Transplant Int (1992) 5 [Suppl 1]: S 343–S 344

TRANSPLANT
International
© Springer-Verlag 1992

Myocardial preservation with the UW solution. First European results in clinical heart transplantation

S. Demertzis, T. Wahlers, H.-J. Schäfers, J. Wippermann, M. Jurmann, J. Cremer, and A. Haverich

Division of Thoracic and Cardiovascular Surgery, Hannover Medical School, Hannover, Federal Republic of Germany

Abstract. In recent years, there is a growing body of evidence that the University of Wisconsin (UW) solution offers many advantages in organ preservation with regard to preservation quality and time. We, therefore, conducted the first European prospective, randomized, clinical trial comparing myocardial performance after preservation with UW and St. Thomas Hospital (ST) solution. Preliminary results indicated superior heart function after preservation with UW solution.

Key words: Cardiac transplantation – Myocardial preservation – UW solution

Throughout the last 3 years the overall number of heart transplantations has reached a plateau, reflecting mainly the limited number of the potential donors available [2]. In kidney and liver transplantation the use of the University of Wisconsin solution (UW) has led to a significant prolongation of ischemic times [3, 5]. Since improved results were also obtained after experimental cardiac preservation with UW solution [1, 4], we initiated a prospective, randomized clinical trial to compare myocardial performance after preservation with St. Thomas Hospital solution (ST) and UW solution.

Patients and methods

From December 1990 to April 1991, 18 patients undergoing orthotopic heart transplantation were included in this prospective randomized study. Patients were randomized according to the preservation solution used. In both groups, there were 8 males and 1 female. Mean age for the ST group was 45.5 ± 16.1 years and for the UW group, 42.3 ± 14.8 years (n.s.). A total of 11 patients had a dilative cardiomyopathy (DCM), 6 in the ST and 5 in the UW group, and 2 patients had an ischemic cardiomyopathy (ICM), 1 in each group. One patient underwent re-transplantation for accelerated graft coronary disease, while two patients in the UW group had an hypertrophic, non-obstructive cardiomyopathy.

Immunosuppression in all patients was based on 3-drug therapy, including cyclosporine A, azathioprine and prednisone. Both groups were compared with regard to donors' and recipients' pre- and postoperative data (age, interval from brain death to organ procurement, catecholamine support), and operation data (ischemic time, aortic clamp time, reperfusion time, spontaneous heart activity). Preoperative parameters were as follows: age, diagnosis, catecholamine support, cardiac output (CO) and pulmonary vascular resistance (PVR). Postoperative data included: right heart catheterization and CO determination via Swan-Ganz-catheter 2, 8 and 12 h postsurgery, as well as cumulative drug support. Statistical analysis was performed with ANOVA or Fisher's exact test.

Results

None of the patients died perioperatively. There were no significant differences regarding donor and preoprative recipient data: mean donor age was 26.1 ± 8 years vs 29.9 ± 5 years, brain death to harvesting interval was 15.4 ± 4 vs 10.9 ± 6 h for the ST and UW groups respectively. Mean preoperative CO was 4.4 ± 1.4 l/min for the ST and 4.2 ± 0.8 l/min for the UW group. Mean PVR was 208 ± 70 dyn/s · cm^{-5} for the ST and 268 ± 110 dyn/s · cm^{-5} for the UW group. No significant differences could be demonstrated with regard to the operation data: mean ischemic time was 168.3 ± 26 min for the ST and 139.5 ± 75 min for the UW group. The mean aortic cross-clamp time was 37.3 ± 6 min for the ST and 35.6 ± 19 min for the UW group. The mean reperfusion time was 37.8 ± 15 min for the ST and 29.8 ± 7 min for the UW group. Spontaneous activity during reperfusion resumed in 2 hearts in the ST and in 5 in the UW group ($P \leq 0.05$). Defibrillation attempts averaged 2 in the ST vs 0.7 in the UW group ($P \leq 0.05$). Significant differences were revealed with regard to the central venous pressure (CVP) 12 h postsurgery and pulmonary capillary wedge presure (PCWP) 8 and 12 h postsurgery: CVP 12 h was 13.7 ± 3.4 mm Hg vs 6.9 ± 4.3 mm Hg for the ST and UW groups respectively. At 8 h the PCW was

Offprint requests to: Stefanos Demertzis, M. D., Division of Thoracic and Cardiovascular Surgery, Hannover Medical School, Konstanty-Gutschow-Str. 8, D-3000 Hannover 61, FRG

13 ± 4.7 mm Hg vs 7.6 ± 4.3 mm Hg and at 12 h 14.8 ± 3.5 mm Hg vs 7.6 ± 4.3 mm Hg in the ST and UW groups respectively ($P \leq 0.05$). Compared to patients in the UW group, patients in the ST group needed significantly more adrenaline to achieve hemodynamic stability (0.42 ± 0.23 vs 0.2 ± 0.11 µg/kg per min) and more nitroglycerine (7 ± 1 vs 2 ± 1.2 mg/kg per min) for effective preload reduction.

Discussion

In recent years, there has been growing evidence that UW solution offers many advantages in organ preservation with regard to preservation quality and time. After an encouraging initial experimental experience we proceeded to a prospective, randomized clinical trial, comparing early postoperative cardiac performance after preservation with ST and UW solution. The lower filling pressures at 8 and 12 h postoperatively at similar cardiac output values and the significantly lower drug support as well as the higher incidence of spontaneous defibrillation reflected superior graft function in the UW group. In conclusion, preliminary results of this first European prospective, randomized clinical study indicated improved myocardial preservation by use of UW solution.

References

1. Demertzis S, Siclari F, Erhorn U, Haverich A (1991) Improved myocardial recovery after 8 hours of cold global ischemia with UW-solution compared to St. Thomas Hospital solution with and without "hot shot" reperfusion. J Heart Lung Transplant 10:156
2. Kriett JM, Kaye MP (1991) The registry of the International Society for Heart and Lung Transplantation: Eighth official report – 1991. J Heart Lung Transplant 10:491–498
3. Ploeg RJ, van Bockel JH, Langendijk PTH, Groenewegen M, van der Woude FJ, Persijn G, Thorogood J, Hermans J (1991) A randomized clinical trial comparing preservation with UW solution and EuroCollins solution in cadaveric kidney transplantation. In: Ploeg RJ (ed) Preservation of kidney and pancreas with the UW solution. The Hague, Pasmans Offsetdrukkerij B. V., pp 156–184
4. Swanson DK, Psaoglu I, Berkoff HA, Southard JA, Hegge JO (1988) Improved heart preservation with UW preservation solution. J Heart Transplant 7:456–467
5. Todo S, Nery J, Yanga K, Podesta L, Gordon RD, Starzl TE (1989) Extended preservation of human liver grafts with UW solution. JAMA 261:711–714