Case Reports

Non-Infected False Aneurysm of the Ascending Aorta
Eight Years After Aortic Valve Surgery

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SUMMARY

In this report, the development of false aneurysm of the ascending aorta 8 years following the repair of congenital aortic stenosis is described. A 14-year-old male patient was found to have congenital aortic stenosis in 1966 after medical check-up and subsequently operated upon. In the postoperative period, he was complicated by remittent fever of 1 month's duration, which was finally controlled by antibiotics. Arterial blood cultures taken on a few occasions were negative. Eight years and 5 months after surgery, he was noticed to have a mediastinal mass around the base of the heart and the presence of false aneurysm was confirmed by aortography. Aneurysmectomy was carried out almost 9 years after the previous operation, and it was found that aneurysm was arising from the suture line of the aortotomy with communication to the aorta at the bottom of the aneurysm. Postoperatively, patient’s recovery was uneventful and was discharged on the 23rd postoperative day.

Etiology, timing of operation and techniques utilizing hypothermia and/or circulatory arrest are discussed.

Additional Indexing Words:
Etiology of aneurysm        Aneurysmectomy

When a mediastinal mass was found around the base of the heart in the course of follow-up period after aortic valve surgery, it may suggest the occurrence of aneurysm secondary to needle puncture, cross-clamping of the aorta and infection. In such a case, firstly, the location and size of aneurysm, and its involvement to the surrounding organs should be estimated. Secondly, especially in a patient with prosthetic cardiac valve, the presence of bacterial or fungal endocarditis and its valvular involvement should be considered before performing a suitable operation. In this report, the develop-
ment of false aneurysm of the ascending aorta 8 years following the repair of congenital aortic stenosis is described.

CASE REPORT

First admission: K. Y., a 14-year-old male was admitted to the University Hospital with chief complaints of palpitation and dyspnea on exercise on February 15, 1966. He was found to have heart murmur at medical examination at the age of 6. Thereafter, because of heart murmur, he had been prohibited to practice gymnastics during school days. He had undergone a diagnostic evaluation and the findings indicated systolic pressure difference of 70 mmHg between the left ventricle and the aorta. In view of this, congenital aortic stenosis was confirmed, and surgical treatment was performed on March 1, 1966. The operation was carried out through a mid-sternal incision and transverse aortotomy was placed after total cardiopulmonary bypass was established. The right and left coronary leaflets were fused and formed the bicuspid aortic valve. The respective commissures were opened and the aortic valve area was widened from 1.1 to 2.0 cm². The incision in the ascending aorta was closed with a continuous running suture of No. 4-0 arterial silk. Two interrupted sutures were added at 2 places. Following adequate control of bleeding the operative wound was closed. Tracheostomy was performed as a preventive procedure. Postoperative course was complicated by temporary seizures and remittent fever up to 39°C for about 1 month. However, fever was finally controlled by Cephalosporin and arterial blood cultures taken on a few occasions were negative.

Second admission: after aortic valve surgery, he was followed occasionally in the Outpatient Clinic and remained well except for slight easy fatigability. However, routine roentgenogram in August, 1974 revealed a mediastinal mass, protruding to the right lung field around the base of the heart, and a tentative diagnosis of false aneurysm was made. Aortography performed on September 18 confirmed the diagnosis and then he was readmitted to the University Hospital to have surgery on February 24, 1975.

Physical examination revealed a slender, alert, healthy-looking young man. Temperature was 36.5°C, pulse rate 58 per minute, and blood pressure 120/70 mmHg. The head and neck were negative. The lungs were clear. The heart was normal, and a grade 3 systolic murmur and a grade 2 diastolic murmur were audible along the left sternal border in the 2-3 intercostal spaces, with transmission of systolic murmur to the neck. The second sound was normal. Blood and urine specimens were not remarkable, and other examinations including serum electrolytes, liver and renal function tests, serological tests for inflammation, and serological tests for syphilis were all within normal limits. X-ray films of the chest demonstrated normal cardiac contour, with a semicircular, smooth mass around the base of the heart towards the right lung field in the frontal view (Fig. 1), and the protrusion of the mass beneath the sternum was noted in the lateral view (Fig. 1). An electrocardiogram revealed a normal sinus rhythm at a rate of 58, an electric axis of +75° and left ventricular hypertrophy. The aortography demonstrated the presence of oval aneurysm in the right lung field with an opening to the aorta just above the orifice of the right coronary artery in the A-P view (Fig. 2), and forward
protrusion of aneurysm beneath the sternum. No regurgitation from the aortic valve was recognized, and coronary arteriogram was estimated to be normal (Fig. 2). Operation was performed on March 11, 1975 under surface cooling down to rectal temperature of 31°C and total cardiopulmonary bypass. Following the completion of surface cooling, the mid-sternal incision was reopened. The false aneurysm was found to be adherent to the sternum, right anterior chest wall and to adjacent structures. No pulsation was palpable. Then, cardiopulmonary bypass was started and an incision for aneurysm was placed after the aortic cross-clamping. On opening the aneurysm, massive laminated clot was noted and removed, and an opening to the aorta, 3 mm in diameter, was recognized at the bottom of the
aneurysm. The edge was thickened and hard. Then aortic valve was explored and found to be bicuspid but pliable in appearance. After closure of the defect with Teflon patch, a piece of m. rect. abdom. was plugged over the bleeding points of

Fig. 3. Aneurysm at operation.
Details: See text.

Fig. 4. Schematic representation of operative procedure.
suture line, and then the remnant of the aneurysmal sac was approximated to cover it (Figs. 3 and 4). Postoperatively, his recovery was uneventful and he was discharged on the 23rd postoperative day.

**Discussion**

False aneurysm of the aorta following aortic valve surgery arises as a result of needle puncture of the aorta to evacuate intracardiac air trapped during open heart surgery or leak in the suture line. Campbell,1) Eliot et al,2) Windsor and Shanahan3) has reported respective cases which were confirmed at the second operations or by autopsy findings. Bleeding from the aortic suture line during operative period is one of the most troublesome problems in case of aortic valve surgery. However, late bleeding is less common, although it may occur with much greater frequency than is reported on the literature. It is also quite rare to demonstrate the presence of false aneurysm 8 years after aortic valve surgery like our case described here.

As etiology, there might be some weak focus to make aneurysm postoperatively and thereafter it has expanded gradually its size to the point which may be recognizable on the film of the chest. In general, weakness will be induced at operation by tying sutures too tightly with consequent necrosis and tearing of the aortic wall, and by using many superficial, closely placed suture.4)

In addition, Eliot et al2) pointed out the participation of mediastinal infection to the process of tearing of the aortic wall, though by the time of death no signs of active inflammation remained. Mulder and Johnson5) also cited that one of Windsor and Shanahan’s cases presumably arose from infection of suture material with aortic opening along the suture line. Actually, cases described by Lopez and Dolbel,6) and Myers et al7) developed mycotic aneurysm of the ascending aorta arising from the suture line of the aortotomy site following infection of the sternum. The contribution of infection around the aortotomy should be kept in mind as additional cause of aneurysmal formation.

Consequently, systemic antibiotic therapy should be continued in the postoperative period with a concrete schedule. As to techniques, Eliot et al2) proposed the use of only a purse-string of very fine silk or enlargement of the needle puncture into a linear incision of the aorta which is followed by closure of the aortic opening with everting sutures. Windsor and Shanahan3) avoided indiscriminate needling of the ascending aorta in order to evacuate air and reinforced all aortic suture line with a Teflon buttress. Also, there may be other several ways for surgeons to prevent this undesirable complication.

Although the timing of operation must be considered from point of natural
history, and careful follow-up of clinical findings and lesions, a report of Fleming and Green\textsuperscript{8} on 43 patients with traumatic aneurysm of the thoracic aorta will give a clue to decide the timing. As a conclusion, because of low morbidity and mortality under elective repair, and of avoidance of unexpected instability of aneurysm which will sometimes results in leak and rupture, they recommended elective repair of all chronic traumatic aneurysm of the thoracic aorta at the time of discovery unless specific contraindications exist.

In our case, aneurysm was repaired using combination of surface cooling and total cardiopulmonary bypass. Lillehei et al\textsuperscript{9} described a method of partial cardiopulmonary bypass, hypothermia, and total circulatory arrest to save life-threatening cardiac lesions including ruptured mycotic aortic aneurysm, and under the circulation arrested, especially in case of otherwise invariably fatal emergency, the wound can be opened with little loss of blood, even when the aneurysm is entered, and mobilization and closure of the aorta can be performed without difficulty. The idea will be modified in various situation from hypothermia utilizing simple surface cooling to the technique of Lillehei et al depending on the condition, location, size of aneurysm and its grade of the involvements to other structures which will define operative complexity.

\textbf{References}