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Reversible Snaring for Proper Prosthetic Seating During Valve Replacement

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A method of reversible suture snaring is described for evaluating the final valve seating and positioning before knot tying of valve sutures. This allows for alteration of the operative plan before investing substantial ischemic time in a nonfunctional result. The procedure has been used in 577 consecutive prosthetic valve replacements in the past 5 years. The technique maintains proper seating while the valve is permanently anchored in place.

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The proper seating of a prosthetic valve in a small annulus, particularly in the aortic position, may pose substantial problems [1]. We herein report a simple and reliable technique to reversibly evaluate the proper seating of prosthetic valves, as well as to maintain proper seating while the sutures are tied.

Technique
Cardiopulmonary bypass is established with bicaudal cannulation for mitral and tricuspid replacement and two-stage single venous cannulation for aortic valve replacement. For aortic valve replacement, after the valve is excised, the annulus is sized to obtain a plan for possible subsequent maneuvers (eg, Manouguian annular enlargement [2]), which are then done at this time. Ultrasonic debridement of the valve is performed as necessary to make the annulus more pliable and to enlarge the orifice area further [3]. Three pledgeted 2-0 Ethibond (Ethicon, Somerville, NJ) sutures are placed at the commissures with the needle traveling from the aortic into ventricular direction (ie, with the pledget on the aortic side of the annulus). The remaining sutures are passed from the ventricular to the aortic direction (ie, with the pledget on the ventricular side of the annulus). The valve will thus ultimately be in a supraannular position. Generally three to four pledgeted sutures are placed between each commissural suture for a total of 12 to 15 sutures in the annulus. The orifice is resized, the prosthetic valve is chosen, and the sutures are placed through the sewing ring. The valve is seated and three of the sutures located at equal distances from each other are chosen to be snared. Snugly tightening these snares wedges the prosthesis into position in a reversible manner, allowing the surgeon to make an estimation whether it is indeed feasible for that size valve to be seated in a given annulus. The key is to visualize the three commissural pledgets placed, and if this can be done then the given valve can indeed be adequately seated.

The sutures between the snares are then tied down, and finally the snared sutures are tied. We have found that stiffer snares are more useful in snugging down the valve than the more rubbery, softer snares. Figure 1 summarizes the technical details. If necessary, more than three and as many as all the sutures can be snared down to evaluate the positioning. If the valve cannot be properly seated, the sutures can be withdrawn from the sewing ring and passed through the sewing ring of a smaller valve with a French-eye needle.

For mitral and tricuspid valve replacement, pledgeted 2-0 Ethibond sutures are passed from the atrial into the ventricular aspect (ie, the pledgets are on the atrial side and the final valve position will be intraannular). Again, three sutures are chosen for snaring and proper positioning is determined by visualizing the pledgets on the atrial side of the annulus. Impingement on prosthetic leaflet excursion by the subvalvular apparatus can be corrected if necessary before the valve is permanently anchored in place.

Results and Comment
From January 1992 until January 1997 we have performed a total of 577 prosthetic valve replacements in 561 patients with a 30-day operative mortality of 3.7%. The valve snaring technique to evaluate and maintain proper valve seating was used in every case. The valve replacements have included 320 aortic, 234 mitral, and 23 tricuspid valve replacements. Intraoperative transesophageal echocardiography was passed from the atrial into the ventricular aspect (ie, the pledges are on the atrial side and the final valve position will be intraannular). Again, three sutures are chosen for snaring and proper positioning is determined by visualizing the pledges on the atrial side of the annulus. Impingement on prosthetic leaflet excursion by the subvalvular apparatus can be corrected if necessary before the valve is permanently anchored in place.

The small aortic annulus poses a particular problem.
Placing the pledgeted sutures from the ventricular to the aortic side of the annulus results in supraannular placement of the valve, which often allows placement of a larger valve than if placed intraannularly. Annular patch enlargement as described by Manouguian and Seybold-Epting [2] is useful. If a St. Jude prosthesis is used, downsizing by one valve size to the Hemodynamic Plus series will often obviate sizing problems. Annular decalcification using the Cavitron Ultrasonic Surgical Aspirator (Cavitron Surgical Systems, Inc, Stamford, CT) has been very helpful to maximize orifice area [3]. We have found that the routine use of snares in anchoring the aortic prosthesis is extremely valuable in making feasible the placement of the maximal allowable valve size.

The snaring technique has two major advantages. First, it allows for confirmation of the technical feasibility of a given valve fitting into and functioning in a given orifice. The reversibility of the technique allows for altering one’s plan by placing a smaller valve, performing annular enlargement, or excising obstructing subvalvular tissues. Second, it maintains a snug fit of the valve while the remaining sutures are tied down. We are convinced that we have been frequently able to increase the size of the prosthesis chosen with confidence for a given annulus with this simple maneuver. The best example is the instance in which the valve sizer passes the orifice but with difficulty and barely fits through the annulus. In this instance the snaring technique is invaluable for making it feasible for the chosen valve to fit the annulus, and to confirm this feasibility before permanently anchoring the valve. We have also used snares to reversibly evaluate annular narrowing in DeVega-type tricuspid annuloplasty as well as to determine prosthetic patch positioning. Suture snaring is a useful, reversible technique in valve replacement, and in particular in instances of small annuli or bulky subvalvular structures.

References

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