Alternatives for heart transplantation?

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Ventricular assist devices (VADs) have been used in the University Medical Centre Utrecht (UMCU) since 1993 to 'bridge' patients on the waiting list for heart transplantation (HTx) with deteriorating chronic heart failure to the actual transplantation after a matching donor heart becomes available.¹ The Rotterdam heart transplantation centre also published about this technique.² In 2001, the Utrecht group published results on exercise performance in 15 male patients with end-stage heart failure after implantation of a (left) VAD and compared the values with those after HTx.³ Three months after implantation of a VAD, exercise capacity measured by ergospirometry (VO_2 max) was comparable with that three months after HTx: 23 ± 4.4 ml/min/kg. Such an aerobic capacity enables patients to perform all activities of daily life. This level is around double the exercise capacity which qualified them for placement on the waiting list for HTx. Not only the VAD led to this result. The patients underwent an intensive rehabilitation programme which consisted of bicycle, treadmill and rowing machine training as well as participation in games. Intensity was light to moderate and the duration was gradually increased to 20 to 40 min/day three to five times a week. In addition to these activities, patients received strength and endurance training. It was the combination of the technology and the rehabilitation programme which led to the excellent results at three months.

In this issue of the Journal, 29 patients are described who performed an exercise test three months after implantation of a VAD and the results are compared with those three months after HTx.⁴ The findings reconfirm a good exercise capacity in this large cohort

of patients. In addition to exercise tests, BNP plasma levels and serum creatinine levels were measured. Post VAD BNP decreased from a mean of 570 pmol/l to 31 pmol/l, which is close to the local normal level (≤ 30 pmol/l). The reduction in serum creatinine after VAD implantation indicates haemodynamic recovery from a 'shock' to a normal level. In the current report only a few remarks are made with respect to rehabilitation of patients on VAD support and/or after HTx, although this will have contributed substantially to the good results. The authors state that 'it is well known that physical training can improve exercise capacity in patients with heart failure'. It is clear that optimal rehabilitation is of the utmost importance in patients with heart failure.⁵

It is important to bear in mind that the authors report the three-month results in functional and haemodynamic recovery. The qualification 'alternative to heart transplantation' is mentioned in the conclusion of the article. However, ten-year life expectancy after HTx exceeds 50%, while one-year life expectancy with the VAD as destination therapy is only 52%, as found in the REMATCH trial.⁶ Thus VAD therapy is not an equivalent alternative to HTx. Another perspective emerges if the age of the patient exceeds 65 years and/or serious renal failure is present which precludes HTx. A cohort of 280 patients with such characteristics were recently evaluated in the post-REMATCH era.⁷ They received a modified VAD type HeartMate XVE and overall survival on device support was 56 and 31% at one year and two years, respectively. VAD implantation bears risks such as bleeding, thrombosis, stroke, right-heart failure, percutaneous or device infection and/or sepsis. In an attempt to reduce these risks, a less bulky VAD based on continuous flow, the HeartMate II, was developed and recently tested in 133 patients awaiting HTx.⁸ In six months, 56 of these patients were transplanted. Overall, 75 and 68% of the patients survived at six and 12 months, respectively. Probably due to the 50% smaller drive line of the HeartMate II, infections were less frequently seen but a direct comparison with the pulsatile devices is not yet available.

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Are there other possibilities to bridge patients with end-stage heart failure to HTx or as destination therapy for those with a contraindication to HTx? For the acute situation an intra-aortic balloon pump (IABP) may be considered but the relief is temporary and another bridge is needed within one or two weeks. In this context it must be mentioned that the sequence: acute severe myocardial dysfunction, emergency VAD implantation and HTx is very rare. From our large heart failure centre annually only one or two patients who are listed for HTx and who deteriorate despite inotropic therapy and/or an IABP are offered to UMCU colleagues for VAD implantation. Another extended conservative management option in selected patients who are listed for HTx or as destination therapy is home-based intravenous inotropic therapy.⁹ In our retrospective study 16/22 patients (73%) listed for HTx proceeded to HTx. For safety reasons these patients should carry an implantable cardiac defibrillator. Inotropic therapy at home is feasible, safe and cheap, and improves quality of life. Inotropic therapy is not an alternative for HTx, it is usually a (first) bridge. VAD therapy has proven to be a bridge in terminally ill patients on the waiting list for HTx. In the United States, the HeartMate XVE is approved for destination therapy. In the Netherlands, VADs are not allowed for this indication; these devices are currently only temporary alternatives to HTx.

Survival to HTx in the Utrecht cohort of 84 VAD patients in 13 years (6 to 7 patients annually) was 76% after a mean of 206 days with the VAD. Compared with other published data, the Utrecht group has to be congratulated on their excellent results, based on careful selection of VAD candidates followed by high quality care. ■

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