

Spanish Registry of Heart Transplantation. 15th Official Report of the Working Group on Heart Failure, Heart Transplantation, and Other Therapeutic Alternatives of the Spanish Society of Cardiology (1984-2003)

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

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

This paper outlines the general characteristics and results obtained with heart transplantation in Spain after including the data for the year 2003. In 2003, 290 heart transplants were performed. Since 1984, a total of 4386 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 29%, which is higher than in the previous year (26%) and the mean for the preceding 5 years (20%). The early mortality rate was 13%, which is similar to the mean for the preceding 5 years (13%).

After combining the 2003 results with those of the previous years, the probability of survival at 1, 5, and 10 years was 76%, 66%, and 54%, respectively. When survival rates for separate periods were considered, a significant improvement was seen in the last 5 years, with survival rates at of 81% at 1 year and 74% at 5 years. The most frequent causes of death were acute graft failure in the first month, infection and rejection in the first year, and a 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 in the literature, with a gradual tendency for survival rate to improve in recent years.

Key words: *Heart transplantation. Registry. Survival.*

Registro Español de Trasplante Cardíaco. XV Informe Oficial de la Sección de Insuficiencia Cardíaca, Trasplante Cardíaco y Otras Alternativas Terapéuticas de la Sociedad Española de Cardiología (1984-2003)

En este artículo se describen las características generales y los resultados obtenidos con el trasplante cardíaco en España tras incluir los datos del año 2003. El año pasado se realizaron 290 trasplantes que, junto con los efectuados desde 1984, suman un total de 4.386.

El perfil clínico medio del paciente que se trasplanta en España corresponde a un varón de aproximadamente 50 años, grupo sanguíneo A, con enfermedad coronaria no revascularizable y situación funcional IV/IV según la clasificación de la New York Heart Association.

El porcentaje de trasplantes cardíacos urgentes en 2003 fue del 29%; esta cifra es superior a la del año previo (26%) y a la media de los últimos 5 años (20%). La mortalidad precoz fue del 13%, cifra similar a la media de los últimos 5 años (13%).

Tras incorporar los resultados del pasado año a los previos, se obtiene una probabilidad de supervivencia al primer, quinto y décimo años del 76, el 66 y el 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 81 y el 74%. La causa más frecuente de fallecimiento en el primer mes es el fallo agudo del injerto; en el primer año, la infección y el rechazo, y a largo plazo, los tumores y el combinado 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 literatura médica mundial, con una progresiva tendencia a mejorar la supervivencia en los últimos años.

Palabras clave: *Trasplante cardíaco. Registro. Supervivencia.*

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

Received October 8, 2004.
Accepted for publication October 8, 2004.

INTRODUCTION

This article is the annual update analysis of the Spanish Society of Cardiology (*Sociedad Española de Cardiología*) Working Group on Heart Transplantation. We present the results of heart transplants performed in Spain between May 1984, when the first such operation was performed, and December 31, 2003, when the current data set was closed.¹⁻¹⁴

This comprehensive Registry report includes data on all heart transplants performed by teams at all centers in Spain. Therefore, it is an accurate account of the status of heart transplantation in the country. The reliability of the report is founded on the use by all of the teams of a similar database constructed on mutually agreed principles, which unifies possible responses and standardizes variables.

HEART TRANSPLANTS PERFORMED

The Registry currently includes 18 heart transplantation centers (Table 1), although only 17 of them performed transplants in 2003. In contrast to previous years, 2003 saw a stabilizing of the number of active centers. Most transplantation centers believe it unwise to increase the number of centers as the benefit gained from shorter travel distances for patients is offset by the fact that new centers are considerably slow in gaining the necessary experience to ensure good results.

In the 19 years that heart transplantation procedures have been performed in Spain, the total number of operations has reached 4386. Figure 1 presents the distribution of heart transplants by year, 96% of which were isolated orthotopic transplants. Table 2 shows the distribution of transplants by procedure type.

TABLE 1. Spanish Registry on Heart Transplantation, 1984-2003. Centers Reporting

Hospital de la Santa Creu i Sant Pau, Barcelona
Clínica Universitaria de Navarra, Pamplona
Clínica Puerta de Hierro, Madrid
Hospital Marqués de Valdecilla, Santander
Hospital Reina Sofía, Córdoba
Hospital La Fe, Valencia
Hospital Gregorio Marañón, Madrid
Fundación Jiménez Díaz, Madrid
Hospital Virgen del Rocío, Sevilla
Hospital 12 de Octubre, Madrid
Hospital Juan Canalejo, A Coruña
Hospital de Bellvitge, L'Hospitalet de Llobregat, Barcelona
Hospital La Paz, Madrid
Hospital Central de Asturias, Oviedo
Hospital Clínic, Barcelona
Hospital Virgen de la Arrixaca, Murcia
Hospital Miguel Servet, Zaragoza
Hospital Clínic, Valladolid

TABLE 2. Spanish Registry on Heart Transplantation (1984-2003). Procedure Types

Orthotopic heart transplants	4215
Heart re-transplantations	90
Simultaneous transplantations	
Heart-lung	46
Heart-kidney	30
Heart-liver	4
Heart-liver-pancreas	1
Total	4386

HEART TRANSPLANT RECIPIENT PROFILE AND UNDERLYING HEART DISEASE

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

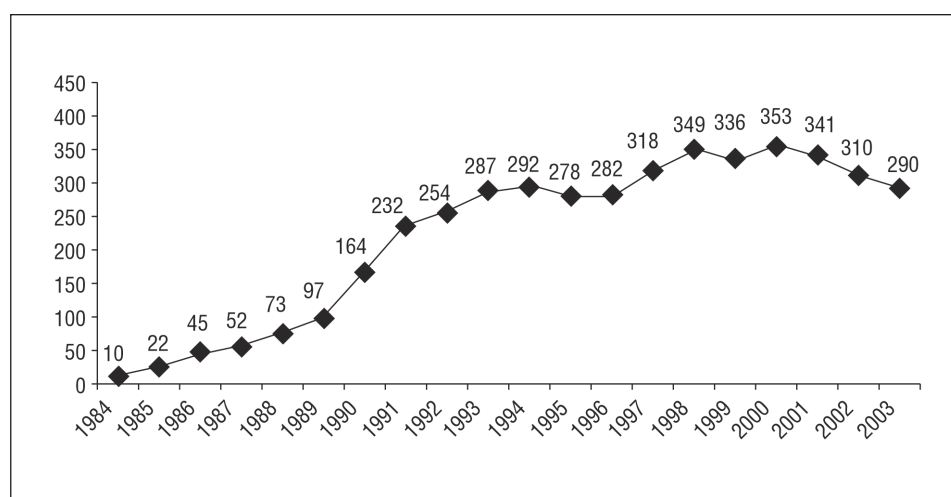


Figure 1. Number of heart transplants by year.

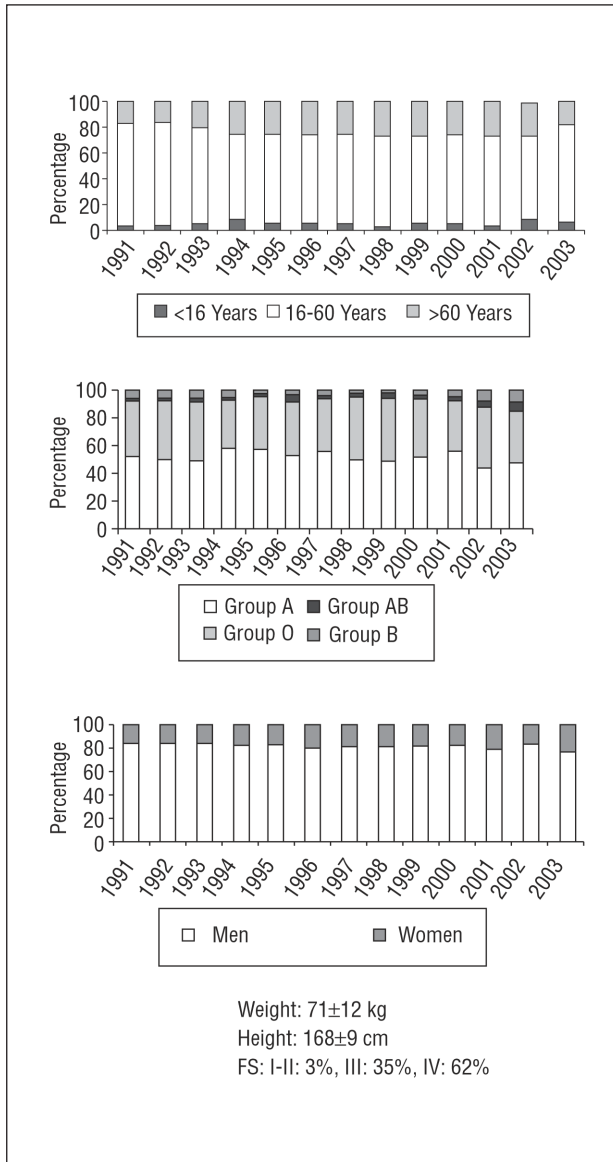


Figure 2. Annual distribution by age, blood group, and gender. Weight, height, and recipient functional status. FS indicates functional status.

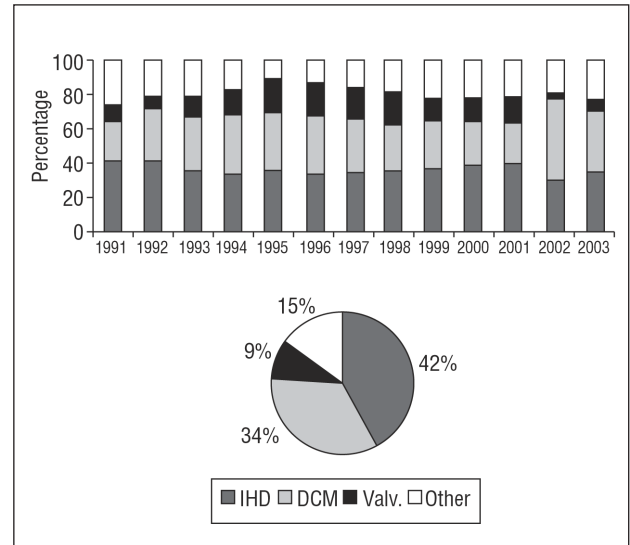


Figure 3. Underlying diseases indicating transplantation and their annual distribution. IHD indicates ischemic heart disease; DCM, idiopathic dilated cardiomyopathy; Valv., valvular heart disease.

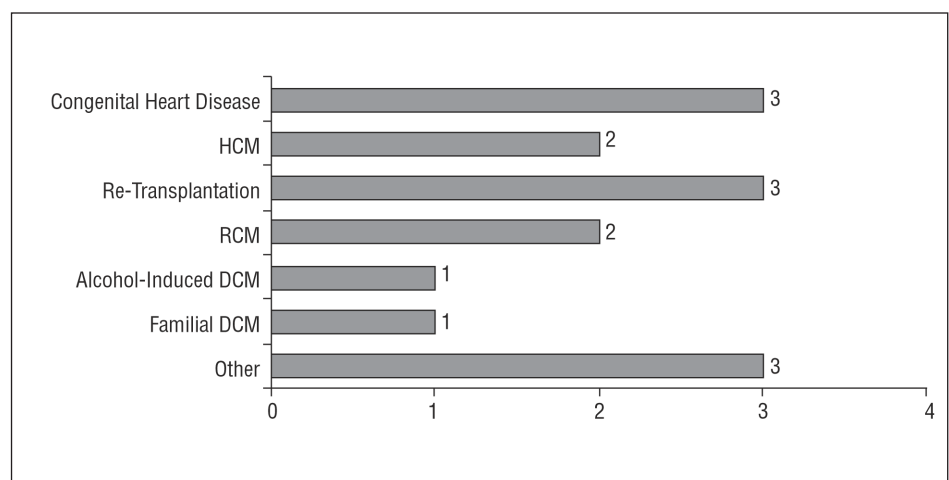
belonging to blood group A. Percentages of children, older adults, or women are comparatively low. Figure 2 presents the general characteristics of transplant recipients.

Heart transplantation is most frequently indicated for ischemic heart disease, followed by idiopathic dilated cardiomyopathy. Together, these 2 diagnoses account for 76% of all causes. Other specific causes are relatively infrequent, except for valvular heart disease (9%). Figures 3 and 4 show the distribution of pathologic processes that are indications for heart transplantation.

WAITING LIST MORTALITY AND URGENT TRANSPLANTATION

In 2003, waiting list mortality was 9%. The percentage of patients excluded from transplant after place-

Figure 4. Less frequent diseases indicating transplantation. The number at the end of each column represents the corresponding percentage of the total. DCM indicates dilated cardiomyopathy; HCM, hypertrophic cardiomyopathy; RCM, restrictive cardiomyopathy.



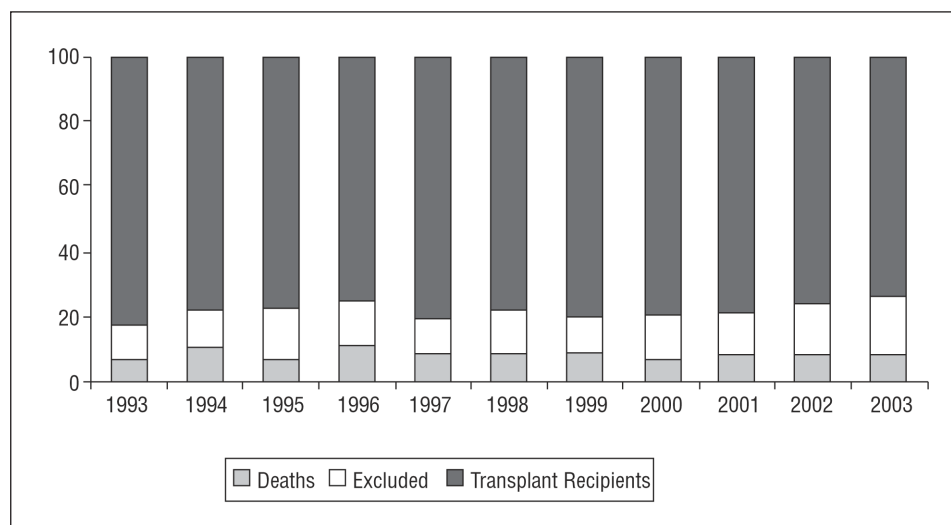


Figure 5. Percentage annual distribution of patients who died, patients removed from waiting lists and transplant recipients.

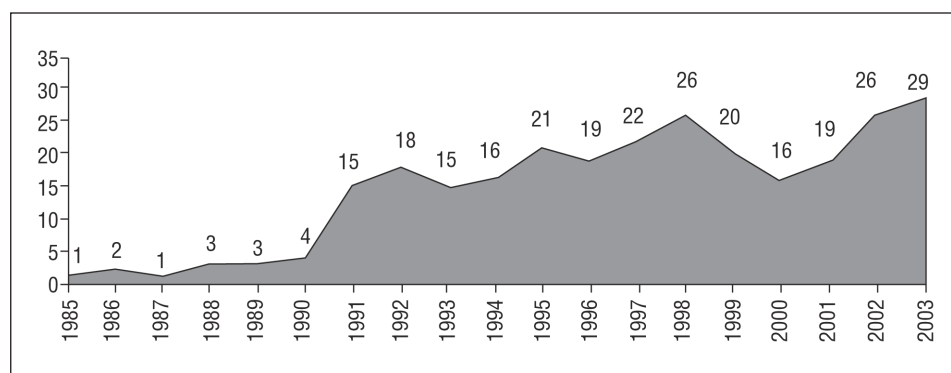


Figure 6. Annual changes (percentage) in indications for emergency transplantation.

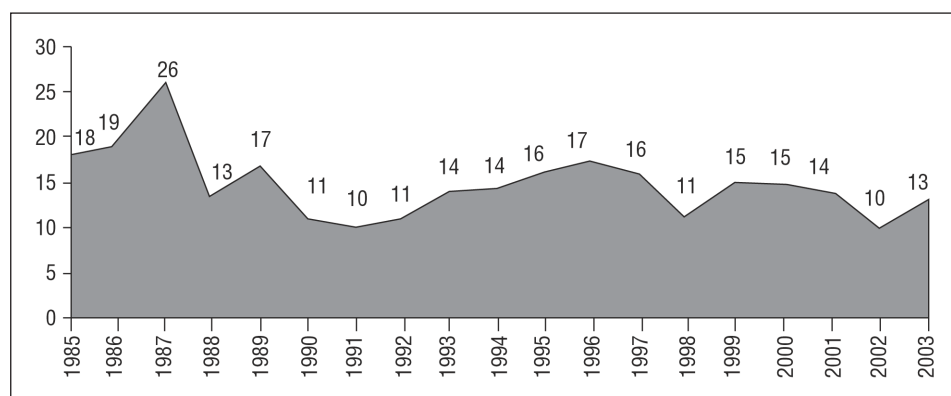


Figure 7. Evolution of percentage early mortality rate by years.

ment on the waiting list was 22%. Figure 5 shows the annual percentages of waiting list patients who received a transplant, patients removed from the list without receiving a transplant, and patients who died before receiving a transplant.

The percentage of indications for urgent transplantation has varied, sometimes substantially, over the years. Often, there has been no obvious explanation for this. Last year, urgent transplants accounted for 29% of procedures. This is a clear increase over 2002

(26%) and is above the average for the last 5 years (21%). Figure 6 shows the evolution of indications for urgent transplantation over the years.

RESULTS

Survival

Early mortality (death within 30 days of transplant) in 2003 was 13%. Figure 7 shows the evolution of

Figure 8. Actuarial survival curve (Kaplan-Meier). Horizontal axis shows years post-transplantation.

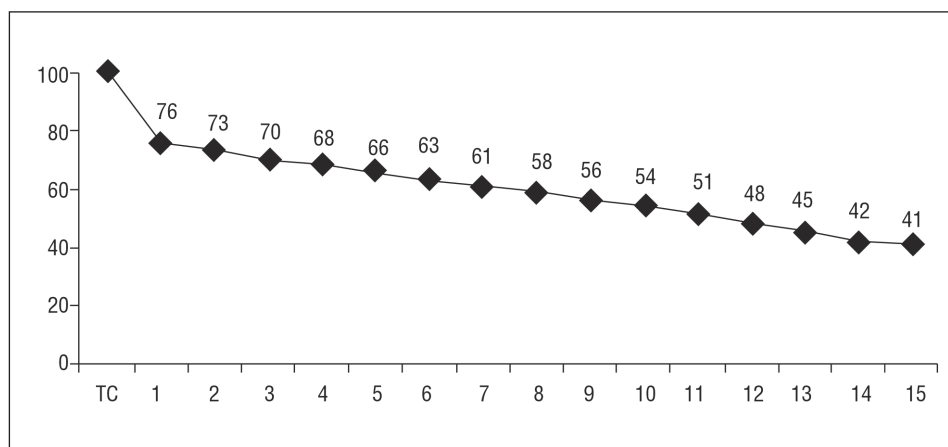
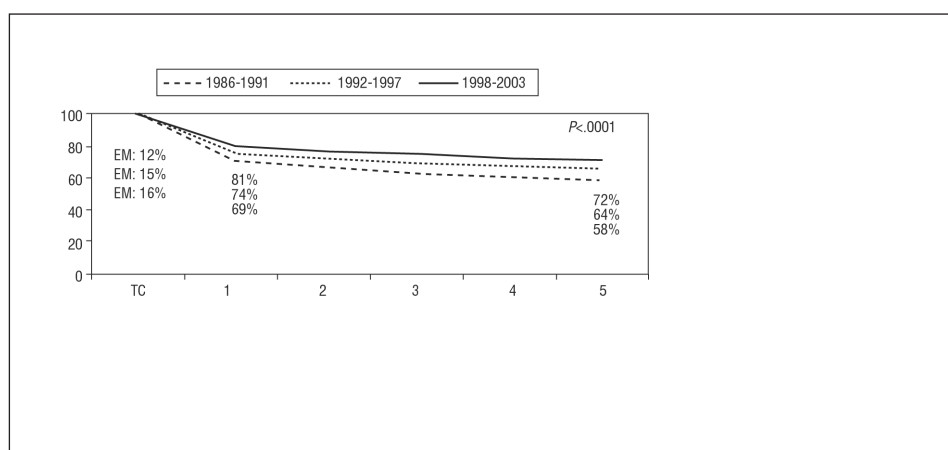


Figure 9. Survival curve by periods. Horizontal axis shows years. EM indicates early mortality.



early mortality over the years.

When survival rate data for 2003 were added to those of previous years, we obtained 1-, 5-, and 10-year actuarial survival 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 2.2% per year. Figure 9 shows that substantial differences exist when the overall survival curve is analyzed by 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.

The most common causes of overall mortality 30 days after transplantation were the combination of vascular graft disease and sudden death, acute graft failure and infection. Figures 11 and 12 show inciden-

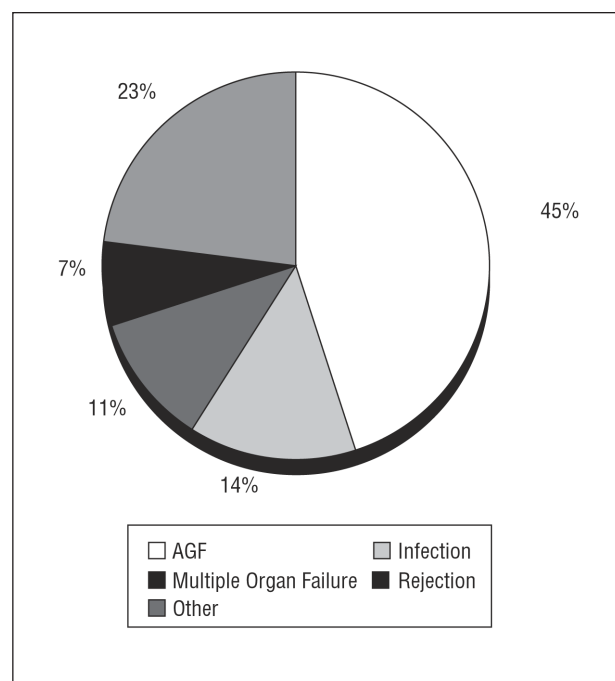


Figure 10. Causes of early mortality. AGF indicates acute graft failure.

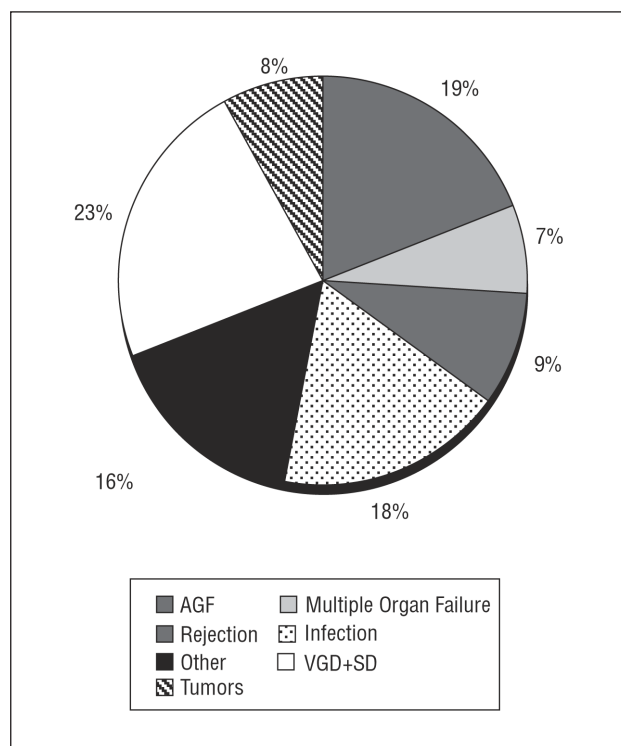


Figure 11. Causes of overall mortality. AGF indicates acute graft failure; VGD+SD, vascular graft disease and sudden death.

ce of causes of overall mortality.

When causes of mortality are analyzed by periods, differences can be seen in the first month (acute graft failure), between the first month and the first year (infection), and after the first year (tumors and the combination of vascular graft disease and sudden death). Figure 13 shows how the distribution of causes of mortality varies by periods.

DISCUSSION

In Spain, the early days of heart transplantation are

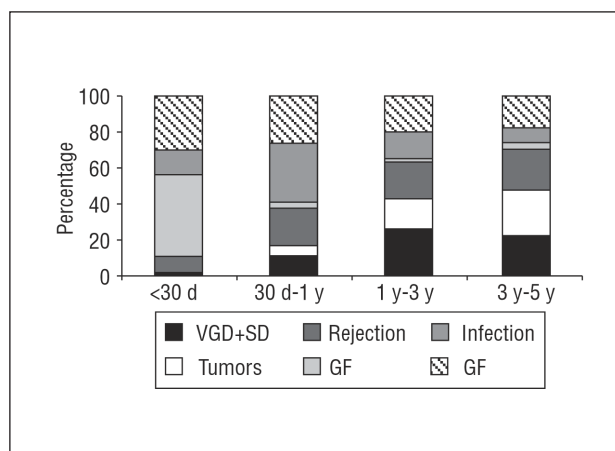


Figure 13. Causes of mortality by periods. Y indicates year(s); d, day(s); VGD+SD, vascular graft disease and sudden death; GF, graft failure.

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 in both Europe and North America, as any analysis of the annual report of the Registry of the International Society for Heart and Lung Transplantation reveals.¹⁵⁻¹⁷ The fact that our Registry comprises information provided by all transplant teams in the country and that it is founded on an agreed, standardized database reinforces the validity of these results. All teams update their results annually and submit their figures to the Registry coordinator who, with the help of custom-built software, introduces the data into a common database to facilitate analysis of the variables. We believe this method greatly enhances the reliability of our results and avoids errors of the kind so often found in non-standardized databases.

Last year, 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

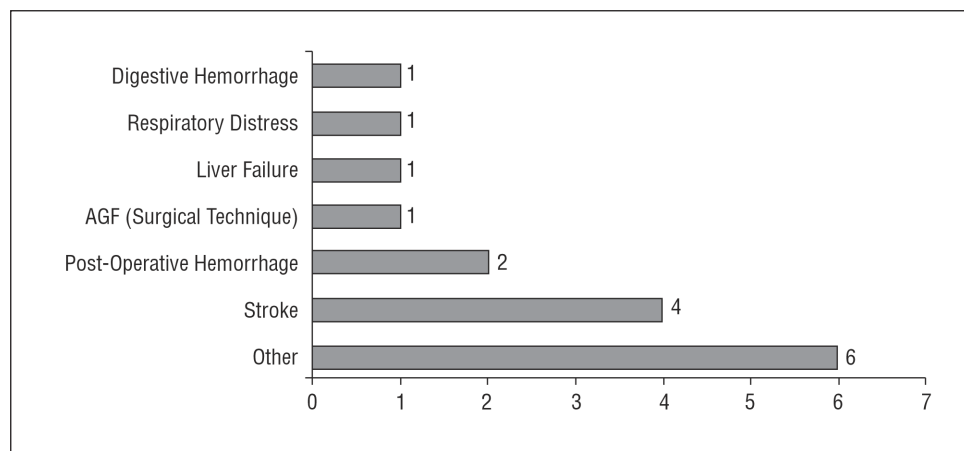


Figure 12. Less frequent causes of overall mortality. The number to the end of each of the columns represents percentage with respect to the total. AGF indicates acute graft failure.

has remained constant whereas the number of transplants per center has decreased. The fact that fewer transplant procedures are being performed leads to under use 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 2003 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 next year will see a return to the earlier pattern.

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. Last year, only 3 such operations were performed in Spain and the peak year was 1998 with 7 heart-lung transplantations. Technical difficulties, the so-called "consumption" of organs and the substantially worse associated prognosis make development of this type of transplant complicated. Of the other simultaneous transplantation procedures, 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 years, ischemic heart disease has been the most frequent indication for heart transplantation in Spain, which is not surprising given the prevalence of the disease. Some international registries report dilated cardiomyopathy as the most frequent indication 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 only includes those patients who die while on the list and ignores those removed due to severe decompensation with multiple organ failure and who subsequently die. In 2003, the number of patients who died and the number removed from the waiting list were similar to previous years (9% and 22%, respectively).

Urgent heart transplantations are controversial because 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. Last year, the percentage of urgent transplants increased substantially (29% vs 26% in 2002). This was above the average for the last 5 years (21%). Although urgent procedures involve a higher degree 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.

Overall survival has improved steadily over the years. However, logically, the number of patients added to the Registry each year represents a relatively smaller percentage of the total. Thus, the chances of our finding substantial changes within a single year are highly remote and analysis of survival by periods is more revealing.

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, re-transplants, heterotopic transplantations, heart-lung, heart-kidney, heart-liver, and other simultaneous transplantations).

Early mortality (death within 30 days post-transplant) was 13% last year, similar to the previous 5 years, although 2002 had seen a reduction to 10%. The most frequent cause of early mortality was acute graft failure, causing 45% of early deaths. The impact of this complication is so great that, despite being a postoperative problem, it accounts for a substantial percentage (19%) of all deaths after the first month. It is worth noting that mortality due to rejection (early mortality, 7%, late mortality, 9%) is somewhat lower than that caused by infection (early mortality, 14%, late mortality, 18%). Perhaps transplant teams should consider reducing immunosuppression regimens even though this might increase the number of rejection episodes.

To conclude, we can say that:

1. The annual volume of heart transplantations has fallen over recent years.
2. The practice of combined heart-lung transplantation procedures has yet to become established in Spain.
3. General survival rates are above those recorded in many international registry reports and have shown a year-on-year improvement 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 early and overall survival.

REFERENCES

1. Vázquez de Prada JA. Registro Español de Trasplante Cardíaco. Primer Informe Oficial. Rev Esp Cardiol 1991;44:293-6.
2. Vázquez de Prada JA. Registro Español de Trasplante Cardíaco. Segundo Informe Oficial 1991. Rev Esp Cardiol 1992;45:5-8.
3. Arizón JM, Segura J, Anguita M, Vázquez de Prada JA. Registro Español de Trasplante Cardíaco. Tercer Informe Oficial. Rev Esp Cardiol 1992;45:618-21.
4. Arizón del Prado JM. Registro Español de Trasplante Cardíaco. Cuarto Informe Oficial (1984-1992). Rev Esp Cardiol 1993;46:791-5.
5. Arizón del Prado JM. Registro Español de Trasplante Cardíaco. Quinto Informe Oficial (1984-1993). Rev Esp Cardiol 1994;47:791-5.
6. Arizón del Prado JM. Registro Español de Trasplante Cardíaco. Sexto Informe Oficial (1984-1994). Rev Esp Cardiol 1995;48:792-7.
7. Arizón del Prado JM. Registro Español de Trasplante Cardíaco. Séptimo Informe Oficial (1984-1995). Rev Esp Cardiol 1996;49:781-7.
8. Arizón del Prado JM. Registro Español de Trasplante Cardíaco. VIII Informe Oficial (1984-1996). Rev Esp Cardiol 1997;50:826-32.
9. Almenar Bonet L. Registro Español de Trasplante Cardíaco. IX Informe Oficial (1984-1997). Rev Esp Cardiol 1999;52:152-8.
10. Almenar Bonet L. Registro Español de Trasplante Cardíaco. X Informe Oficial (1984-1998). Rev Esp Cardiol 1999;52:1121-9.
11. Almenar Bonet L. Registro Español de Trasplante Cardíaco. XI Informe Oficial (1984-1999). Rev Esp Cardiol 2000;53:1639-45.
12. Almenar Bonet L. Registro Español de Trasplante Cardíaco. XII Informe Oficial (1984-2000). Rev Esp Cardiol 2001;54:1305-10.
13. Almenar Bonet L. Registro Español de Trasplante Cardíaco. XIII Informe Oficial (1984-2001). Rev Esp Cardiol 2002;55:1286-92.
14. Almenar Bonet L. Registro Español de Trasplante Cardíaco. XIV Informe Oficial (1984-2002). Rev Esp Cardiol 2003;56:1210-7.
15. Boucek MM, Edwards LB, Keck BM, Trulock EP, Taylor DO, Hertz MI. The Registry of the International Society for Heart and Lung Transplantation: Seventh official pediatric report-2004. J Heart Lung Transplant 2004;23:933-47.
16. Trulock EP, Edwards LB, Taylor DO, Boucek MM, Keck BM, Hertz MI. The Registry of the International Society for Heart and Lung Transplantation: Twenty-first official adult heart transplant report-2004. J Heart Lung Transplant 2004;23:804-15.
17. Taylor DO, Edwards LB, Boucek MM, Trulock EP, Keck BM, Hertz MI. The Registry of the International Society for Heart and Lung Transplantation: twenty-first official adult heart transplant report-2004. J Heart Lung Transplant 2004;23:796-803.