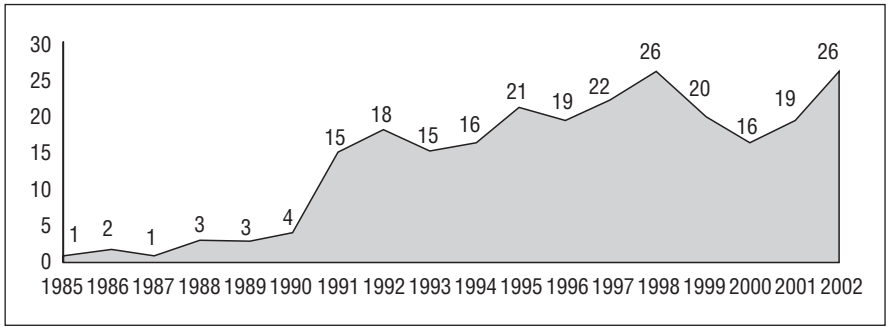

Fig. 6. Annual changes (percentage) in indications for emergency transplantation.

In 2002, the early mortality rate (death within 30 days of transplant) was 10%. Figure 7 shows the evolution of early mortality rate for the period 1984-2002.

When survival rate data for 2002 were added to those of previous years, we obtained 1-, 5- and 10-year actuarial survival likelihood rates of 76%, 66% and 54%, respectively, with an average recipient survival of 11.4 years. Figure 8 shows the actuarial survival curve, with an initially sharp decrease over the first year (essentially due to deaths within the first month) followed by a less marked decline of approximately 2.5% per year. Figure 9 shows that substantial differences exist when the overall survival curve is broken down into periods.

Causes of death

The most frequent cause of death during the early period was acute graft failure (45%). Figure 10 shows the distribution of causes of death during the first month.

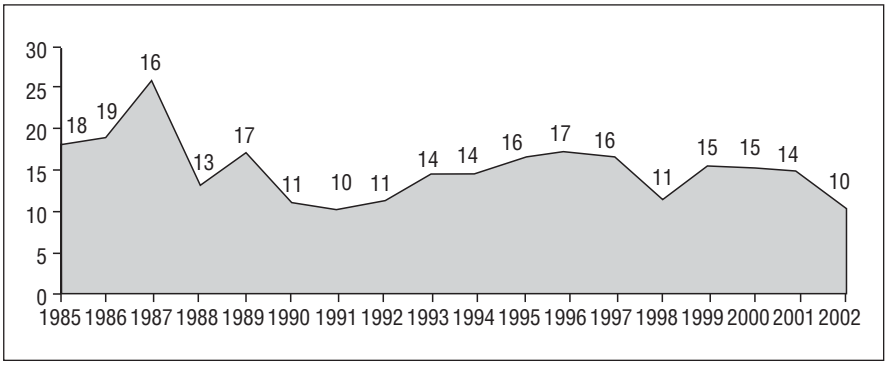

Fig. 7. Evolution of percentage early mortality rate by years.

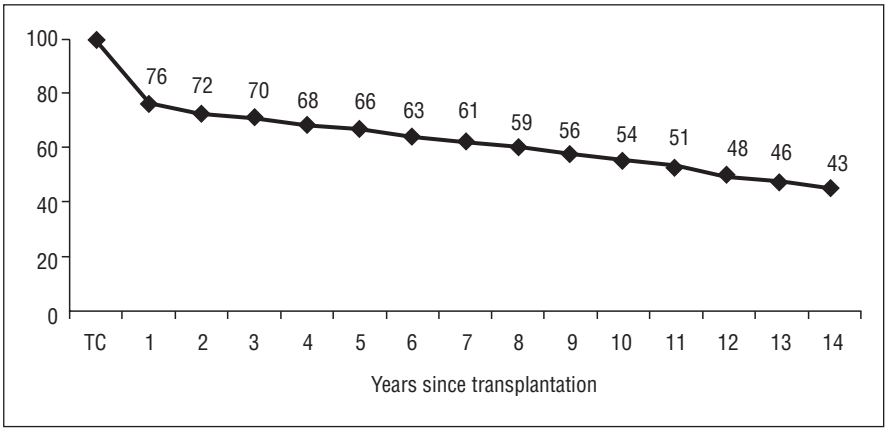

Fig. 8. Actuarial survival curve (Kaplan-Meier).

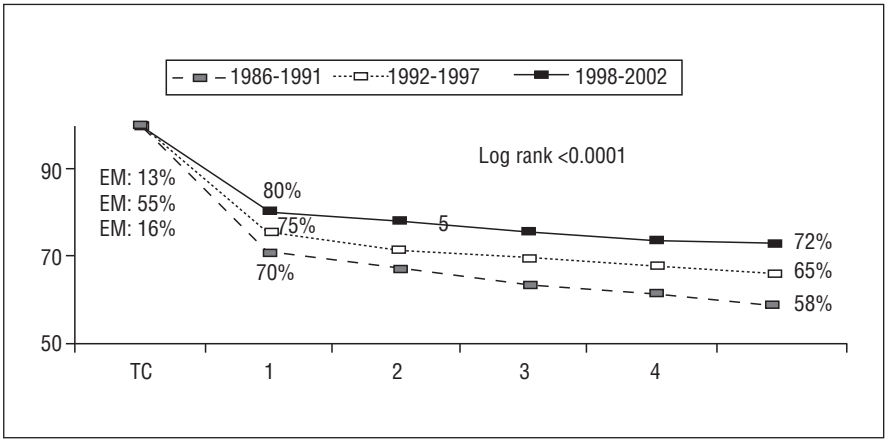

Fig. 9. Survival curve by periods. EM indicates early mortality.

The most common causes of overall mortality were infections and acute graft failure. Figures 11 and 12 show the incidence of causes of overall mortality.

When causes of mortality are broken down into periods, differences appear in the first month (acute graft failure), between the first month and the first year (infections), and after the first year (tumors and a combination of sudden death and vascular disease of the graft). Figure 13 presents the distribution of causes of mortality by periods.

DISCUSSION

In Spain, the early days of heart transplantation are long gone, and today we can call on a wealth of experience with this procedure. Our results are on a par with those achieved in other countries both in Europe and in North America, as any analysis of the annual report of the Registry of the International Society for Heart and Lung Transplantation will show.[14,15] The facts that our Registry comprises information provided by all transplant teams in the country, and that it is founded on an agreed, standardized database, reinforce the validity of these results. Each year, all teams update their results and submit the figures to the Registry coordinator who, with the help of custom-built software, introduces the

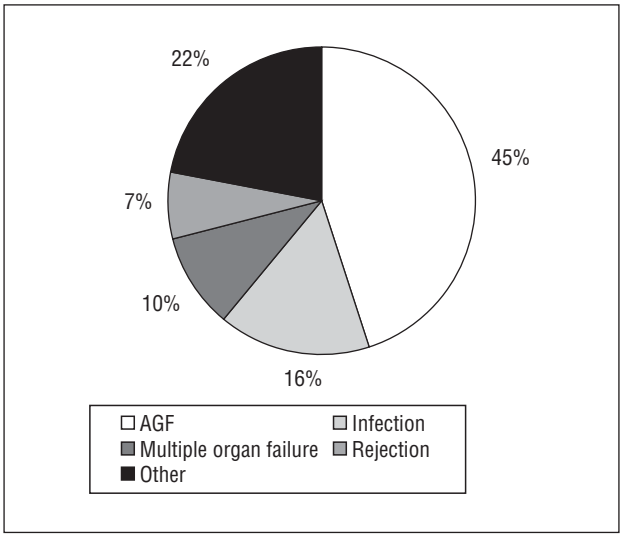

Fig. 10. Causes of early mortality. AGF indicates acute graft failure.

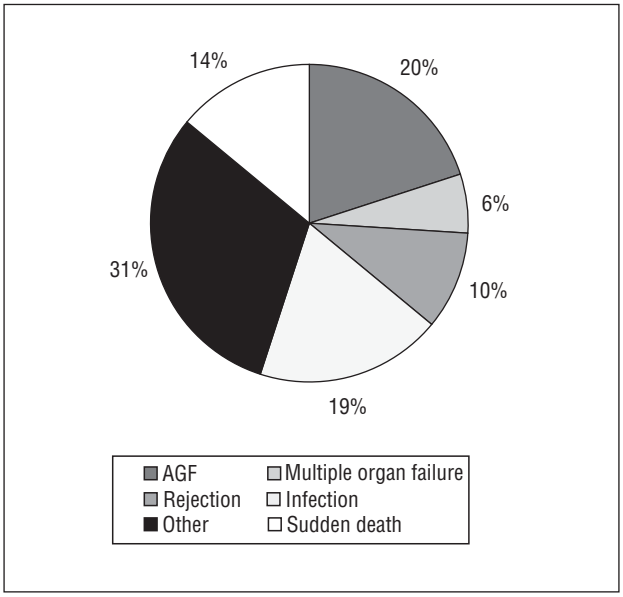

Fig. 11. Causes of overall mortality. AGF indicates acute graft failure.

data into a common database to facilitate analysis of the variables. We believe this method greatly enhances the reliability of the results and avoids the inconsistencies so often produced by non-standardized databases.

In 2002, the number of active transplantation centers in Spain remained stable. This is an encouraging sign, as the number of operating centers is a source of concern. The number of optimal donors has remained constant whereas the number of transplants per center has decreased. The fact that fewer transplant procedures are being performed leads to underuse of resources in those hospitals prepared to undertake a large number of transplants, and to an increase in the time needed to learn skills and achieve suitable results. The only tangible benefit for the patient is the convenience of not having to travel to a different part of the country in order to receive a transplant.

Since heart transplantation was first performed in Spain, there has been an almost constant increase in the number of procedures. However, the rate of increase was greatest between 1989 and 1993, when it grew from 97 to 287 transplants. Since 1993, the annual rate of increase has been slower. Only once, in 2000, has the volume of transplants slightly exceeded 350. This is considered the volume-per-year plateau, given our expectations for the number of donors per year and current criteria for accepting donor hearts. Nevertheless, in 2002 there was a general decrease in the number of transplants, with longer waiting lists at all centers. We can only hope that this was transitory, and that 2003 will see a return to the pattern of earlier years.

The future of simultaneous heart-lung transplants is still unclear, and this procedure has yet to establish itself fully. Few teams perform heart-lung transplants and few procedures are carried out each year. In 2002, only 6 operations of this kind were performed in Spain, and the peak year was 1998 with 7 heart-lung transplantations. The development of this type of

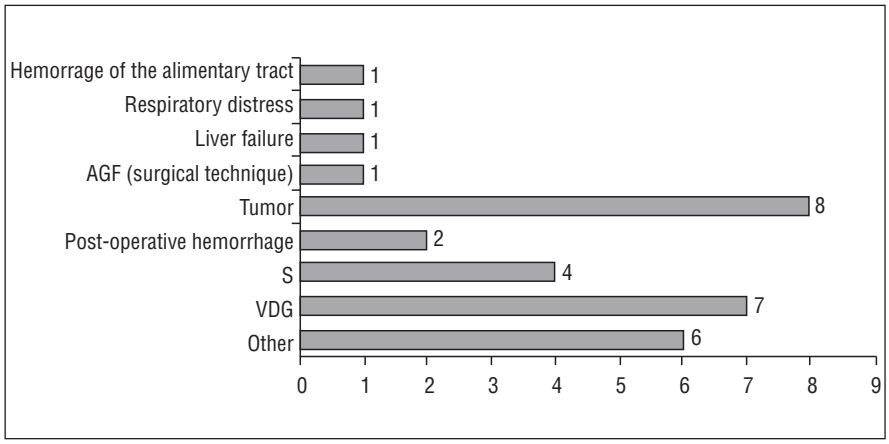

Fig. 12. Less frequent causes of overall mortality. The number to the right of each of the columns represents percentage with respect to the total. S indicates stroke; VDG, vascular disease of the graft; AGF, acute graft failure.

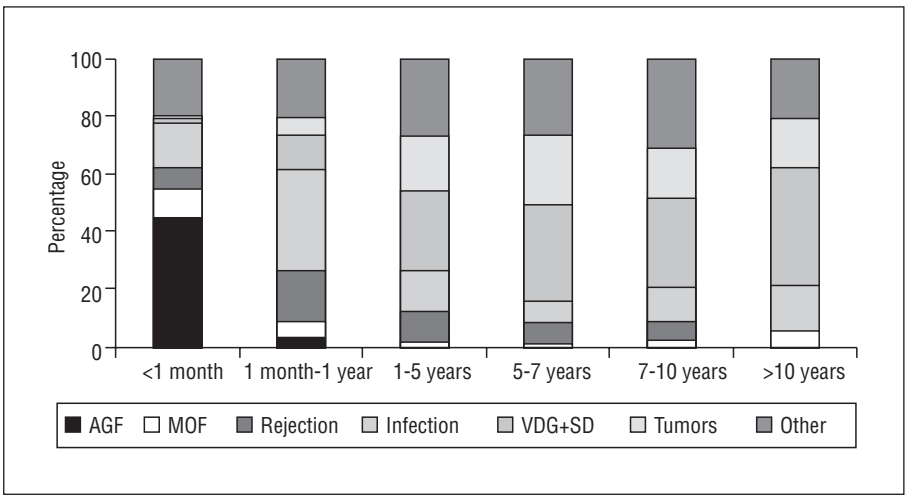

Fig. 13. Causes of mortality by periods. AGF indicates acute graft failure; MOF, multiple organ failure; VDG, vascular disease of the graft; SD, sudden death.

transplant is complicated by the technical difficulties involved, the so-called «consumption» of organs, and the substantially worse associated prognosis. Of the other simultaneous transplantation procedures, the most progress has been made with heart-kidney transplant. Although the volume is low, the prognosis is clearly better than that for heart-lung transplantations.

For some years, ischemic heart disease has been the most frequent indication for heart transplantation in Spain. This is not surprising given the prevalence of the disease in the country. In some international registry reports the most frequent cause is dilated cardiomyopathy, but this may be a terminological issue as ischemic heart disease accompanied by substantial ventricular dilation is defined as dilated cardiomyopathy.

The importance of waiting list mortality may be underestimated, as it considers only those patients who die while on the list, ignoring those removed due to severe decompensation with multiple organ failure who die after removal from the list. In 2002, the number of patients who died and the number who were removed from the waiting list were the same as in the previous 2 years (10% and 18%, respectively).

Urgent heart transplantations are controversial, as they are operations with specific characteristics (recipients in poor clinical condition and donors who are often less than ideal; longer periods of ischemia) that entail a worse prognosis than programmed transplants. In 2002, the percentage of urgent transplants increased substantially (26% in 2002 vs 19% in 2001). Nonetheless, this was only slightly above the average for the last 5 years (24%). Although urgent procedures involve a higher level of risk, the transplant teams believe they should continue to be performed given that they are the only option available for the subgroup of patients with advanced heart failure and uncontrollable acute decompensation.

Over the years, the overall survival rate has improved steadily. However, each year the number of patients added to the Registry represents a relatively smaller percentage of the total. Thus, the chances of our finding substantial changes within a single year are increasingly remote, and an analysis of survival by periods is more illuminating.

When evaluating our Registry and comparing it with others, we must remember that it includes all the transplants performed, and reliably portrays the status of transplantation procedures in Spain. However, the analyses are global and also include high-risk transplants (urgent transplants, older age group recipients, pediatric transplants, retransplants, heterotopic transplantations, heart-lung, heart-kidney, heart-liver and other simultaneous transplantations).

The year 2002 saw a substantial reduction in the percentage of patients who died in the early postoperative period (14% in 2001 vs 10% in 2002). This reduction is encouraging, as early mortality makes a substantial contribution to the overall mortality rate, and these figures are the lowest recorded since large numbers of transplants began to be performed. The most frequent cause of early mortality was acute graft failure, affecting 45% of those patients who die within 1 month of the transplant procedure. The impact of this complication is so great that, being a postoperative problem, it accounts for a substantial percentage (20%) of all mortality during the post-transplant period. It is worth noting that mortality due to rejection (early mortality rate 7%, overall mortality rate 10%) is much lower than that caused by infection (early mortality rate 16%, overall mortality rate 19%). Perhaps in the transplant teams we should consider reducing immunosuppression regimens, despite the fact that this might lead to a higher number of rejection episodes.

To conclude, we can say that:

1. The annual volume of heart transplantations stands between 300 and 350 procedures per year.

2. The future of heart-lung transplantations remains unclear.

3. In general, survival rates are above those published in many international registry reports. Moreover, they have shown steady yearly improvements, especially in the last 5 years.

4. We must continue our efforts to reduce the high incidence of acute graft failure. This would have a substantial positive effect on the likelihood of immediate postoperative and overall survival.

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