The Current Role of Left Ventricular Reduction for Treatment of Heart Failure*

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In 1996, Batista reported a radical new surgical treatment for dilated cardiomyopathy (1). It was based on the reduction of left ventricular (LV) volume, resulting in a reduction in LV wall stress, and a relative increase in LV wall thickness. This innovative approach had the potential of providing an alternative to heart transplantation in the treatment of congestive heart failure for non-ischemic dilated cardiomyopathy. As other centers have adopted this procedure, data have accumulated regarding its early mortality and the procedure’s effect on intermediate term survival. The effect of the procedure on LV performance is being studied, and the article in this issue by Popovic et al. is a valuable report on early LV performance (2). Relatively little is known about the long term effects of this procedure on survival or on LV performance.

Early enthusiasm regarding this operation was somewhat dimmed by a relatively high early mortality and the findings that a significant number of patients required ventricular assist devices or were relisted for transplantation. The early mortality in the recent series has ranged from 2% to 22% (3–5). The one year survival in Batista series of 120 patients was 55%; in the series reported by McCarthy and associates it was 87%; and in the series by Moreira and associates it was 59%. In McCarthy’s series, 15% of patients required early LV assist devices and 28% were relisted for transplantation. These results are sobering because survival for the medical treatment of nonischemic dilated cardiomyopathy has been 81% at one year for patients with an LVEDD of <4 cm/m² and 65% for patients with an LVED of >4 cm/m² (6). These results can also be compared with those of heart transplantation. The early mortality for nonurgent transplants is estimated to be 95%, and one year survival is currently about 85% (7). Subsequent mortality is 4% per year. The risk of dying while on the waiting list for heart transplantation must be included, although with current optimal medical therapy, the estimated one year risk of sudden death for such patients is 8% (8). The overall mortality risk while waiting is 20% (9). The survival benefit conferred by transplantation is therefore seen in medium and long term followup.

An important reason to explore options such as partial left ventriculectomy (PLV) is the shortage of donor hearts and the much greater number of patients in severe heart failure (10). Other alternatives that must be compared to the PLV have been proposed. These currently include cardiomyoplasty and the use of a totally implantable left ventricular assist device. Partial left ventriculectomy seems to have a far greater effect on improving LV performance than cardiomyoplasty and is performed on sicker patients. Cardiomyoplasty has not been shown to have an effect on survival. Mechanical LV assist has a reduced quality of life compared with these other options because of the dependence on external power sources and a noisy intra-abdominal device (11).

The PLV procedure is still in the early stages of its development. Much is being learned about the selection of patients, the conduct of the procedure and the postoperative care. Popović and associates have shown that patients with a dominant right coronary artery have a better functional result than those with a dominant circumflex, which is divided in the procedure and causes distal ischemia. This is a valuable finding and could result in improved selection or modification of the procedure. Another factor, which this study has not addressed, is the use of preoperative ultrafast computerized tomography scans to evaluate segmental LV wall thickness. This may be variable, and the resection of a thickened lateral wall, while leaving a thinned out septum, could be expected to give a suboptimal result. Intraoperative management may be crucial to early and late outcomes. It seems that operating on the beating heart, rather than using cardioplegia, gives better results. In addition, the extent of resection may be critical. It is interesting that in the series studied by Popović, three of the patients required mitral valve replacement while 19 had mitral valve repair. It is likely that in some patients, an adequate resection cannot be performed without sacrificing the papillary muscle, requiring mitral valve replacement.

The results of PLV must also be compared with those of mitral valve repair. Early improvement in congestive heart failure after correction of secondary mitral regurgitation in end-stage cardiomyopathy has been reported in a small series of patients by Bach and Bolling (12,13). They found improved ejection fraction and reduced LV volume. All were improved and there were no early deaths. Marked reduction in the mitral valve annulus size may result in ventricular remodeling, as well as improving the symptoms of heart failure due to mitral regurgitation. This is an alternative option and may have a lower early and late mortality compared with PLV.

Popović et al.’s study adds to the accumulating evidence that PLV does indeed accomplish its objectives of reducing LV volume, improving ejection fraction and lowering LV filling...
pressures, thus effectively treating heart failure. The early mortality thus far remains significant. In addition, the failure rate reflected by recurrent symptoms and re-listing for transplantation is unexpectedly high, and the one year survival may be lower than medical therapy alone. It must be stressed, however, that this is a relatively new operation. Improvements in patient selection based on patient’s clinical status, underlying cardiomyopathy, their coronary anatomy as shown by Popović et al., the LV wall thickness and the criteria not yet defined will be developed in time. In addition, the intraoperative management of these patients is evolving, and it is hoped that it will yield a lower early and late mortality. Ultimately, a randomized trial will be required to evaluate this procedure. Meanwhile, this operation should be used on selected patients in institutions that have active heart failure and heart transplantation programs for the proper selection of patients and an experienced cardiac assist device program.

References