Case Report

Nepalese Heart Journal 2024; Vol 21(2), 47-49

Konno Rastan Aortoventriculoplasty: The Last Resort for Complex Left Ventricular Outflow Tract Obstruction.

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Cite this article as: Timala, R. B., Aryal, M., Joshi, D., Timala, T., Pathak, S., Rajbhandari, N., Pokhrel, B., Basnet, N., Joshi, R., & Gautam, N. Konno Rastan Aortoventriculoplasty: The Last Resort for Complex Left Ventricular Outflow Tract Obstruction. Nepalese Heart Journal. 21(2). 47-49

Submission Date: May 18, 2024
Accepted Date: October 11, 2024

Submitted using Care checklist

Abstract

Konno-Rastan aorto-ventriculoplasty is used to enlarge the aortic root in patients with a narrow aortic root that increases the size of the implanted valve. We present the two case reports; one 13-year-old male and another 59-year-old female, who underwent aortic valve replacement and double valve replacement respectively, along with Konno-Rastan aorto-ventriculoplasty. The case reports show that the Konno procedure allows for inserting an appropriately sized prosthesis in case of a small aortic annulus. The Konno technique addresses all levels of left ventricular outflow tract obstruction, increasing the left ventricular outflow tract more than other techniques. Both of the cases had good long-term follow-up.

Keyword: Aortic Root Enlargement, Aortic Valve Replacement, Konno Rastan Aortoventriculoplasty, LVOT Obstruction

DOI: http://doi.org/10.3126/nhj.v21i2.70781

Introduction

Aortic valve replacement (AVR) in patients with a narrow aortic root because of young age or disproportionate hypoplastic aortic root remains a technical challenge[1], and enlargement of the aortic annulus is required in many such patients while performing AVR.

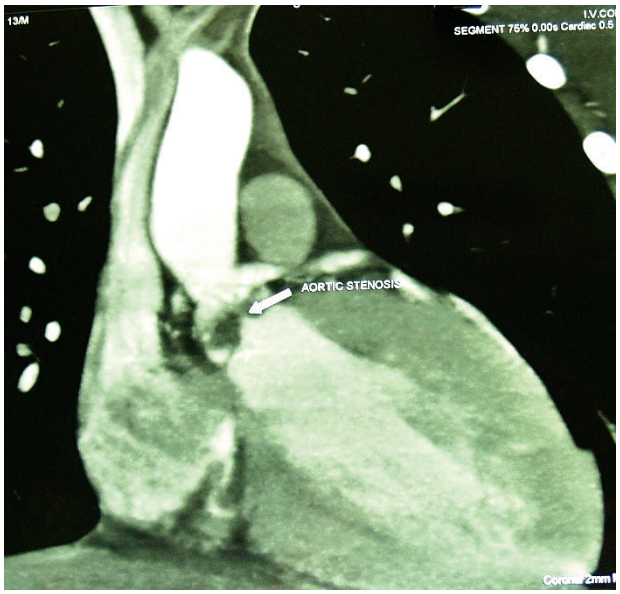
Konno aortoventriculoplasty is used to enlarge the aortic root and increase the size of the aortic valve implanted. The Konno procedure was first performed in October 1974 and was reported in 1975[2]. In this procedure, the proximal aorta, aortic annulus, and left ventricular outflow tract (LVOT) are simultaneously enlarged, and it is therefore considered to be an effective measure to relieve severe LVOT obstruction associated with aortic root narrowing. To date there hasn't been any case report of Konno aortoventriculoplasty published from Nepal.

Case Reports:

Case no. 1

A 13- year-old male presented with shortness of breath and fatigue on exertion for last six months, before admission to cardiac surgery department. He was diagnosed as a case of subvalvular, valvular and supravalvular aortic stenosis. He had a bicuspid aortic valve, which was dysplastic, thickened, and fleshy with marked intimal proliferation. His interventricular septum (IVS) was markedly thickened (Figure 1).

Figure 1: Computed Tomography (CT) scan of case no. 1, showing narrow LVOT, aortic valvular and supravalvular stenosis.



He underwent posterior annulus enlargement by Manouguian technique and anterior annular enlargement by Konno-Rastan aortoventriculoplasty nine years back (Figure 2). Postoperative

recovery was uneventful. He received a 17 mm HP St. Jude Medical aortic mechanical valve. He has been doing fine for the last nine years and is on regular follow-up. He is clinically stable without any symptoms. His latest echocardiography showed normally functioning prosthetic aortic valve with peak gradient of 70 mmHg.

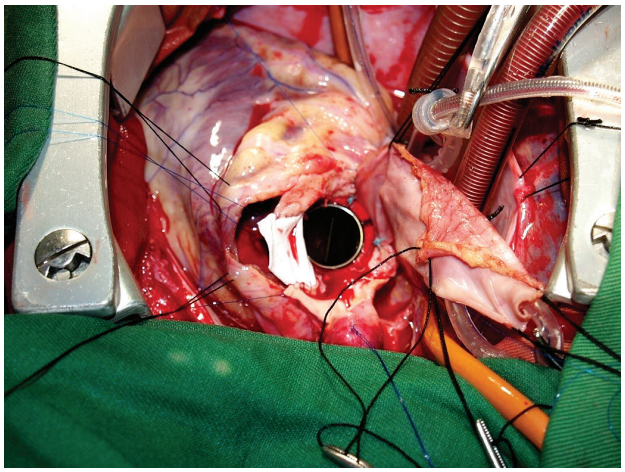


Figure 2: Rittenhouse-Manouguian posterior root enlargement with Konno Rastan Aortoventriculoplasty in a case no. 1.

Case no. 2

A 59-year-old female presented with occasional dyspnea and palpitation for last two years and history of one episode of syncope one month back, before admission to cardiac surgery department. She was diagnosed as a case of moderate mitral stenosis, and severe aortic stenosis along with LVOT obstruction. She had a fibromuscular subaortic tunnel of about one centimeter in diameter, with markedly thickened IVS of two centimeter. She underwent chordae-sparing mitral valve replacement, septal myectomy, and Konno-Rastan aortoventriculoplasty eight years back (Figure 3). She required permanent pacemaker implantation in the postoperative period for a complete heart block. She received a 25 mm St. Jude Medical mechanical mitral valve and 19mm HP St. Jude Medical aortic valve implantation. Her latest echocardiography showed normally functioning prosthetic mitral valve (peak gradient: 13.0 mmHg and mean gradient: 5.0 mmHg) and aortic valve (peak gradient: 11.0 mmHg and mean gradient 6.0 mmHg).

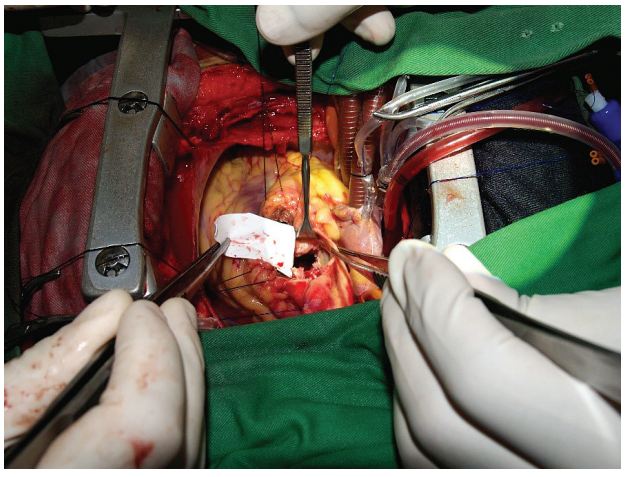


Figure 3: Septal myectomy, and Konno-Rastan aortoventriculoplasty in case no. 2.

Operative Procedure:

After median sternotomy, cardiopulmonary bypass, and cardioplegia, a cross-clamp was applied. The Right ventricular incision was done parallel to the pulmonary artery ring and 5 mm proximal to it. This incision is extended toward the aortic root. The Ascending aorta was longitudinally opened along its left anterior wall down to the commissure between the left and right coronary cusps, towards the interventricular septum, as described by Konno et al.[2]. The incision in the septum was generous and carried beyond any subvalvular stenosis if present.

The aortic cusps were excised. Valve sizers were used to estimate the size of the newly enlarged annulus, and half the circumference of a mechanical prosthesis was embedded in the original aortic valve ring. The septal incision was closed with a PTFE patch. The valve was then sutured in place using interrupted horizontal mattress sutures. The PTFE patch was continued to suture along the aortic edges. The right ventricular incision was closed with a pericardial patch.

Discussion

The main advantage of the Konno procedure when compared with other posterior root enlargement procedure is that it enables the insertion of a larger sized prosthesis in case of a small aortic annulus. The combination of subvalvular and valvular aortic stenosis may require an extensive operation including enlargement of the aortic root and aortic valve replacement. Several methods to enlarge the aortic root have been described[2-4]; one is the anterior aortoventriculoplasty described by Konno and colleagues in 1975.[2] The advantage of the Konno technique is that it addresses all levels of LVOT obstruction (i.e. the diffuse muscular subvalvular stenosis, the small aortic annulus, and the small proximal ascending aorta). This technique achieves a larger increase in the left ventricular outflow tract compared with other techniques. Operative mortality was found to be 17.5% (10 out of 57) in large series reported by Erez et al.[5]

Mechanical valves for Konno anterior aortoventriculolasty and AVR work well in the short term, yet the potential exists for some complications in the long-term including thromboembolism or anticoagulation-related hemorrhage, prosthetic valve endocarditis, and prosthetic valve outgrowth[5].

The study by Erez et. al. found that for mechanical valve patients, freedom from reoperation at 10 years was 80% and by 15 years this value declined to 52%. In patients with Konno aortoventriculoplasty and mechanical valves, indications for reoperation were valve outgrowth in 6 and prosthetic valve endocarditis in 3 among 57 patients[5].

Among 21 Konno aortoventriculoplasties performed among 20 patients, the long-term survival was excellent, with a 10-year survival of 90%+/-7%, and the re-operation-free survival at 10 years is 89%+/-7%, as reported by Cobanoglu et. al.[6]

One of the complications of Konno aortic root enlargement is the development of complete heart block. The incidence of pacemaker insertion after the Konno procedure was found to be 9%- 12.5% in earlier reports[7,8] to 0%- 6% in later reports[6,9]. Our second case who had undergone mitral valve replacement along with Konno-Rastan aortoventriculoplasty developed complete heart block post operatively and required permanent packemaker implantation.

Conclusion

The Konno procedure is an effective option for enlargement of the left ventricular outflow tract in the face of multilevel obstruction. However, long-term complication of prosthetic valve implantation has to be carefully looked for.

Conflict of interest: None.

Acknowledgment: None.

Declaration: Dr. Marisha Aryal did not participate in the review process for this article.

References:

1. Wortham DC, Tri TB, Bowen TE. Hemodynamic evalution of the St. Jude Medical valve prosthesis in the small aortic annulus.J Thorac Cardiovasc Surg. 1981;81:615–20. DOI: 10.1016/S0022-5223(19)39496-6.
2. Konno S, Imai Y, Iida Y, Nakajima M, Tatsuno K. A new method for prosthetic valve replacement in congenital aortic stenosis associated with hypoplasia of the aortic valve ring. J Thorac Cardiovasc Surg. 1975;70:909-17. DOI: 10.1016/S0022-5223(19)39673-4.
3. Manouguian S, Seybold-Epting W. Patch enlargement of the aortic valve ring by extending the aortic incision into the anterior mitral leaflet. J Thorac Cardiovasc Surg. 1979;78:402–12. DOI: 10.1016/S0022-5223(19)38105-X
4. Nicks R, Cartmill T, Bernstein L. Hypoplasia of the aortic root: the problem of aortic valve replacement. Thorax. 1970;25:339–46. DOI: 10.1136/thx.25.3.339.
5. Erez E, Kanter KR, Tam VK, Williams WH. Konno aortoventriculoplasty in children and adolescents: from prosthetic valves to the Ross operation. Ann Thorac Surg. 2002 Jul;74(1):122-6. DOI: 10.1016/s0003-4975(02)03595-6. PMID: 12118742.
6. Cobanoglu A, Thyagarajan GK, Dobbs J. Konno-aortoventriculoplasty with mechanical prosthesis in dealing with small aortic root: a good surgical option. Eur J Cardiothorac Surg. 1997 Nov;12(5):766-70. DOI: 10.1016/s1010-7940(97)00221-2. PMID: 9458149.
7. Reddy VM, Rajasinghe HA, Teitel DF, Haas GS, Hanley FL.Aortoventriculoplasty with the pulmonary autograft: The“Ross-Konno” procedure. J Thorac Cardiovasc Surg. 1996;111:158–67. DOI: 10.1016/S0022-5223(96)70412-9.
8. Fleming WH, Sarafian LB. Aortic valve replacement with concomitant aortoventriculoplasty in children and young adults: long term follow-up. Ann Thorac Surg. 1987;43:575–8. DOI: 10.1016/S0003-4975(10)60224-X.
9. Starnes VA, Luciani GB, Wells WJ, Allen RB, Lewis AB.Aortic root replacement with the pulmonary autograft in children with complex left heart obstruction. Ann Thorac Surg. 1996;62:442–8. DOI: 10.1016/0003-4975(96)00270-6.