Fistulous Communication of Aortic Sinuses into the Cardiac Chambers

Fifteen Years Surgical Experience and a Report of 23 Patients

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SUMMARY

Over the past 15 years 23 patients, aged 14–50, with aortic sinus-cardiac chamber fistulous communication have been operated upon. All were symptomatic and had angiographic evaluation before surgery. The last 5 were diagnosed by two-dimensional echocardiography. The origin of the fistula was the right aortic sinus in 22 and the non-coronary sinus in 1. The involved cardiac chamber was the right ventricle in 18, right atrium in 3 and left ventricle in 2. Associated lesions were ventricular septal defect (VSD) in 9, ventricular septal defect + atrial septal defect (VSD + ASD) in 1, ventricular septal defect + pulmonary stenosis (VSD + PS) in 1, atrial septal defect (ASD) in 3 and congenital aortic stenosis (AS) in 1. At surgery both the aorta and involved cardiac chamber were opened. No recurrence was encountered when the fistula was repaired using teflon felts on both ends. Three patients, 2 of whom had been operated upon before the use of cardioplegic arrest, died (13%).

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IN 1831 James Hope was the first to describe an aneurysm of a sinus of Valsalva which had ruptured into the right ventricle. Thurnam, 9 years later, reported another one and in the following 100 years 18 similar cases were reported. However, in the succeeding years the number has increased significantly due to great advances in the methods of diagnosing heart diseases. The first successful surgical correction was reported in 1957.

Although all authorities agree on surgical treatment when an aortic sinus ruptures into a cardiac chamber, the method of surgical approach is still controversial.

In this manuscript we review our 15 years experience in patients with abnormalities of the sinus of Valsalva with fistula into a cardiac chamber and discuss the necessity of complete evaluation of the aortic sinuses, and our surgical approach.

SUBJECTS AND METHODS

Between the years 1970 and 1985, 23 patients, 16 males and 7 females, were operated upon for fistulous communication of the aortic sinus at the
Higher Specialization Hospital of Turkey (TYIH). Their ages were between 14 and 50 years (average 29). All patients were symptomatic, and after admission to the hospital, angiographic studies were performed in all. The last 5 patients were diagnosed by two-dimensional echocardiography.

The fistula originated from the right sinus of Valsalva in 22 and from the non-coronary sinus of Valsalva in 1 patient. There was a right coronary sinus-right ventricle communication in 18, right coronary sinus-right atrium in 3, right coronary sinus-left ventricle in 1 and non-coronary sinus-left ventricle in 1. Associated lesions were VSD in 9, VSD+ASD in 1, VSD+PS in 1, ASD in 3 and congenital AS in 1. All of the fistulas but 2 were congenital in origin. In 1 of them a fistulous communication between the non-coronary sinus and left ventricle had occurred as a result of a subvalvular membrane resection for subvalvular aortic stenosis. A second was due to bacterial endocarditis. In one patient (Fig. 1), the course of the fistula was very unusual, originating from the right coronary sinus, forming a sac and descending through the lateral border of the left ventricle along the obtuse marginal artery, making another sac at the apex of the left ventricle, and consequently opening into the right ventricle.

Tables I and II describe the patients.

Conventional cardiopulmonary bypass techniques were used in all cases. The first 5 patients were operated upon using anoxic cardiac arrest, and the

<table>
<thead>
<tr>
<th>Communication</th>
<th>Number of patients</th>
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<tbody>
<tr>
<td>Right coronary sinus-right ventricle</td>
<td>18</td>
</tr>
<tr>
<td>Right coronary sinus-right atrium</td>
<td>3</td>
</tr>
<tr>
<td>Right coronary sinus-left ventricle</td>
<td>1</td>
</tr>
<tr>
<td>Non-coronary sinus-left ventricle</td>
<td>1</td>
</tr>
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Table II. Associated Lesions

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSD</td>
<td>9</td>
</tr>
<tr>
<td>VSD+ASD</td>
<td>1</td>
</tr>
<tr>
<td>VSD+PS</td>
<td>1</td>
</tr>
<tr>
<td>ASD</td>
<td>3</td>
</tr>
<tr>
<td>Congenital AS</td>
<td>1</td>
</tr>
<tr>
<td>AI</td>
<td>4</td>
</tr>
</tbody>
</table>

VSD = ventricular septal defect; ASD = atrial septal defect; PS = pulmonary stenosis; AS = aortic stenosis; AI = aortic insufficiency.
remainder with cold chemical cardioplegia. During surgery the aorta was opened and inspected, and then the involved cardiac chamber opened. In 12 cases the involved aortic sinuses were completely normal and in 11 they were slightly enlarged. In 1 patient a prolapsed right coronary sinus was resected and repaired with a dacron patch.

Aortic valve replacement was performed in 4 patients for aortic insufficiency. We repaired the fistulous communication at the aortic site in the first 10 patients with buttressed teflon felt. However, after we had observed 3 recurrences, one in a patient who had been operated upon at another hospital where the fistula had been repaired by simple sutures at the aortic sinus, we had changed our surgical technique and began to repair the fistula on both ends with buttressed teflon felt. Utilizing this technique, we did not encounter any recurrences in the next 13 patients.

There were 3 deaths. Two which occurred during the period in which we had been using anoxic cardiac arrest were due to low cardiac output and refractory ventricular fibrillation. There was only one operative death, which was due to air emboli, in the following 18 patients (5.5%). Total operative mortality was 13%.

DISCUSSION

Early publications implicate bacterial infections as the cause of aneurysm of the sinus of Valsalva but currently it is believed that most such aneurysms are congenital in origin. A few cases of aortic sinus of Valsalva with fistulous communication caused by penetrating trauma and bacterial endocarditis have been reported. Edwards and Burchell provided histologic evidence that the lesions resulted from an anatomic defect in the elastic tissue between the base of the aorta and the annulus fibrosus.5) Another proposal from Van Praagh and McNamara is based on the deficiency of the conal septum as a cause of aneurysm of the aortic sinus.6)

Although most of the symptomatology is related to heart failure which is caused by the rupture and fistulous communication of the aortic sinuses into the cardiac chambers, encroachment of the sinus aneurysm on the cardiac structures produces some different symptoms; additionally patients may suffer from arrhythmia or coronary stenosis.7),8)

Echocardiography is very helpful in diagnosing the aortic sinus fistula.9)–11) The last 5 patients in our group were diagnosed by two-dimensional echocardiography before angiographic study.

There is no question that patients with fistulous communication into the cardiac chambers should be treated surgically, however, the surgical approach
is still open to discussion. Some surgeons prefer to open the aorta and repair
the fistula, while others open only the cardiac chamber involved. In the
light of our 15 years of surgical experience, it is our opinion that both the
aorta and involved cardiac chamber should be opened and repair should be
done on both ends by buttressed teflon felt. By this approach we are able to
evaluate any aortic valve pathology and the aortic sinuses completely, and
ensure complete repair. Aortic sinus pathology must be inspected carefully
because, as in 12 cases in our group, the aortic sinuses may be found to be
completely normal even in the presence of a fistula, or the fistula may be
associated with sinus prolapsus or with an aneurysm which, to some extent
requires excisional surgery. The 3 recurrences in the group support this
because in all of them the fistula had been repaired only by the aortic
approach. We have seen no recurrence in patients treated by repair of both
ends of the fistula by buttressed teflon felt. This surgical approach is also
supported by some surgeons who have had experience with large numbers of
patients.

Aortic sinus aneurysm is a rare abnormality and the total number of
reported patients is not large. Among 4380 patients who underwent cardiac
surgical procedures employing cardiopulmonary bypass at The TYIH from
1970 to 1985, 23 had a fistulous communication of the aortic sinuses to the
cardiac chambers; this represents an incidence of 0.4% which is similar to
that reported by the Texas Heart Institute. Some of the large series
reported also included aortic sinus aneurysm without fistula in the groups.
From the Methodist Hospital, 35 patients were reported by De Bakey et
al, among whom aneurysm with fistula was observed in 4 and only fistula
in 3. From The Texas Heart Institute 45 patients were reported among
whom 23 had fistulous communication into the cardiac chamber and from
the Mayo Clinic 21 cases with aortic sinus fistula were reported. Our
group of 23 cases with fistula is one of the largest reported in the literature.

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