Subannular left ventricular aneurysm in a patient with bicuspid aortic valve stenosis

Paolo Vanelli, Cristina Carro, Roberto Scrofani, Maurizio Turiel, Carlo Antona, Luigi Beretta

Division of Cardiovascular Surgery, L. Sacco Hospital, Milan, Italy

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The term "subannular" left ventricular aneurysm (LVA) implies that the aneurysm's origin is very close to the aorta. In the absence of an infective etiology, subannular LVAs are very rare among Caucasians. Only a few cases have been reported in the literature. We present the case of a patient with a subannular LVA who underwent surgery at our Institution.

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Address:

Dr. Paolo Vanelli

Divisione di Chirurgia Cardiovascolare
Ospedale L. Sacco
Via G.B. Grassi, 74
20157 Milano
E-mail:
vanelli@tiscalinet.it

Case report

A Caucasian 47-year-old man was recovering from acute pulmonary edema. Fifteen days before, during normal physical activity, he suddenly developed rapidly progressive moderate dyspnea.

The electrocardiogram showed a regular heart rate of 96 b/min and a deviation towards the right. Physical examination revealed the presence of a systolic murmur of Levine intensity III-IV and of a diastolic murmur of Levine intensity I-II at the level of the mesocardium.

A transthoracic echocardiogram (TTE) showed moderate aortic regurgitation, stenosis with a mean gradient of 55 mmHg, a Vmax of 274 cm/s, severe left ventricular dysfunction with an ejection fraction of 0.30, a left ventricular diastolic diameter of 70 mm, a left ventricular systolic diameter of 60 mm and an interventricular septum thickness of 12 mm. The aortic root was normal in dimensions but several calcified nodules were present on the semilunar cusps (Fig. 1). A transesophageal echocardiogram (TEE) (Fig. 2) was needed to exclude the presence of vegetations. On the contrary, we discovered an aneurysm with a high-velocity systolic flow that bulged posteriorly towards the "roof" of the left atrium.

The patient's history did not include any evidence of infective or rheumatic disease. A therapeutic regimen including diuretics and inotropes was started and resulted in an improvement of the pulmonary function.

The patient was submitted to elective surgery including a standard mid-sternotomy and cardiopulmonary bypass. The aortic valve was severely calcified with a complete commissural fusion of the left and right coronary cusps. Having resected the cusps, the aneurysm, measuring 4 × 2 cm, was visible in a subannular position under the left and noncoronary sector. There were no signs of endocarditis (Fig. 3). A 27 St. Jude HP mechanical valve (St. Jude Medical Inc., St. Paul, MN, USA) was implanted in a suprannular position and sutured using 2-0 pledget stitches; in particular, the orifice of the aneurysm was directly obliterated by means of the same pledget sutures used for the implantation of prostheses.

Postoperative TEE showed that there was no flow in the aneurysm without residual mitral incompetence (Fig. 4).

The postoperative course was uneventful and the patient was discharged on the seventh postoperative day. One year later TTE confirmed a satisfactory long-term outcome with complete obliteration of the excluded cavity.

Discussion

The first case of a subannular left ventricular aneurysm (LVA) was described by Corvisart[1] in 1812. Reports from Africa were described by several authors in the 1960s and black males compose the majority of this population[2].

Recently, other cases from India have been reported[3]. The authors conclude that in some cases of submitral aneurysm there seems to be a close association with tuberculosis. However, the etiology of a noninfective subannular LVA in white men is still

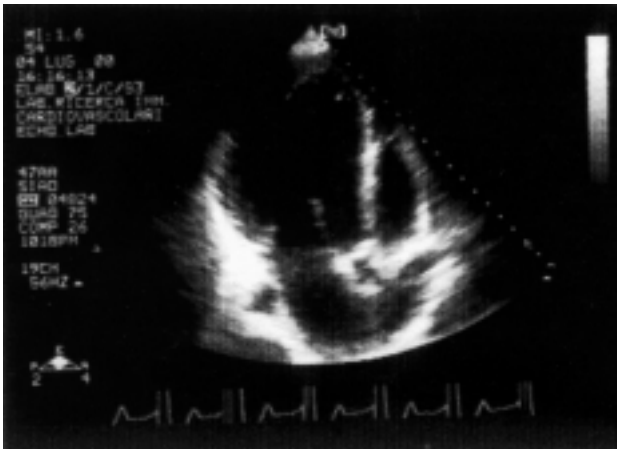

Figure 1. *Transthoracic echocardiography showing calcification of the cusps of the aortic valve.*

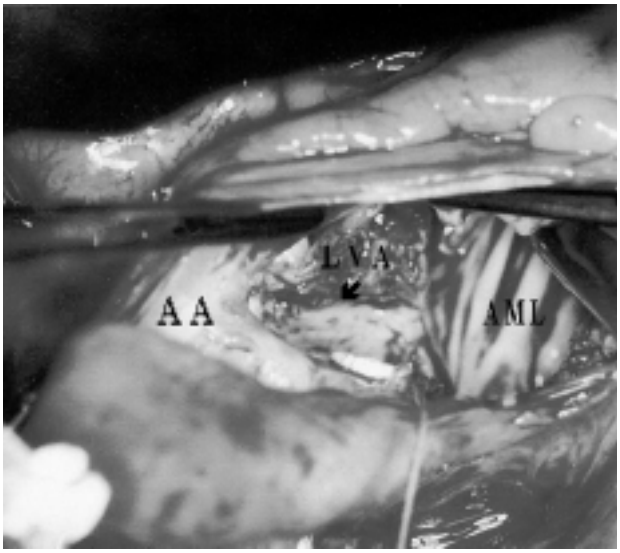

Figure 3. *Closure of the subaortic left ventricular aneurysm using the same sutures reinforced with the pledget used for aortic valve replacement. AA = aortic annulus; AML = anterior mitral valve; LVA = left ventricular aneurysm.*

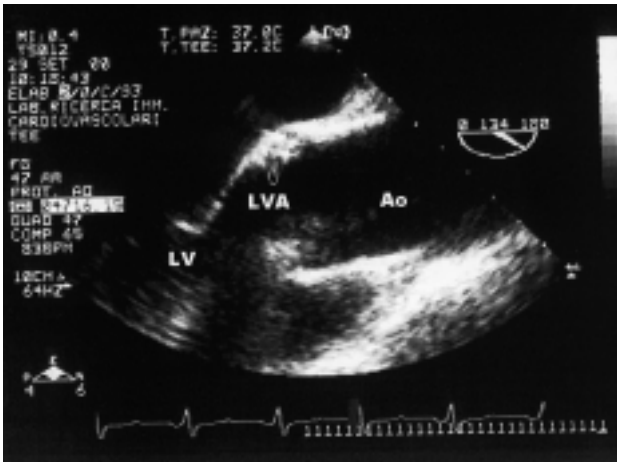

Figure 4. *Transesophageal echocardiography after closure of the aneurysm with the pledget sutures. Abbreviations as in figure 2.*

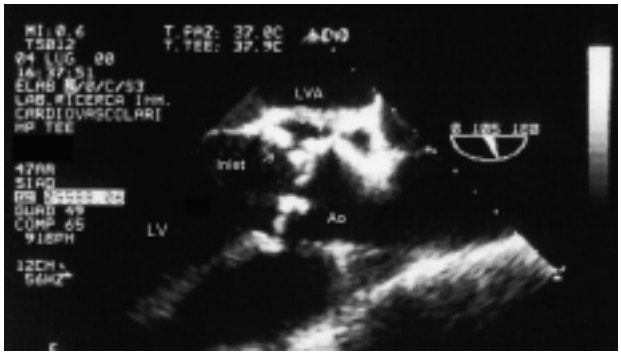

Figure 2. *Transesophageal echocardiography showing the subaortic aneurysm* (arrows). *Ao = aorta; LV = left ventricle; LVA = left ventricular aneurysm.*

unclear. A congenital defect or an area of weakness between the muscular ventricular wall and the fibrous valve annulus has been suspected[4]. The only case of acquired subannular LVA was described in a child presenting with acute rheumatic carditis, while trauma, syphilis and tuberculosis are only postulated as a cause of LVA[5].

On the basis of the anatomical relationship of their own orifice, subannular LVAs may be classified as submitral or subaortic[5]. Submitral LVAs are relatively more common than subaortic ones; according to the literature, the latter are generally diagnosed in young adults with a mean age of 26 years[4]. The aneurysmal cavity is larger in the submitral position and negatively influences the onset and severity of the illness characterized by symptoms of cardiac failure[5]. Different sites of origin along the annular ring are reported for subaortic LVAs[5]. In most instances the orifice is located between the noncoronary and right aortic cusps, i.e. in the septum membranous. About 6% of cases described in the literature have a bicuspid valve, most of them with the aneurysm sited in the area of the septum fibrosus between the noncoronary and left cusps. A prompt diagnosis of LVA is not always simple, in particular if patients with a murmur attributable to an associated insufficiency or, more commonly, to a valvular stenosis are not routinely submitted to physical examination[5]. Because the cavity is generally too small to be visible at simple chest roentgenography, TTE is the first procedure to be performed if a diagnosis is to be made, in spite of the fact that TEE provides additional information regarding the precise localization of the aneurysm and about adjacent structures. In fact, in our case TEE was effective in adequately showing the presence of bicuspid valve stenosis, the location of the subaortic aneurysm with the orifice located beneath the left and noncoronary cusps (septum fibrosus) and the structure of the adjacent anterior mitral leaflet. There are two main surgical techniques for repairing subaortic annular aneurysms: primarily closure, as described by Collins et al.[6] and the following patch closure[7]. In our situation, in spite of the risk of mitral insufficiency, the

choice to obliterate the origin of the LVA and suture the prosthesis with the same single stitches appeared simple. In the aneurysmal sector wide stitches are needed in order to assure the closure of the origin of the aneurysm and the correct implantation of the prosthesis without leaks. An intraoperative TEE was necessary to exclude mitral insufficiency with a correct movement of the anterior leaflet and the absence of paraprosthesis leakage after the procedure.

Subannular LVAs should always be corrected when aortic insufficiency or valvular or subvalvular stenosis is present. However, even in the absence of any associated pathology, the rapidly increasing severity of symptoms owing to valvular regurgitation, pericarditis, ventricular arrhythmias and myocardial infarction due to coronary artery compression are reasons that support a prompt surgical correction by patch or suture obliteration of the orifice of the aneurysm.

We believe that this latter method is simple and feasible in the majority of patients.

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