

STATE-OF-ART DURABLE MCS

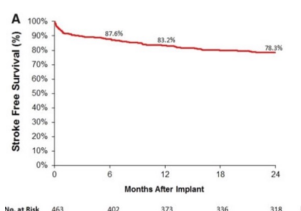
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Considerable technical developments over the last 30 years have enabled long-term support of patients suffering for advanced heart failure (HF) with left ventricular assist devices (LVADs). While the original pumps were pulsatile but large and bulky, modern pumps are small and operate by continuous flow (fig. 1). Pumps are driven electrically by external batteries which must be exchanged 1-2 times per day and are connected to the pump via a percutaneous driveline. Impressively, patients with insufficient LV function to enable opening of the aortic valve, can be supported for more than 10 years with the same pump. LVADs are mentioned with a class IIa recommendation in the European Society of Cardiology (ESC) guidelines on heart failure and have received a class I recommendation for patients in cardiogenic shock or inotrope dependency in the recent American guidelines. This is based on several randomized trials comparing either older pumps to medical therapy (REMATHC trial) or older pumps to newer pumps such as the MOMENTUM trial comparing Heartmate II to Heartmate III. Two-year survival after implantation of a continuous flow pump now exceeds 80%, quite comparable to heart transplantation



in international registries and most patients report NYHA I-II symptoms 2 years after implantation (fig. 2). Adverse events include bleeding, stroke, and infection (in particular at the driveline exit site). With current pump models pump thrombus is an extremely rare event. A functioning right ventricle (RV) is required to ensure pump preload and RV failure or ventricular arrhythmias compromising RV function may lead to recurrence of HF symptoms or circulatory instability. Randomized trials addressing means to reduce the burden of adverse events are underway and will likely further improve outcomes in LVAD recipients.

Early referral of patients with advanced HF symptoms for evaluation for heart transplantation or implantation of an LVAD is crucial for good outcomes, but many patients are referred late where these therapies may not be a realistic option.



Mean age 56 years
13 % t-MCS
31 % INTERMACS 1-2
39 % INTERMACS 3

HeartmateVE 1996 (XVE 2001)

Heartmate2 2005

Heartmate3 2015

