Double Annulus Enlargement, Rastan-Manouguian's Technique: A Case Report†

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Abstract

A 35-year old female patient underwent a double valve replacement. The operative findings revealed a small aortic annulus (about 17 mm in diameter). In order to implant the adequate-size prosthetic valve, the aortic and mitral annulus were enlarged using the technique described by Rastan and Manouguian. The annulus were enlarged with a patch of gel-sealed dacron graft. After the enlargement, the prosthetic valve No. 23A and 31M could be implanted in the aortic and mitral annulus, respectively. This is an effective technique to enlarge the aortic and mitral annulus in a double valve replacement procedure. The annular diameter could be increased approximately 30 per cent.

In an aortic valve replacement operation, a small aortic annulus is an important factor which may cause this procedure to be more complex. There are several ways to solve this problem. Utilization of the small mechanical valves usually causes significant pressure gradient across the aortic valve. A homograft replacement either by an aortic allograft or by a Ross' procedure provides less pressure gradient across the valve in comparison to the mechanical valve of the same size. The recently-designed disc valves have less pressure gradient and can be used in selected cases. More complex approaches are patch annulus enlargement techniques described by several authors[1-5]. In a small child with a very small aortic root, left ventricle-aorta bypass may be necessary[6]. When the patient requires a double valve replacement, a double annulus enlargement technique described by Rastan and Manouguian is a good alternative approach[7,8]. We had experience in a patient on whom a double annulus enlargement was performed with good result. The aortic annular diameter was increased approximately 30 per cent after the enlargement.

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A CASE REPORT

A 35-year old female patient had suffered from severe aortic stenosis, moderate aortic regurgitation, moderate to severe mitral stenosis and mitral regurgitation for five years. She underwent a double valve replacement at Siriraj Hospital on 30th April 1998. The operation was performed using the conventional cardiopulmonary bypass with retrograde cold blood cardioplegia. The left atrium was opened through a longitudinal incision, inferior and parallel to the interatrial groove. The mitral valve was excised and the mitral annulus was measured to be 27 mm in diameter. The aortotomy was performed, and the aortic valve was resected. Although the preoperative echocardiographic measurement revealed the aortic root to be 22 mm in diameter, the intraoperative measurement revealed that the aortic annulus was too

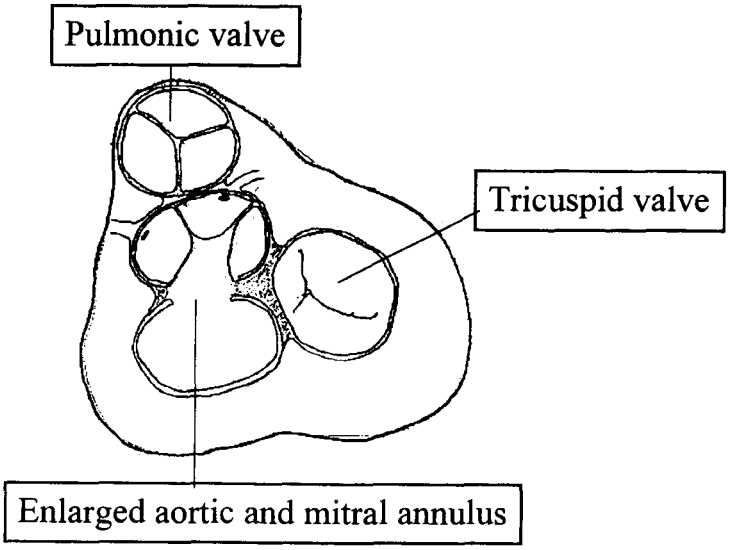

Fig. 1. Cross-section anatomy shows the enlarged aortic and mitral annulus.

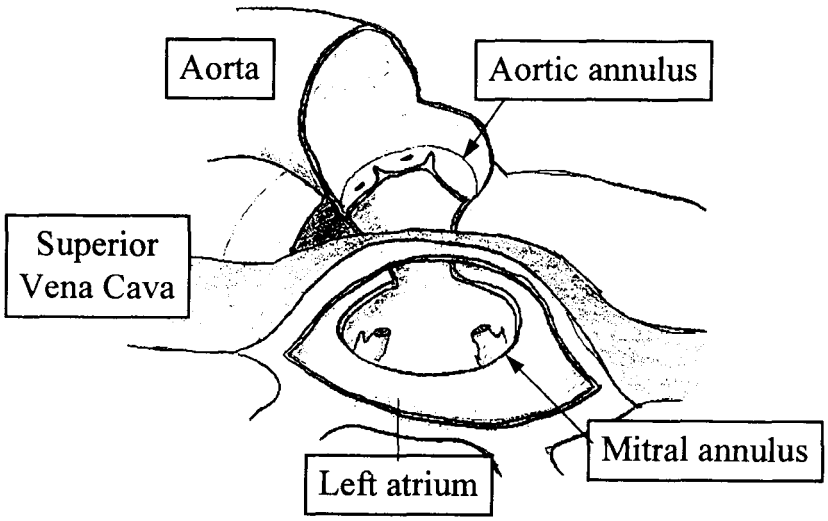

Fig. 2. The enlarged aortic and mitral annulus are seen from the aortic and left atrial incisions.

small (about 17 mm in diameter) to accept the smallest mechanical valve available. We decided to enlarge the aortic annulus down to the mitral annulus using the technique described by Rastan and Manouguian[7,8]. The aortic incision was extended down across the commissure between the non coronary and left coronary sinus. The incision was then carried down to the left atrial roof and the mitral annulus. Both the aortic and mitral annulus were divided (Fig. 1 and 2). A diamond-shaped patch of gel-sealed dacron graft was used to enlarge and reconstruct both the aortic and mitral annulus by suture Medtronic-Hall prosthetic valves No.23A and 31M to these new annulus (native annulus and patch) (Fig. 3). The new aortic and mitral annulus diameter were measured 23 and 31 mm, respectively. Both triangular ends of the patch were used to close the left atrial roof and aor-

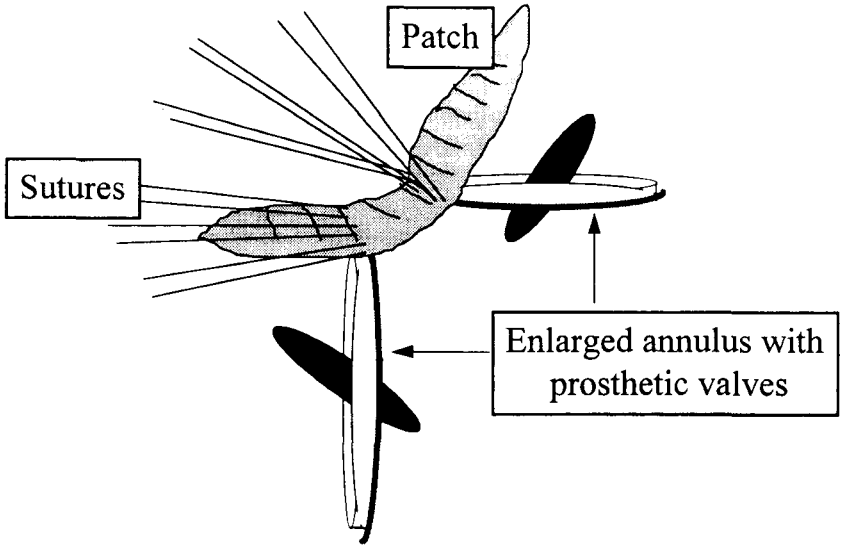

Fig. 3. The diamond-shaped patch was sutured to both aortic and mitral prosthetic valves.

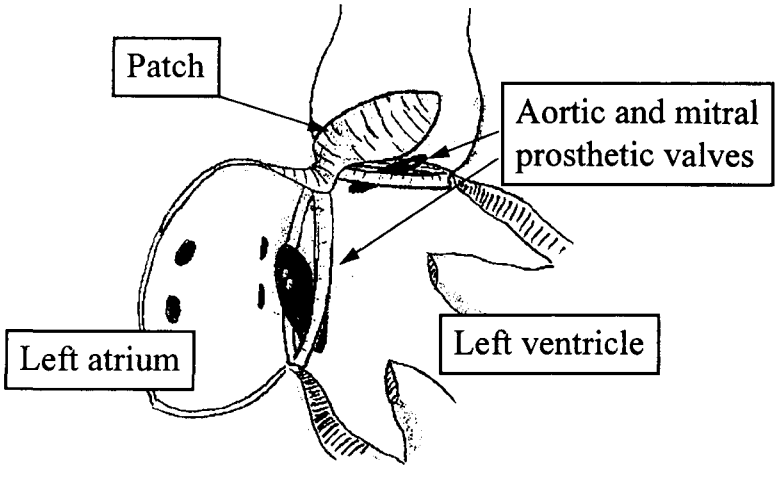

Fig. 4. The prosthetic valves were implanted to the enlarged aortic and mitral annulus with patch extended to the aortic incision and the left atrial roof.

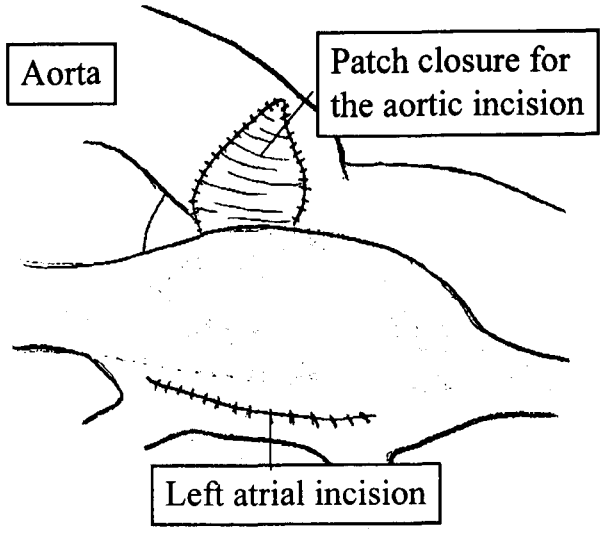

Fig. 5. Closure of the aortic and left atrial incision.

totomy (Fig. 4). The first left atrial incision was closed with running sutures (Fig. 5). The patient came off cardiopulmonary bypass without incident. The immediate postoperative course was quite good but the patient developed acute heart failure on the 4 th postoperative day. There was a chordae entrapped in the mitral prosthesis and this caused the prosthetic valve malfunction. After removal of the entrapped chordae, the postoperative course was uneventful.

DISCUSSION

Patch annulus enlargement is one of the procedures used in a case of a small aortic annulus especially in children. The first patch annulus enlargement technique was proposed by Nicks in 1970[2]. He recommended an extension of an aortic incision downwards through the non coronary aortic sinus across the aortic ring as far as the origin of the mitral valve which could enlarge the annulus up to 10 mm in circumference. Blank reported this same technique in 1976[4]. A more extensive procedure where the annulus is enlarged more, was described by Konno in 1975, and later by Rastan in 1976[3]. This technique can enlarge the annulus to about 30 per cent by incising the anterior surface of the aorta longitudinally down to about 7 mm from the left side of the right coronary ostium, continuing down and slightly to the left, with the anterior wall of the right ventricular outflow tract being cut below the pulmonary valve to reach the aortic ring at about the level of the commissure between the right and left cusps then continuing over the IVS in the region of crista supraventricularis. The disadvantage of this technique is that the incision is carried down to the important structures, i.e. the interventricular septum and the right ventricular outflow tract which can lead to morbidity. Rastan and Manouguian reported a new approach in 1979[5,9]. With this technique, the aortic incision was extended through the intervalvular trigone beneath the commissure between the left coronary and the non coronary sinus toward the center of the fibrous origin of the anterior mitral leaflet. The extension of the aortic incision about 1 cm into the initial portion of the anterior mitral leaflet allows an enlargement of the aortic valve ring of 15 mm. Unfortunately, this technique can lead to mitral regurgitation due to distortion of the anterior mitral leaflet and patch dehiscence[5].

In a case of double valve replacement, the extension to mitral annulus is more feasible, and does not lead to mitral regurgitation. The annulus can be enlarged as much as needed by the patch reconstruction to both aortic and mitral annulus. The review of the world literature with English

abstracts on double annular enlargement revealed only 11 cases published. Manouguain first reported such a case in which the aortic annulus diameter could be enlarged from 15 to 23 mm in diameter[8]. Rastan also reported two cases in which the annulus were enlarged from 21 to 25 and 27 mm in diameter[7]. Kawachi reported in 1991 another 8 patients in which the mean aortic annulus diameter was increased from 18.3 to 22.3 mm[10]. In our case, the aortic annulus diameter and orifice area were increased about 30 per cent and 50 per cent, respectively (from 17 to 23 mm in diameter). Although the more extensive incision through the left atrial roof and both annulus can lead to bleeding complication and paravalvular leakage. There are no reports on these complications but five deaths have been reported[7,10]. Both cases reported by Rastan died[7], One died of severe rheumatic carditis and the other was caused by a severe head injury[7]. Kawachi reported three deaths with one early death from fulminant hemolysis which led to acute renal failure and hyperkalemia[10]. The others died of congestive heart failure and prosthetic valve endocarditis[10]. The long term result of Kawachi's series is quite good[10]. We used a patch of gel-sealed vascular graft which has a good hemostasis. Some authors used fresh autologous pericardium which has several benefits such as the prevention of hemolysis and accurate hemostasis and in a case of bacterial endocarditis[11,12].

SUMMARY

The Rastan-Manouguian's patch annulus enlargement technique is feasible and very effective for a patient with small aortic and/or mitral annulus who requires a double valve replacement. The aortic annulus diameter can be increased up to 30 per cent after the enlargement, allowing insertion of a prosthesis at least two sizes larger than the native aortic orifice. Implantation of the prosthesis three numbers larger was demonstrated in our case.

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การขยายกรอบลิ้นของหัวใจเอออร์ติกและไมตรัลด้วยวิธีของ Rastan และ Manouguian: รายงานผู้ป่วย 1 ราย†

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ผู้ป่วยหญิงไทยอายุ 35 ปี ได้เข้ารับการผ่าตัดเปลี่ยนลิ้นหัวใจเอออร์ติกและไมตรัล จากการผ่าตัดพบว่ากรอบของลิ้นหัวใจเอออร์ติกมีขนาดเล็กมาก (เส้นผ่าศูนย์กลางประมาณ 17 มม.) ไม่สามารถใส่ลิ้นหัวใจเทียมขนาดที่เหมาะสมได้ จึงทำการขยายกรอบของลิ้นหัวใจทั้งสองด้วยวิธีของ Rastan และ Manouguian โดยใช้ส่วนของเส้นเลือดเทียมชนิด gel-sealed dacron graft หลังจากทำการขยายแล้วสามารถใส่ลิ้นหัวใจเทียมขนาดเบอร์ 23 และ 31 สำหรับลิ้นเออออร์ติกและไมตรัลตามลำดับ วิธีนี้เป็นวิธีทำให้สามารถขยายกรอบของลิ้นหัวใจได้ดี วัดได้เส้นผ่าศูนย์กลางของกรอบของลิ้นหัวใจใหญ่ขึ้นร้อยละ 30

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