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More pumps—more questions

To the Editor:

We would like to congratulate Wilhelm and colleagues¹ on their outstanding results concerning long-term survival after the implantation of axial flow left ventricular assist devices (LVADs). Since the worldwide first implantation of the axial flow pump in our institution on November 13, 1998,² followed by implantations in Vienna 1 week later,³ these pumps have increasingly gained acceptance. Long-term LVAD support not only enables patients to be bridged to heart transplantation or recovery but also opens up the opportunity to prolong high-quality life for nontransplant candidates. The article presented also shows that long-term nonpulsatile or less-pulsatile blood flow is not detrimental for the function of the end organs. Our experience with 44 patients who were supported with rotary blood pumps for more than 200 days accords with the results presented by the authors. However, good long-term results can also be achieved with pulsatile systems. Of a total of 110 patients supported with an LVAD for longer than 200 days in our institution, 66 had pulsatile devices. Of these, 3 patients were supported for more than 4 years with the Novacor LVAS and 2 with the BerlinHeart Excor.⁴

During long-term support, appropriate anticoagulation plays a key role for the survival and complication rates. As anticoagulative medication with the rotary pumps, we now administer phenprocoumon with a target international normalized ratio of 2.5, aspirin, and, in patients supported with axial flow pumps, additional clopidogrel according to platelet aggregation tests, taking polymorphism of the platelet GP IIb/IIIa receptors into consideration.⁵ In our opinion the aspirin dose should not exceed 100 mg/d.

We would be interested in the authors' current anticoagulation protocols and whether they used different regimens in patients with different rotary blood pumps. Second,

based on the experience gained in Münster, are there any preferences of pump type for destination therapy?

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Reply to the Editor:

Left ventricular assist device (LVAD) support was originally used to bridge high risk patients to heart transplantation.¹ After increased experience with this therapy showed that the failing native heart may have the potential to recover, LVAD therapy provided the option of weaning selected patients from mechanical support as an alternative to transplantation.² As technology made further progress, the duration of support has increased markedly and paved the way for destination therapy.

Device selection, however, in particular for long-term support, still remains an unresolved question. Most centers have experience with one or two types of devices. Devices are selected on the basis of personal experience. As long as people are satisfied with the devices they are using,

they do not see a reason to change to other systems. Only centers that handle large numbers of patients use a variety of devices, which offers them the opportunity to compare systems. Prospective randomized studies to evaluate different devices for different indications have not yet been performed.

It is of foremost importance that LVADs meet the criteria of long-term reliability and excellent quality of life in addition to the standard requirements of low frequency of infection and thromboembolism. The intracorporeal pulsatile devices such as the Novacor LVAS and the HeartMate I have demonstrated reliability for long-term support.^{3,4} Extracorporeal pulsatile devices such as the Thoratec LVAD and the Berlin Heart Excor also have supported patients over the long term.^{5,6} The introduction of axial-flow pumps revolutionized mechanical circulatory support. Pump size was markedly reduced, which facilitated the implantation procedure. Bleeding and infectious complications became less frequent. Because axial-flow pumps have not been on the market as long as pulsatile devices, their long-term reliability still has to be proved. Some patients were supported for more than 1 year with the DeBakey VAD, the Jarvik 2000, or the Berlin Heart Incor, respectively.⁷⁻⁹ In particular, the Berlin Heart Incor promises good long-term performance because of the magnetic suspension of its impeller, which provides virtually unlimited durability. The longest support period with this device is about 3 years. The design of axial-flow pumps renders the exchange of single parts less invasive than is required for larger pulsatile devices.

Axial-flow pumps appear to provide a better quality of life than pulsatile devices. They are much smaller than intracorporeal pulsatile pumps, which makes them easier to implant in the pericardium. There is no need for placement in the abdominal wall or in the abdomen, which may cause gastrointestinal and digestive complications. In addition, the axial-flow pumps run silently, whereas the clatter of pulsatile devices accompanies the patient and his environment day and night. Extracorporeal pulsatile systems are associated with an additional aesthetic and psychological disadvantage. The pump chambers, which are located permanently outside the body, re-