UNRUPTURED ANEURYSM OF THE RIGHT CORONARY CUSP

SEIETSU NYUI, M.D., SATOMI INOUE, M.D., TEI SATO, M.D.
AND ATSUNOBU NAKASE, M.D.

A 44-year-old man with an unruptured aneurysm originating from the right coronary cusp is reported. The patient was asymptomatic and a heart murmur and abnormal electrocardiogram were discovered incidentally. Echocardiography and aortography showed an unruptured aneurysm of the right coronary cusp. Surgical correction was successful using a Dacron patch and aneurysmal wall.

CONGENITAL aneurysm of the sinus of valsalva usually results in a fistula between the aorta and the right atrium, right ventricle, or, much less frequently, the left ventricle. It may occur as an isolated defect or be accompanied by other cardiac anomalies. Once the aneurysm has ruptured, the diagnosis is not difficult, and early surgical intervention is required.

We report an unusual case of an isolated unruptured aneurysm, originating not from the coronary sinus of valsalva but from the coronary cusp in an asymptomatic patient.

CASE REPORT

A 44-year-old man, who was asymptomatic for cardiac disease, was found incidentally to have a heart murmur and abnormal electrocardiogram. He was referred to our hospital for surgical treatment of his aortic regurgitation and an unusual membranous protrusion into the left ventricle.

On admission, the patient had a grade 3/6 diastolic blowing murmur with a systolic click on the left third intercostal space and a grade 2/6 diastolic rumbling murmur at the

Key words:

Unruptured aneurysm
Right coronary cusp
Surgical correction

Fig.1. Electrocardiogram shows clockwise rotation, left axis deviation and 1° atrioventricular block. There is evidence of left ventricular hypertrophy and abnormal Q waves in leads V₁₋₄.

Received August 10, 1990; Accepted November 22, 1990

The Department of Cardiovascular surgery, Sapporo City General Hospital, Sapporo, Japan

Mailing address: Dr. Seietsu Nyui, M.D., Department of Cardiovascular Surgery, Sapporo City General Hospital, Sapporo 060, Japan

Fig.2. Echocardiogram demonstrates an unruptured saccular aneurysm of the right coronary cusp prolapsing into the left ventricle. (Ao=aorta; LA=left atrium; LV=left ventricle; RV=right ventricle, IVS=interventricular septum; AV=aortic valve; MV=mitral valve; An=aneurysm)

Fig.3. A, Preoperative aortogram shows a saccular aneurysm (3 cm×2 cm) in the left ventricle with grade I aortic regurgitation, which filled the ventricle with contrast medium during diastole. B, Postoperative aortogram shows slight residual aortic valve regurgitation with exclusion of the aneurysmal cavity.

apex. Chest roentgenogram disclosed cardiomegaly with a cardiothoracic ratio of 0.60. The electrocardiogram (Fig. 1) showed clockwise rotation, left axis deviation and 1° atrioventricular block. There was an evidence of left ventricular hypertrophy and abnormal Q waves in leads V_{1-4} . The echocardiogram (Fig. 2) revealed an unruptured aneurysm of the right coronary cusp. An aortogram (Fig. 3A) confirmed the presence of a saccular aneurysm (3 cm×2 cm) in the left ventricle with grade I aortic regurgitation, in which contrast medium filled the

ventricle during diastole. The coronary arteries were not displaced and were patent. A catheter was not inserted into the left ventricle for fear of rupture. During cardiac catheterization, sudden complete atrioventricular block occurred. This was managed successfully by external pacing. Infective endocarditis was suspected, but blood cultures were negative.

The surgical procedure (Fig. 4) was performed under cardiopulmonary bypass with moderate hypothermia. Through an oblique aortotomy, the aortic valve was exposed,

Fig.4. Surgical correction. After removal of the free posterior wall of the aneurysm, the mouth of the aneurysm was closed by sandwich sutures in the aorta side using Dacron patch, and the left ventricle side using a portion of the aneurysmal wall. (Ao=aorta; LV=left ventricle; NCC= noncoronary cusp; LCC=left coronary cusp; RCC=right coronary cusp; IVS=interventricular septum; An=aneurysm)

and blood cardioplegic solution was injected into the coronary ostia. The large mouth of the aneurysm (15 mm $\times$ 19 mm) originated from the right coronary cusp itself, and was not associated with the aortic wall or annulus. A 2 mm thick-walled saccular aneurysm was found to extend downward into the left ventricle, with the anterior wall of the aneurysm fixed along the ventricular septum. The commissures were not fused, and the other two cusps were normal. After removal of the free posterior wall of the aneurysm, the mouth of the aneurysm was closed by sandwich sutures in the aorta side using a Dacron patch, and the left ventricle side using a portion of aneurysmal wall.

Histopathologic examination showed foci of elastic fibers, but no evidence suggesting infective endocarditis.

The postoperative course was uneventful, and elective aortogram (Fig. 3B) one month later showed a slight residual aortic regurgitation without an aneurysmal cavity. Two months later, the patient returned to work in satisfactory condition.

DISCUSSION

To our knowledge, aneurysm of the coronary cusp has not been reported previously in the world literature. We believe that this case demonstrates the same clinical manifestations as aneurysm of the coronary sinus of Valsalva protruding or rupturing into the

left ventricle.

Howard et al¹ have recommended operation on aneurysms of the coronary sinus of Valsalva only in the event of rupture. However, most authors²⁻⁴ advise elective repair of an unruptured aneurysm, even when it is asymptomatic and has been detected incidentally, as rupture can result in severe cardiac failure, chest pain and occasionally death.

Aneurysms of the coronary sinus of Valsalva are congenital in the majority of cases, but other etiologies include trauma, endocarditis and cystic medial necrosis^{1,5,6}. Edwards and Burchell⁷ pointed out a lack of continuity between the media of the aortic wall and the annulus. Taguchi et al⁸ have hypothesized a developmental structural defect in the aortic annulus itself. However, this patient had an exceptional rare type of aneurysm which did not arise from the aortic wall or annulus, but from the coronary cusp itself. Although this aneurysm was possibly caused by infective endocarditis, pathological examination showed no evidence of it. It seems likely that such aneurysms are due to inherent weakness in the coronary cusp related to local forces and the presence of an anatomically abnormal aortic valve cushion associated with the bulbospinal septum, rather than a congenital defect.

Echocardiography and aortography are helpful diagnostically, especially echocardiography which can be performed noninva-

sively without any risk to the patient. In this patient, the narrow left ventricular outflow in systole due to the aneurysm may explain the left ventricular hypertrophy and cardiomegaly. We can not explain why the electrocardiogram revealed abnormal Q waves and ST elevations in leads V_{1-4} since the patient had no episodes of myocardial infarction in the past, and left ventricular contraction and coronary angiogram showed normal findings. The atrioventricular block suggested aneurysmal compression to the septum.

If such cases take the same clinical course as aneurysms of the coronary sinus of Valsalva protruding into the left ventricle, congestive heart failure, bacterial endocarditis, and less frequently heart block, are major causes of death, before operative treatment is available. Cases of myocardial infarction caused by coronary artery compression from such aneurysms have also been reported.⁹⁻¹¹ Progress in cardiopulmonary bypass and myocardial protection have made the safe surgical correction of this anomaly feasible, justifying an aggressive attitude towards surgical repair. In this patient, as surgical repair using Dacron patch was incidentally successful, aortic valve replacement was not required.

REFERENCES

1. HOWARD JR, MOLLER J, CASTANEDA AR, VARCO RL, NICOLOFF DM: Surgical correction of sinus of Valsalva aneurysm. *J Thorac Cardiovasc Surg* **66**: 420, 1973
2. KERBER RE, RIDGES JD, KRISS JP: Unruptured aneurysm of the sinus of Valsalva producing right ventricular outflow obstruction. *Am J Med* **53**: 775, 1972
3. SAKAKIBARA S, KONNO S: Congenital aneurysms of the sinus of Valsalva: a clinical study. *Am Heart J* **63**: 708, 1962
4. MAYER JH, HOLAER TM, CANENT RV: Isolated, unruptured sinus of Valsalva aneurysm. *J Thorac Cardiovasc Surg* **69**: 429, 1975
5. SHUMACKER H: Aneurysms of the sinuses of Valsalva secondary to bacterial endocarditis with special reference to their operative management. *J Thorac Cardiovasc Surg* **63**: 896, 1972
6. HOLMES EC, BREDENBERG CE, BRAWLEY RK: Aneurysm of the sinus of Valsalva resulting from bacterial endocarditis. *Ann Thorac Surg* **15**: 628, 1973
7. EDWARDS JE, BURCHELL HB: The pathological anatomy deficiencies between the aortic root and the heart, including aortic sinus aneurysms. *Thorax* **12**: 125, 1957
8. TAGUCHI K, SASAKI N, MATSUURA Y, UEMURA R: Surgical correction of aneurysms of the sinus of Valsalva. *Am J Cardiol* **25**: 474, 1970
9. HIYAMATA K, OHTSUKI T, SHIMAMATSU M, OHKITA Y, TERASAWA M, BEKKI H, TOSHIMA H, UTUSU F, OHISHI K, KOGA M: Aneurysm of the left aortic sinus causing myocardial infarction. *Circulation* **67**: 1151, 1983
10. OLSEN J: Aneurysm of the aortic sinus of Valsalva. A case of rupture and myocardial infarction. *Acta Pathol Microbiol Scand* **76**: 12, 1969
11. ROBERT TF, PHILLIP G, NAVIN CN: Rapid expansion of a saccular aneurysm on the left coronary sinus of Valsalva. *Br Heart J* **54**: 442, 1985

1. HOWARD JR, MOLLER J, CASTANEDA AR,