AORTIC VALVULOPLASTY FOR AORTIC INSUFFICIENCY ASSOCIATED WITH VENTRICULAR SEPTAL DEFECT

Massimo A. Mariani, MD, PhD,^a Tjalling W. Waterbolk, MD,^a Jan L. M. Strengers, MD, PhD,^b and Tjark Ebels, MD, PhD,^a Groningen, The Netherlands

Aortic insufficiency caused by valve prolapse is present in more than 5% of children with ventricular septal defect (VSD).¹ Treatment of aortic insufficiency in children with VSD is a challenging issue. Aortic valvuloplasty by triangular resection of the prolapsing cusp has been used successfully for the treatment of aortic insufficiency resulting from cusp prolapse in adult patients.² Aortic valvuloplasty by triangular resection of the prolapsing cusp associated with circular annuloplasty and reinforcement of the aortic wall has been previously described for the treatment of aortic insufficiency in children with VSD.³ However, a circular annuloplasty that includes the entire annulus has the theoretic disadvantage of reducing annular flexibility and precluding annular growth. This can have an adverse effect in view of the somatic growth of children.⁴

In this brief communication we report the operations performed in three children with VSD and severe aortic insufficiency resulting from cusp prolapse. Aortic valvuloplasty was done successfully with an isolated triangular resection of the prolapsing cusp without any additional procedure involving the aortic annulus.

Surgical technique and results. The first child (4 years old) was operated on in 1990, the second (5 years old) in 1991, and the third (3 years old) in 1996. The operations were performed with the use of moderate hypothermia. The ascending aorta and both caval veins were cannulated. Cardioplegic arrest was induced by infusion of crystalloid Bretschneider solution. A right transatrial approach was used to expose the VSD. In one case it was necessary to detach the septal leaflet of the tricuspid valve to obtain an adequate exposure of the VSD. The VSD was closed by means of a glutaraldehyde-fixed pericardial patch with a running 6-0 polypropylene suture (Prolene, Ethicon, Inc., Somerville, N.J.). After closure of the VSD, the aorta was opened with an oblique incision extending toward the noncoronary sinus of Valsalva. After inspection of the aortic valve, a triangular portion of the prolapsing cusp was identified at the site of the nodulus of Arantius (Fig. 1). The basis of the triangle was delimited by two 7-0 polypropylene sutures (Prolene, Ethicon),

which were used to test proper coaptation of the cusp before cutting the triangular portion. After the size of the triangle had been determined by the amount of excessive tissue, the triangular portion of the prolapsing cusp was resected. A small extra amount of tissue was left for incorporation into the suture line. The resected margins were approximated by means of four to five single 7-0 polypropylene sutures (Prolene, Ethicon). The sutures were tied on the aortic side to prevent the knots from lying on the coaptation side of the cusp. At the end of the procedure the coaptation of the cusps was checked by filling the aortic root with saline solution. The aortotomy was closed with a running 5-0 polypropylene suture (Prolene, Ethicon). After the patients were weaned from cardiopulmonary bypass and before decannulation, the competence of the aortic valve was verified by means of intraoperative epicardial echocardiography. Aortic insufficiency was reduced to a trivial degree in all three patients (Fig. 2). The children were discharged after an uneventful postoperative course. Routine follow-up has shown a stable echocardiographic pattern through the years, with no worsening of the aortic insufficiency.

Discussion. Treatment of aortic insufficiency resulting from cusp prolapse is required in a small percentage of children with VSD in western Europe. The possible treatments are aortic valve replacement with a prosthetic valve, aortic valve replacement with a pulmonary autograft, or aortic valvuloplasty. Aortic valve replacement with a prosthesis is a cumbersome technique, because annulus enlargement is required to seat an adequately sized prosthesis. In addition, further need for prosthetic replacement can occur as a result of the somatic growth of children. Aortic root replacement with a pulmonary autograft has been described as an effective treatment for congenital aortic insufficiency with good early and late results⁵ and with growth potential.⁶ However, aortic root replacement with a pulmonary autograft is a demanding and time-consuming technique. Furthermore, replacement of the entire aortic valve is questionable when only one cusp is diseased. Aortic valvuloplasty with plication of redundant tissue in the prolapsed cusp has recently been reported as the treatment of choice for congenital aortic insufficiency when the aortic valve is tricuspid.⁷ However, previous studies of aortic valvuloplasty performed with plication have given controversial results. In fact, despite low in-hospital mortality and good initial follow-up results, long-term recurrence of aortic insufficiency is not uncommon with plication³ in children with VSD and aortic insufficiency. We report three successful cases in which aortic valvuloplasty was performed with an isolated triangular resection of the prolapsing cusp in children with VSD and aortic insufficiency. In these children we did not perform any additional procedure involving the aortic

From the Thorax Center^a and Pediatric Cardiology,^b University Hospital Groningen, Groningen, The Netherlands.

Received for publication March 12, 1997; accepted for publication March 27, 1997.

Address for reprints: Tjark Ebels, MD, PhD, Thorax Center, University Hospital Groningen, Hanzeplein 1, Postbus 30.001, 9700 RB Groningen, The Netherlands.

J Thorac Cardiovasc Surg 1997;114:851-3

Copyright © 1997 by Mosby-Year Book, Inc.

0022-5223/97 \$5.00 + 0 12/54/82354

Fig. 1. Draft of the aortic valvuloplasty with triangular resection of the prolapsing cusp. The aortic valve is exposed via an oblique aortotomy. *Left*, The right coronary cusp is prolapsing. The excessive length of the free edge is identified by placing two 7-0 sutures (see text). Then the triangular resection (*gray triangle*, with the base on the free edge) is made. *Right*, After the triangular resection, the free edge of the right coronary cusp is at the same level as the other two cusps. The knots are lying on the aortic side.

Fig. 2. *Left*, Two-dimensional echocardiogram of the aortic root in patient 2. Preoperative image showing a prolapse of the right coronary cusp, with a central defect of coaptation. *Right*, Two-dimensional echocardiogram of the aortic root in patient 2. Postoperative image showing the realignment of the cusps with proper coaptation.

anulus or the aortic wall. The postoperative course of the children was uneventful. Aortic insufficiency was reduced to a trivial degree and has remained stable at echocardiographic follow-up 5 to 6 years after the operations.

Aortic valvuloplasty with an isolated triangular resection of the prolapsing cusp ensures growth potential and leaves the aortic anulus intact. In addition, because the technique is easy, only a few minutes of extra aortic crossclamp time are required to perform it.

We conclude that aortic valvuloplasty with an isolated triangular resection of the prolapsing cusp is an easy and effective technique for the treatment of the aortic insufficiency in children with VSD.

REFERENCES

1. Keane JF, Plauth WH, Nadas AS. Ventricular septal defect with aortic insufficiency. *Circulation* 1979;56(Suppl):172-7.
2. Cosgrove DM, Rosenkranz ER, Hendren WG, Bartlett JC, Stewart WJ. Valvuloplasty for aortic insufficiency. *J Thorac Cardiovasc Surg* 1991;102:571-6.
3. Chauvaud S, Serraf A, Mihaileanu S, Soyer R, Blondeau P, Dubost C, et al. Ventricular septal defect associated with aortic valve incompetence: results of two surgical managements. *Ann Thorac Surg* 1990;49:875-80.
4. Cosgrove DM, Fraser CD. Aortic valve repair. In: Cox JL, Sundt TM, editors. *Operative techniques in cardiac & thoracic surgery: a comparative atlas*. Philadelphia: WB Saunders; 1996. p. 30-7.
5. Schoof PH, Cromme-Dijkhuis AH, Bogers JJ, Thijssen EJ, Witsenburg M, Hess J, et al. Aortic root replacement with pulmonary autograft in children. *J Thorac Cardiovasc Surg* 1994;107:367-73.
6. Elkins RC, Knott-Craig CJ, Ward KE, McCue C, Lane MM. Pulmonary autograft in children: realized growth potential. *Ann Thorac Surg* 1994;57:1387-93.
7. van Son JAM, Reddy VM, Black MD, Rajasinghe H, Haas GS, Hanley FL. Morphologic determinants favoring surgical aortic valvuloplasty versus pulmonary autograft aortic valve replacement in children. *J Thorac Cardiovasc Surg* 1996;111:1149-57.

RUPTURED MEDIASTINAL BRONCHIAL ARTERY ANEURYSM: A DILEMMA OF DIAGNOSIS AND THERAPEUTIC APPROACH

Afksendiyos Kalangos, MD, PhD, Gregory Khatchatourian, MD, Aristotelis Panos, MD, and Bernard Faidutti, MD, Geneva, Switzerland

Bronchial artery aneurysm is a rare entity that is observed in fewer than 1% of all cases of selective bronchial arteriography.¹ It can be classified as mediastinal, intrapulmonary, or both. The mediastinal localization may manifest various symptoms simulating clinical pictures of aortic dissection or rupture of an aortic aneurysm that could raise some challenging problems.^{2,3} We report a case complicated by life-threatening massive bleeding from a ruptured mediastinal bronchial artery aneurysm mimicking a clinical picture of aortic dissection. The mechanisms of formation, clinical presentation, and therapeutic management of mediastinal bronchial artery aneurysms are discussed with reference to the 13 previously reported cases in the literature (Table I).¹⁻¹¹

Clinical summary. A 50-year-old man was brought to a local hospital because of the sudden onset of severe back pain radiating to the abdomen during a mountain excursion. Blood pressure was 95/60 mm Hg, pulse rate 110 beats/min, and respiratory rate 18 breaths/min. The breath sounds were decreased over the left hemithorax. The chest x-ray film revealed a left hemothorax with no

evidence of mediastinal widening or suspicious images on the pulmonary parenchyma. Chest computed tomographic (CT) scan confirmed the left hemothorax and excluded aortic dissection. However, a suspicious vascular mass in the midportion of the mediastinum, ventral to the descending aorta, was visualized, but its nature could not be

Fig. 1. Chest CT scan showing an abnormal vascular structure ventral to the descending aorta (arrow). Note the presence of the large left hemothorax and the absence of dissection in the descending aorta.

From the Clinic for Cardiovascular Surgery, University Cantonal Hospital of Geneva, Geneva, Switzerland.

Received for publication Feb. 3, 1997; accepted for publication March 17, 1997.

Address for reprints: Afksendiyos Kalangos, MD, PhD, Clinic for Cardiovascular Surgery, University Cantonal Hospital of Geneva, 24, rue Micheli-du-Crest, 1211 Geneva, 14, Switzerland. *J Thorac Cardiovasc Surg* 1997;114:853-6

Copyright © 1997 by Mosby-Year Book, Inc.

0022-5223/97 \$5.00 + 0 12/54/81942