

Mechanical circulatory support: a great gap in Brazilian cardiac surgery

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Devices for mechanical circulatory support have become, over recent years, the main parts in the treatment of cardiogenic shock and in the maintenance of circulatory support for patients with terminal heart failure. The use of these devices has been widely indicated as a bridge for subsequent heart transplantation, as supportive treatment for the recovery of the heart in acute myocardial infarction and postoperative cardiac surgery, or even to allow for ventricular recovery during rest obtained by prolonged mechanical circulatory support in patients with cardiomyopathies [1,2]. Additionally, mechanical devices to assist the left ventricle have been deployed in some countries, as destination therapy in the treatment of patients with terminal heart failure with contraindications to cardiac transplantation [1,2].

The development of cardiac surgery in Brazil has always been characterized by the incorporation of latest technologies and treatments in many different fields. In addition, the specialty currently includes a large number of procedures performed, mainly in the treatment of coronary disease [3,4]. Moreover, the use of mechanical assist devices has been limited in our country to support postoperative patients undergoing cardiac surgery by use of centrifugal pumps and some unique experiments with the use of cardiopulmonary bypass with membrane oxygenator (ECMO) in the postoperative period of pediatric cardiac surgery [5] or the treatment of cardiogenic shock after myocardial infarction [6]. Similarly, the use of mechanical assist devices as bridge to heart transplantation also can be summed up in few cases performed [7,8].

Despite the long history of heart transplantation in Brazil [9] and the promising results observed with this therapy, especially in the treatment of Chagas' heart disease [10], a major limitation noted for the results of this procedure is the high mortality observed in the waiting list. Data from the State System of Transplantation of São Paulo showed that 50% of patients listed for heart transplantation over the past five years died on the waiting list. The incidence of cardiogenic shock due to progressive circulatory failure

is the leading cause of mortality in patients with advanced cardiomyopathy. In this condition, the mortality rate can reach values above 60% at six months follow-up may be even higher in patients with Chagas' heart disease [11,12]. The incidence of cardiogenic shock is also the leading cause of mortality on the waiting list for heart transplantation in pediatric patients. With respect to this, Jatene et al. [13] reported a transplantation performed in only eight of 22 children with dilated cardiomyopathy, aged 11 months to 11 years who developed this complication and were treated medically.

Because of the high mortality observed in the presence of ventricular failure, the use of mechanical circulatory assist devices is, in most cases, the only chance of survival while waiting for a donor. Various types of devices have been used to serve as a bridge to cardiac transplantation and international experience with this type of therapy sums up to thousands of cases [1,2]. Based on this experience, the indications of mechanical circulatory support is well established [14] as well as the impact of applying this therapy on life expectancy of patients [15].

In our country, the management of patients who develop cardiogenic shock due to the irreversible impairment of ventricular myocardium continues to rely solely on the use of drug therapy [16,17]. Despite the incorporation of new drugs to control this complication, mortality remains high, reducing the life expectancy of patients and the likelihood of receiving a heart transplant [18].

In parallel, the Brazilian experience with the use of mechanical circulatory support as bridge to transplantation adds a little more than a dozen cases in which paracorporeal ventricular assist devices were used in periods ranging from several days to about two months of circulatory support [7,8]. From this experience, we highlight the pioneering use of mechanical circulatory assist devices in patients with Chagas' heart disease [8].

Despite the existence of well-established indication criteria in national guidelines for treatment of heart failure [19], the lack of financial support by the agencies

responsible for health care in Brazil avoids the access of patients to the use of mechanical devices to treat acute circulatory failure. On the other hand, other high-cost treatments have been funded by the National Health System and the private sector, as the use of ventricular resynchronizers and implantable defibrillators for treating heart failure [20-22].

Cost-effectiveness studies in several countries about the impact of the use of mechanical circulatory support in the treatment of progressive circulatory failure, show values ranging between \$48,000.00 (R\$ 86,000.00) and \$90,000.00 (R\$ 160,000.00) per year of life saved and quality-adjusted (quality adjusted life years - QALY) [23]. In these studies it was not considered the type of device used, and it could be possible to anticipate values near the lower limit for the use of paracorporeal devices when comparing with implantable devices widely used in several centers worldwide. Similar values as those of mechanical support were observed for the use of cardiac resynchronization therapy defibrillator implantation combined with a systematic review that included data from more than 3,400 patients [24]. In parallel, a study about the isolated use of defibrillators in heart failure patients in our country showed a ratio of incremental cost-effectiveness of R \$ 68,000.00 in the public and R \$ 90,000.00 in the private sector [25].

Based on these data, we conclude that despite the high cost of treatment of cardiovascular diseases in Brazil in relation to our income per capita [26], we certainly have reasons to incorporate as a therapeutic option the device implantation of mechanical circulatory support, primarily as bridge to heart transplantation. This procedure is responsible for higher survival rates of 70% in one year, opening the prospect of performing a transplant in most patients treated.

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