

LETTERS TO THE EDITOR

The clinical benefit of the bicaval technique for cardiac transplantation

To the Editor:

We read with interest the article "Bicaval versus atrial anastomoses in cardiac transplantation" by Sievers and colleagues¹ in which they compared tricuspid valve and right atrial dimensions at rest and exercise in both techniques, reporting better tricuspid valve function in the bicaval group.

We randomized 40 patients between November 1992 and May 1993 to either the bicaval^{2,3} (Fig. 1) or the Lower and Shumway standard technique.^{4,5} There was no early mortality in the bicaval group. Right ventricular failure developed in two patients in the standard group, and they died. Nodal rhythm developed in two patients in each group, and all four recovered sinus rhythm per echocardiography; Doppler velocimetry at the transvalvular level confirmed normal atrial function in the bicaval group with erratic atrial contraction in the standard group. Slightly lower incidence of mitral and tricuspid valve regurgitation was seen in the bicaval group. We concluded that the improved atrial function⁶ in the bicaval group may play a part in the recovery from right-sided heart failure after cardiac transplantation.²

By June 1994 the number in each group increased to 35 and 40. We found that the incidence of tricuspid valve incompetence was slightly lower in the bicaval compared with the standard group; although tricuspid incompetence at rest was of a greater severity in the standard group compared with the bicaval group, these differences were not statistically significant. The mean ischemic time for the bicaval technique was 197 minutes versus 181 minutes. For the standard technique, the mean implantation time was 82 minutes for the bicaval and 71 minutes for the standard technique. These differences were not statistically significant, which is contrary to the results of Sievers and colleagues¹ of longer ischemic time: 210 ± 41.1 minutes for the bicaval group compared with 154 ± 65 minutes in the standard group. We found that it is unnecessary to perform caval anastomoses during reperfusion of the donor heart to avoid masking the operative field and creating less than optimal conditions for performing caval anastomoses. We use blood cardioplegia via the donor aorta to provide protection to the donor heart after the completion of the left atrial anastomoses, and we vent the left atrium to avoid cardiac warming during the rest of the procedure. We have found that the bicaval technique is associated with lower right atrial pressure at rest and lower incidence of tachyarrhythmias or bradyarrhythmias; no patients in the bicaval group required permanent use of a pacemaker compared with three patients in the standard group ($p < 0.05$). There was no early mortality as a result of right ventricular failure in the bicaval group compared with three deaths in the standard group ($p < 0.055$). Patients who had bicaval anastomoses required less of a diuretic dose, and they were discharged

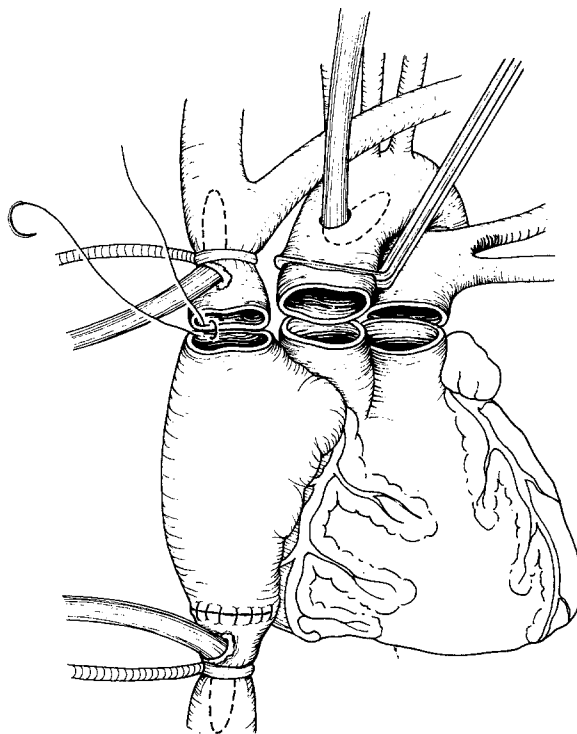


Fig. 1. Bicaval orthotopic cardiac transplantation: note long cavoatrial cuffs for both inferior and superior venae cavae.

4 days earlier from the hospital. Less mitral valve incompetence was seen with the bicaval technique. The right atrial contraction provided an increase of 20% to 25% of the cardiac output in cases of right ventricular dysfunction, and the right atrium in the standard group did not contribute to the measured cardiac output in a large proportion of patients.⁷ We believe that the bicaval technique is both simpler and safer than the total cardiac transplantation described by others,^{9,10} which is technically more demanding and carries the risk of bleeding from inaccessible pulmonary venous anastomoses suture line. Furthermore, the total excision of the donor heart leaves small atrial cuffs for the lung transplant team (Fig. 2). We have performed more than 50 transplantations to date with the new technique. We have not had any caval stenosis or thrombosis. We stress the fact that it is important to create a cavo atrial cuff around not only the inferior vena cava but also the superior vena cava to prevent any tension on the anastomosis and also to prevent the possibility of narrowing or even obstruction of the superior vena cava (Fig. 1). Improved cardiac performance on exercise may be related to the preservation of

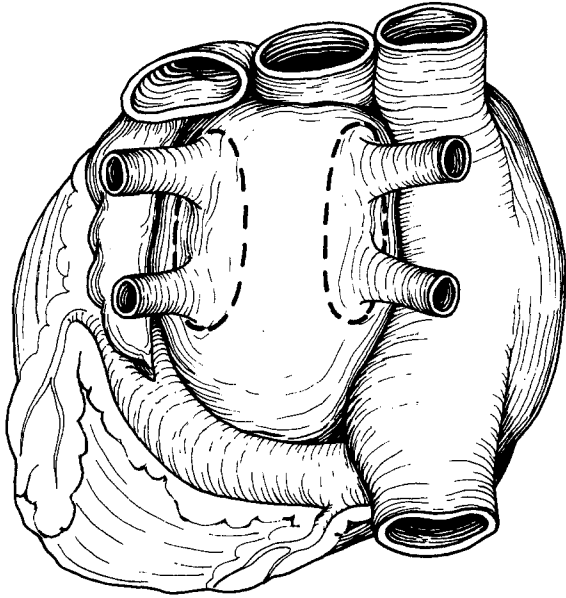


Fig. 2. Total heart excised: note small atrial cuffs which will be left behind.

sinus rhythm and atrioventricular synchrony, with an atrial kick that is of paramount importance when ventricular compliance is reduced. Currently the bicaval technique is our preferred method of orthotopic cardiac transplantation.

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Reply to the Editor:

Dr. El Gamel and associates¹ should be complimented for expanding the knowledge of the alternative bicaval technique for cardiac transplantation. Their results conform mostly with ours in that the shape of the atria is normal and the incidence of tricuspid valve regurgitation is lower in the bicaval group when compared with the standard method.² Furthermore, they observed normal right atrial function in these patients and a lower mean right atrial pressure at rest, which was observed in our patients only during exercise. In addition, tricuspid valve regurgitation was significantly less in our patients during exercise, which probably contributed to an increased exercise performance.² We also entirely confirm the findings of Dr. El Gamel and associates concerning the lower incidence of tachyarrhythmias and bradyarrhythmias, especially during the immediate postoperative period. However, despite normal right atrial size and pressure, we were surprised to find significantly elevated concentrations of plasma atrial natriuretic peptides in the bicaval group, as was also observed in patients with standard anastomoses.³

We agree that the alternative technique is both simpler and probably safer than total cardiac transplantation⁴ because of the technically demanding and inaccessible pulmonary venous anastomoses. To circumvent these difficulties, we introduced the alternative technique first in 1989.⁵ Increasing surgical experience, reperfusion, or blood cardioplegia after completion of the left atrial