

# Prevention of Suture Related Complications in the Supraannular Aortic Valve Replacement: A Different Knot Technique: Surgical Technique

## Supraannular Aort Kapak Replasmanında Sütür Nedenli Komplikasyonların Önlenmesi: Farklı Bir Düğüm Tekniği

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**ABSTRACT** The distance between coronary ostium and prosthetic valve annular ring decrease in supraannular valve replacement. Coronary ostial stenosis may develop due to thrombosis in early and late terms after supraannular valve replacement or coronary ostial dislocation inferiorly in aortic valve replacement. One of the factors affecting the development of coronary ostial thrombosis is foreign body reaction due to sutures in coronary ostium. In case of cutting the sutures short to prevent the foreign body reaction, but paravalvular leak may develop due to dissolving of the knot. We are reporting an alternative knot technique we have applied in supraannular aortic valve replacement.

**Key Words:** Aortic valve; coronary thrombosis

**ÖZET** Supraannular kapak replasmanında prostetik kapak halkası ile koroner ostium arasındaki mesafe azalır. İnförrior yerleşimli koroner ostium bulunan hastalarda ya da supraannular aort kapak replasmanı uygulanan hastalarda erken ve geç dönemde koroner ostiumlarda tromboz meydana gelebilir. Bu tromboz koroner osteal darlığa ve buna bağlı semptomlara yol açabilir. Koroner osteal tromboz gelişmesindeki faktörlerden biri olarak kapak dikişlerinin koroner ostiumda yaptığı yabancı cisim reaksiyonu düşünülebilir. Yabancı cisim reaksiyonunun kaçınmak için sütürler bağlandıktan sonra kısa olarak kesilebilir. Sütürlerin kısa kesilmesi durumunda ise düğüm çözülerek paravalvüler kaçak gelişebilir. Biz bu makalede düğümün sebep olabileceği trombojenik etkiyi azaltmak için uyguladığımız supraannular kapak replasmanında düğüm tekniğini bildiriyoruz.

**Anahtar Kelimeler:** Aort kapağı; koroner tromboz

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Supraannular aortic valve replacement (AVR) techniques can be used for suitable valve replacement according to the body mass index of the patient in case of small left ventricle outflow tract (LVOT) especially in elderly or complicated cases. It shortens both total operation and cardiopulmonary bypass time and decrease perioperative mortality and morbidity.

Supralvular aortic valve replacement shortens the distance between coronary ostia and prosthetic valve. This distance might decrease in congenitally more inferiorly-placed coronary ostia. In cases of decreased distance between coronary ostium and prosthetic valve annular ring, sutures which are swinging towards the coronary ostium with a thrombogenic ac-

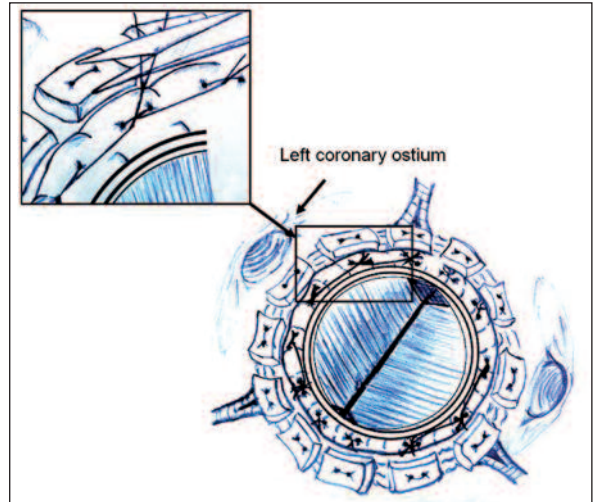
tivity might cause a foreign body reaction and osteal thrombosis. The risk of coronary osteal stenosis might be prevented by the expansion of the coronary ostium during the surgery but coronary osteal enlargement techniques extends operation time.<sup>1</sup> On the other hand, suture which is cut short to prevent swinging in the coronary ostium might cause the knot to dissolve in long term and might cause a paravulvular leakage. In our article, we want to report our surgical technique which might prevent the formation of a swinging object in the coronary ostium and the sutures being left short.

## SURGICAL TECHNIQUE

Supraannular aortic valve replacement performed with our knot technique in two patients due to aortic stenosis. One of them had idiopathic hypertrophic subaortic stenosis, and the second one was previously operated for mitral valve replacement and had small aortic annulus.

During operation, after standart oblique aortotomy and the resection of the damaged leaflet tissue, it was evaluated that 21 no aortic valve could only be placed in a supraannular position. 2/0 ethibond valve sutures were put on the supraannular region. After the prosthetic valve was placed, the relationship between the coronary ostium and prosthetic valve annular ring determined. It was thought that when the valve sutures were cut in a standard way, this would cause a foreign body reaction in coronary ostium. For this reason, it was decided that sutures should be tied for avoiding the sutures movement to the coronary ostium in every diastole.

Suture fixation procedure was started from closest suture to the left main coronary ostium. First suture was not cut after being normally tied. While the suture which was lateral to the suture was tied, the first suture was put under the second suture knot and then the second knot was seated and the first suture was fixed. After the second suture was seated, first suture was cut. The second suture was not cut and the same procedure was reapplied (Figure 1). Same technique was applied to the suture which was medial to the left main coronary artery (LMCA) ostium. The sutures at the level of right coronary ostium, which had a probability to be di-



**FIGURE 1:** Suture connection started just inferior of the left main coronary ostium. First suture was connected but not cut. While the second suture was connecting, the first suture was put under the second suture knot and the second knot was seated. The first suture was cut after fixing under the second suture knot.

(See color figure at <http://cardiovascular.turkiyeklinikleri.com/>)

rected towards coronary ostium were tied in the same way and they were cut. After the valve was checked, aortotomy was sutured primarily and cardiopulmonary bypass was disconnected.

There wasn't any complication in the postoperative period and patients were discharged in the 6th postoperative day. Evaluation of the patients ECG in the 1st, 3rd and 6th postoperative months were normal. Also evaluation of prosthetic valve functions were normal in the echocardiographic examinations.

## DISCUSSION

Effective valve area index should be more than 0.85 cm-square/m-square to prevent significant gradient at rest and during exercise after the aortic valve replacement.<sup>2</sup>

Replacement of small-sized prosthetic valve in patients with small aortic annulus, might cause high transprosthetic gradient, low effective orifice area and less regression in the left ventricle mass.<sup>2</sup> Aortic root enlargement procedures, root replacement or stentless bioprosthesis are helpful for relieve of the left ventricle in this situation. These techniques prolongs both operation and car-

diopulmonary bypass time and increases perioperative mortality and morbidity. Supraannular valve replacement is an alternative procedure, provide enough valve opening with lower perioperative mortality and morbidity especially in high risk patients.<sup>2</sup> Supraannular valves are an easy and safe way to remove the flow barrier which is caused by the suture ring and stent material.<sup>2,3</sup> For this reason, intra-supraannular valves which are designed for supraannular valve replacement is designed.<sup>3</sup>

Iatrogenic coronary artery stenosis after the aortic valve replacement is a rare but potentially life-threatening condition.<sup>1</sup> It might develop due to coronary endothelial damage during the direct cardioplegia application from the coroner ostia or incompatibility of prosthetic annular ring and annulus. Osteal stenosis might cause mortality, if untreated. Also, another reason of the coronary artery stenosis might be inferiorly localization of coronary ostium.<sup>1</sup> Valve sutures, cut in normal sizes might be the reason of foreign body reaction causing thrombogenic effect, in the way of arterial blood flow on the coronary ostium in

patients with decreased prosthetic valve and annulus distance.

Osteal stenosis due to prosthetic valve might be diagnosed after the surgical procedure and annular enlargement or smaller valve replacement might be applied after removing of the prosthetic valve under cardiopulmonary bypass. Coronary bypass and coronary osteal transposition are another options, coronary transposition time consuming procedure with displacement of hidden coronary ostium under the prosthetic valve. As an alternative to all of this, coronary osteal expansion technique has been reported.<sup>1</sup>

As a result, supraannular aortic valve replacement is the frequently-preferred method due to its ease of application with low perioperative mortality and morbidity rates especially in high-risk patients. With the knot technique we have reported, we aimed to decrease the risk of foreign body reaction which might cause coronary osteal stenosis in the long term. This technique is better when the buttresses are left on the ventricular aspect while performing supraannular prosthetic valve implantation. Also this technique might be performed in the inferiorly located coronary ostia.

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