RIGHT VENTRICULAR ANEURYSM DUE TO MYOCARDIAL FATTY INFILTRATION

—Report of a Case—

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A case of right ventricular aneurysm due to myocardial fatty infiltration was reported. A 39-year-old man was admitted to our hospital for evaluation of several episodes of syncopal attack presumably induced by malignant arrhythmia. There were frequent observations of ventricular premature beats, which occurred occasionally in couples. Cardiac catheterization disclosed the aneurysm situated at the outflow tract of the right ventricle. Aneurysmectomy was performed and the ventricular premature beats and syncopal attacks were effectively abolished. Etiology of the aneurysm was proved to be a fatty infiltration in the myocardium. To the best of our knowledge, there has been no case report of right ventricular aneurysm due to fatty infiltration in the myocardium.

Left ventricular aneurysm is a relatively common sequela of myocardial infarction. In contrast, right ventricular aneurysm is rare and coronary artery disease is not thought to be an important etiological factor. The majority of right ventricular aneurysms occur following surgical and non-surgical trauma which involve the right ventricle. Right ventricular aneurysm due to fatty infiltration has not been reported as far as we know. We describe one case in which surgical resection of the aneurysm was successfully performed.

**CASE REPORT**

A 39-year-old man was admitted to Kagoshima University Hospital on December 13, 1979, complaining of several syncopal attacks, palpitations and a feeling of "pressure" in the chest. Eleven years before, he experienced episodes of syncopal attack and palpitation for the first time. At that time, he was admitted to our hospital for 20 days, where his electrocardiogram showed symmetrically inverted T waves in leads V1 through V5, and was interpreted as indicating ischemic heart disease. Two months prior to the present admission, he had had an especially severe episode of palpitation with left precordial oppression and an episode of unconsciousness for a brief period. The patient has smoked two packages of cigarettes daily and consumed two bottles of beer daily for many years. There was

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neither a past history of hypertension, diabetes mellitus nor any family history of heart disease.

Physical examination disclosed a well-developed man without acute distress. His height was 164 cm and his body weight 62 kg. He had a body temperature of 36.7°C, a pulse rate of 90 beats per minute and a respiration rate of 20 times per minute. His blood pressure was 120/85 mmHg. The cervical veins were not distended. The lungs were clear on percussion and auscultation. The heart was not enlarged and its rhythm was regular; murmur, thrill or friction rub were not found. Abnormal precordial heave or thrill was not observed. The liver was not palpable. There was no edema, cyanosis or clubbing. The urine was normal. His hemoglobin was 17.1 gm/dl, and his white blood cell count 6200/mm³ with 58% neutrophils. Erythrocyte sedimentation rate was 20 mm (one hour). The total cholesterol was 170 mg/dl, the triglyceride 141 mg/dl and the fasting blood sugar 91 mg/dl.

His present electrocardiogram was nearly the same as that taken 11 years before (Fig. 1). Namely, there were symmetrically inverted T waves in leads V₁ through V₅. There were no abnormal Q wave. The P waves were normal. A 24-hour Holter electrocardiogram demonstrated frequent ventricular premature beats, which occasionally occurred in couples. The focus of the ventricular premature beats was thought to be at the right ventricle, because the QRS complex of the premature beat showed a left bundle branch block pattern. His chest X-ray revealed a slightly enlarged main pulmonary trunk with normal pulmonary vasculature and clear lung fields. The cardio-thoracic ratio was 56% (Fig. 2).

An echocardiogram showed the enlarged right ventricular cavity (Fig. 3). The right ventricular dimension along the short axis at the level of the mitral valve in an M-mode echocardiogram was more than 40 mm. An angiocardiogram of the right ventricle revealed a moderately enlarged

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right ventricular outflow tract with a tubular appearance (Fig. 4, left panel). A left ventriculogram disclosed a small aneurysmal protrusion of the left ventricle near the apex (Fig. 4, right panel). A selective coronary arteriogram was normal. Hemodynamic parameters obtained by cardiac catheterization were as follows: 3 mmHg of right atrial mean pressure, 23/7 mmHg of right ventricular pressure, 22/11 mmHg pulmonary arterial pressure and 3.51 L/min/m$^2$ of cardiac index.

Because various antiarrhythmic agents had failed to abolish the ventricular premature beats, surgery was performed on January 25, 1980. The heart was exposed by a midsternal incision. The right heart was enlarged with massive fatty deposits on its entire free wall. The right ventricular free wall, particularly the outflow tract region, showed a dyskinetic movement. By the cardiopulmonary bypass procedure, the right ventricle was opened vertically in the midst of its outflow tract. Fatty infiltration was diffuse and had moved up to the inner surface of the right ventricle. The posterior interventricular septum and the papillary muscle of the tricuspid valve were also involved. A small infiltration area was found in the left ventricle close to the apex, where the cavity protruded like an aneurysm. There was no evidence of myocardial infarction. A 10 × 3 cm width of the right ventricular outflow tract having fatty infiltration was resected and the defect was closed by multi-U shaped sutures and reinforced by a Teflon patch. His recovery was uneventful. He was discharged and has remained well up to the present time.

Histologically, the resected right ventricular tissue consisted almost totally of fatty tissue and fibrous tissue (Fig. 5). In the residual small area of the myocardium, eosinophilic change of the muscle cells with nuclear pyknosis was observed. In addition, some vacuolar degeneration was recognized.

DISCUSSION

The majority of cardiac ventricular aneurysms are the result of myocardial infarction. Because of the almost exclusive occurrence of myocardial infarction on the left side of the heart, most aneurysms are found on the left ventricle. Rare causes of left ventricular aneurysms are as follows: congenital defects of the myocardium, surgical or non-surgical trauma, rheumatic myocarditis, gummatous (syphilitic) myocarditis, granulomatous myocarditis, cardiac sarcoidosis, myotic myocardial infarction, and cardiomyopathy.

Aneurysm of the right ventricle is an extremely rare disorder, and coronary artery disease is not thought to be an important etiological factor. The majority of right ventricular aneurysms follow to surgical or non-surgical trauma, which involves the right ventricle. On rare occasions, a selective right-sided angiography induces right ventricular aneurysm. In addition to those of traumatic origin, cases of congenital diverticulum in the right ventricle and atrumatic right ventricular aneurysm presumably due to an inflammatory process have been reported. Ventricular aneurysm of both the right and left ventricles and that caused by fatty infiltration have not been reported to our knowledge.

Two varieties of fatty change may occur in the heart: fatty infiltration and fatty degeneration. This classification is useful, because clinical, pathological and etiological differences exist between these two conditions. Fatty infiltration is a condition of excessive accumulation of fat in the connective tissue fiber between the parenchymatous cells of organs.

The parenchyma is abnormally separated by the accumulated fat. Therefore, it may be a subject to some interference of its function and tend to atrophy. Myocardial fatty infiltration is...
an uncommon autopsy finding with an overall incidence rate of approximately 3%, and is more common in women. It is found chiefly in the subepicardium of the right ventricle and is often associated with excessive epicardial fat deposits.

Substantial fat deposits in the cardiac interatrial septum have been designated "lipomatous hypertrophy of the interatrial septum".

Fatty infiltration in the heart rarely causes actual clinical signs and symptoms, but right-
sided heart failure, cardiac arrhythmia, and conduction defect due to fatty infiltration into the conduction system have been reported. Only on rare occasions has sudden death due to cardiac rupture or conduction defect been described. However, right ventricular fatty infiltration has never been diagnosed in a living patient because of a lack of its specific clinical pictures. The present case was correctly diagnosed by surgical intervention. Left ventricular aneurysmectomy as a cure for intractable ventricular arrhythmia has often been reported, but there are very few reports concerning the right ventricular aneurysmectomy for this purpose. Our case had several episodes of syncopal attack. These attacks are thought to have been induced by a brief episode of ventricular fibrillation, because ventricular premature beats, occasionally occurring in couples, were observed frequently. In our case, right ventricular aneurysmectomy abolished the frequently occurring ventricular beats and syncopal attacks, and is therefore thought to have been an effective treatment.

As to the etiology of fatty infiltration in the myocardium, obesity, diabetes mellitus and alcohol consumption are thought to be contributing factors. In our case, etiology of the fatty infiltration in the myocardium is not clear, but alcohol consumption may have contributed partially to the present disease process.

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REFERENCES

7. ABRAMS D, BARTON CJ, COCKSHOTT WP, EDINGTON GM, WEAVER EJM: Annular subvalvular left ventricular aneurysms. Quart J
10. BURN CG, HOLLANDER AG, CRAWFORD JH: Rare cardiac aneurysm in a child. Am Heart J 26: 415, 1943
11. BRAUNSTEIN AL, BASS JB, THOMAS S: Gummatous myocarditis and aneurysm of the left ventricle. Am Heart J 19: 613, 1940
23. PAGE DL: Lipomatous hypertrophy of the cardiac interatrial septum: Its development and probable clinical significance. Hum Path 1: 151, 1970