Reversible snaring technique for proper prosthetic valve replacement

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Introduction
The use of snaring technique to fit a prosthetic valve into the annulus, either in aortic or mitral valve replacement (AVR, MVR) surgery has been previously described.
Aims
The purpose of this article was to provide a benefit, easy technique regardless of the type, size, and position of the prosthetic heart valve for valve fitting into the annulus during valve replacement surgery.
Settings and design
Using this technique from August 2014 until August 2016 a total number of 83 prosthetic valve replacements in 68 patients (56 prosthetic MVR and 27 prosthetic AVR, 41 patients with single MVR, 12 single AVR, and 15 double A, MVR) were performed in Assiut University Hospitals.
Patients and methods
In this technique three to four of the valve sutures were snared; the cornerstone of this technique is to visualize the pledgets in-place, and if this can be done then the given valve can certainly be adequately seated.
Results
Those snares wedge the prosthetic valve into position in a reversible manner, allowing the surgeon to make estimation whether it is certainly reasonable for that size valve to be settled in a given annulus or not.
Conclusion
We recommend using this technique in all heart valve replacements prior to the final tightening of stitches.

Keywords:
Open heart, valve surgery, Rhumatic Heart Disease

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Introduction

The use of snaring technique to fit a prosthetic valve into the annulus of either in aortic or mitral valve replacement (AVR, MVR) surgery has been previously defined [1]. The appropriate seating of a prosthetic valve in a small annulus, particularly in the aortic position, may pose substantial problems. Therefore, the full-root technique or annular enlargement is sometimes mandatory in order to implant an adequate size of the prosthesis into a small annulus [2].

Patient–prosthetic mismatch (PPM) in mitral position is independently associated with persisting pulmonary hypertension, increased incidence of congestive heart failure, and reduced survival after MVR [3,4].

The snaring technique could be used to fit proper valve size into the annulus without enlargement. However, in mitral valve it was suggested that the snaring technique is useful to detect whether the preserved subvalvular apparatus disturbs the mechanical leaflet motion or not [1].

The purpose of this article was to provide a multiple-benefit, easy technique regardless of the type, size, and position of the prosthetic heart valve during valve implantation surgery.

Patients and methods

From August 2014 until August 2016 a total number of 83 prosthetic valve replacements in 68 patients (56 prosthetic MVR and 27 prosthetic AVR, 41 patients with single MVR, 12 single AVR and 15 double A, MVR) were done in the Cardiothoracic Surgery Department, Faculty of Medicine, Assiut University, Egypt.

Cardiopulmonary bypass is established with aortobicaval cannulation for mitral and double-valve replacement and two-stage single venous cannulation for AVR. After the valve is excised, the

annulus is sized to get a plan for possible succeeding maneuvers.

In case of AVR, pledged 2-0 sutures are placed first at the three commissures; the remaining sutures are then placed. All sutures passed from the ventricular to the aortic direction in case of supra-annular position or from the aortic side to the ventricular side in intra-annular position of the valve (which I operated only in one case with an aortic valve sized 25).

Generally, we use a total of 12 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 snugged usually at the lowest point.

In the mitral position, the needle passes from the atrial side to the ventricular side in all the 12–14 sutures. The orifice is resized, the prosthetic valve is chosen, and the sutures are placed through the sewing ring. The valve is seated, and we chose four sutures to be snugged, two at the commissures and the other two at half way of each leaflet.

In all prosthetic valves, snugly tightening these snares wedges the prosthesis into position in a reversible manner, letting the surgeon to make estimation whether it is certainly reasonable for that size valve to be settled into a given annulus.

The main stem of this method is to visualize the pledgets in-place, and if this can be done then the given valve can surely be adequately seated. Also, we assess the subvalvular apparatus in the mitral position as impingement on the prosthetic leaflet excursion by the subvalvular apparatus can be corrected if necessary before the valve is permanently fixed in place; we assess the visibility of the coronary ostia in the aortic position.

If everything is accepted, 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.

If the valve cannot be properly seated, or another problem was found the sutures can be withdrawn from the sewing ring and passed through the sewing ring of a smaller valve with a French-eye needle or can deal with the excitant problem surgically.

Results

From August 2014 until August 2016 a total of 83 prosthetic valve replacements were performed in 68 patients, with a 30-day operative mortality of 1.47%; redo valve surgery was excluded from this study.

The 'valve reversible snaring technique' to evaluate and keep proper valve seating was used in every case. The valve replacements included 27 aortic and 56 MVR. Postoperative transthoracic echocardiography was done in every case up to the sixth week postoperatively in some cases. There was no instance of perivalvular leak, with good valve mobility and accepted pressure gradient across the valve in all the cases. Valve pathologies mostly were rheumatic, in origin.

The small aortic annulus poses a problem but placing the pledged sutures from the ventricular to the aortic side of the annulus results in supra-annular placement of the valve, which often allows placement of a larger valve than if placed intra-annularly with an accepted pressure gradient across the valve.

We have found that the routine use of snares in fixing the aortic prosthesis is extremely valuable in making feasible the placement of the maximal allowable valve size avoiding the need for root enlargement in all the cases included in our study, although we use an aortic size of 19 mm 'supra-annular' in five cases out of 27, it was accepted with their effective orifice area (EOA) and patient's body surface area (BSA).

Discussion

Despite the marked enhancements in prosthetic valve design and surgical techniques over the former years, valve replacement does not carry an ultimate therapy to the patient. Instead, native valve disease is switched to 'prosthetic valve disease', and the outcome of patients undergoing valve replacement is affected by prosthetic valve durability, hemodynamics, and thrombogenicity. Nonetheless, many of the prosthesis-related complications can be barred or their impact minimized through optimal prosthesis choice and careful medical and surgical management and follow-up after implantation. One of these complications is the term valve PPM [5].

PPM occurs when the 'EOA' of a normally operational prosthesis is too small in relation to the patient's body size resulting in abnormally high postoperative gradients across the valve. The most widely accepted and validated parameter for identifying PPM is the indexed EOA [6–9].

Moderate PPM may be quite frequent in both the aortic (20–70%) and mitral (30–70%) positions, whereas the prevalence of severe PPM ranges from 2 to 10% in both positions [3,4,8,9].

In view of the data published in the literature, the surgeon should attempt to avoid severe PPM in every patient undergoing AVR or MVR. However, the surgeon try to do his best to implant a large prosthetic valve with accepted EOA for the patient [10–12].

Here comes the safety and efficacy of using the reversible snaring technique as it allows for confirmation of the technical feasibility of a given valve fitting into and functioning in a given orifice, while the reversibility of the technique allows for altering one's plan by placing a smaller valve if any other maneuvers cannot be done to implant the 'corrected size valve according to the measured EOA.'

Recent studies have reported that this procedure can be performed safely for this purpose. The prevention of PPM in the mitral position represents a much greater challenge than in the aortic position because valve annulus enlargement or stentless valve implantation is not an option in this situation [4,9].

In cases of AVR, it allows for the visibility of the coronary ostia after the valve fitting into position and makes sure it is not obstructed by valve body especially in cases of supra-annular implantation or uses of large valve sizes.

The snaring technique has major advantages:

(1) First, it allows for confirmation of the technical possibility of a given valve fitting into and functioning in a given orifice
(2) Second, the reversibility of the technique permits for altering surgeon's plan by placing a smaller valve, performing annular enlargement (in aortic valve), or excising obstructing subvalvular tissues (in mitral valve)
(3) Third, in cases of AVR it allows for visibility of the coronary ostia after the valve fitting into position and makes sure it is not obstructed by the valve body
(4) Fourth, it maintains a snug fit of the valve while the remaining sutures are tied down making its easy to fit down the tied sutures into the valve.

We are able to increase the size of the prosthesis chosen with confidence for a given annulus with this simple maneuver. Suture reversible snaring technique is a useful, in valve replacement, and in instances of small annuli or bulky subvalvular structures.

In conclusion, this maneuver has zero disadvantage despite the good advantages.

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Conflicts of interest

There are no conflicts of interest.

References

1 Baumgartner FJ, Omari BO, Stuart L, Milliken JC, Nelson RJ, Robertson JM. Reversible snaring for proper prosthetic seating during valve replacement. Ann Thorac Surg 1998; 66:957–958.

2 Wendler O, Dzindzibadze V, Langer F, El Dsoki S, Schäfers HJ. Aortic valve replacement with a stentless bioprosthesis using the full-root technique. Thorac Cardiovasc Surg 2001; 49:361–364.

3 Lam BK, Chan V, Hendry P, Ruel M, Masters R, Bedard P, *et al.* The impact of patient–prosthesis mismatch on late outcomes after mitral valve replacement. J Thorac Cardiovasc Surg 2007; 133:1464–1473.e1463.

4 Magne J, Mathieu P, Dumesnil JG, Tanné D, Dagenais F, Doyle D, *et al.* Impact of prosthesis-patient mismatch on survival after mitral valve replacement. Circulation 2007; 115:1417–1425.

5 Rahimtoola SH. The problem of valve prosthesis-patient mismatch. Circulation 1978; 58:20–24.

6 Dumesnil JG, Honos GN, Lemieux M, Beauchemin J. Validation of applications of indexed aortic prosthetic valve areas calculated by Doppler echocardiography. J Am Coll Cardiol 1990; 16:637–643.

7 Dumesnil JG, Honos GN, Lemieux M, Beauchemin J. Validation and applications of mitral prosthetic valvular areas calculated by Doppler echocardiography. Am J Cardiol 1990; 65:1443–1448.

8 Pibarot P, Dumesnil JG. Hemodynamic and clinical impact of prosthesis–patient mismatch in the aortic valve position and its prevention. J Am Coll Cardiol 2000; 36:1131–1141.

9 Pibarot P, Dumesnil JG. Prosthesis-patient mismatch: definition, clinical impact, and prevention. Heart 2006; 92:1022–1029.

10 Castro LJ, Arcidi JM, Fisher AL, Gaudiani VA. Routine enlargement of the small aortic root: a preventive strategy to minimize mismatch. Ann Thorac Surg 2002; 74:31–36.

11 Dhareshwar J, Sundt TM III, Dearani JA, Schaff HV, Cook DJ, Orszulak TA. Aortic root enlargement: What are the operative risks? J Thorac Cardiovasc Surg 2007; 134:916–924.

12 Kulik A, Al-Saigh M, Chan V, Masters RG, Bédard P, Lam BK, *et al.* Enlargement of the small aortic root during aortic valve replacement: is there a benefit? Ann Thorac Surg 2008; 85:94–100.