MUSICAL COOING MURMURS IN DEGENERATED PORCINE VALVES

—A Report of Three Cases—

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Three cases with typical cooing murmurs in degenerated porcine valves at mitral positions were studied. An echophonocardiogram disclosed that the origin of cooing murmur was due to cusp vibration with fixed cycle in frequency. Three failed xenografts were replaced with mechanical valves and the removed prostheses were examined. The first valve had a torn cusp, the second had a perforated cusp and the third had both a torn and perforated cusps. The failed leaflets were all pliable and not thickened in properties. These common findings are suspected to relate closely to the occurrence of a musical cooing murmur. Since all cases with cooing murmurs suddenly developed severe or progressive heart failure, we recommend prompt evaluation and reoperation when a cooing murmur appears in the patients with xenografts.

In three cases, musical cooing murmurs of bioprosthetic valves developed 8, 9 and 10 years after mitral valve replacements. Two cases suddenly developed severe congestive heart failure due to acute mitral regurgitation. In the third case there was a change in heart sound while symptoms of palpitation and dyspnea progressed. All cases had no episodes of fever.

Failed prostheses were replaced with mechanical valves and all three cases took uneventful postoperative courses. A tear and/or a perforation on a pliable cusp was a common finding in the removed xenografts with musical cooing murmurs.

Case 1: A 55 year-old man, who received mitral valve replacement with a Carpentier-Edwards valve (31-M) 8 years ago, developed sudden hemodynamic deterioration. He became orthopnoic with lung congestion. ECG revealed atrial fibrillation and an X-ray film showed cardiac enlargement of 62% in cardiothoracic ratio. A loud systolic cooing murmur on the apex was ascertained as having had the cycle of 280/sec. An echocardiogram showed a prosthetic cusp prolapsed into the left atrium in systole. Vibration of prolapsed leaflet had the same cycle on the echophonocardiogram (Fig. 1-case 1). Preoperative cardiac catheterization disclosed mitral regurgitation with 44/15 mmHg in pulmonary artery pressure and 22 mmHg of v-wave in pulmonary wedge pressure (PAWP). The ventriculograms showed the 2nd grade regurgitation of mitral and tricuspid valves.

The implanted xenograft was replaced with a St. Jude Medical valve (29-M) and tricuspid annuloplasty was added. The resected prosthesis is shown in Fig. 2. There was a tear on one cusp along the edge fixed to the stent. The cusp had enough pliability without calcification.

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The xenograft was replaced with a Björk-Shiley valve (29-M) and a St. Jude Medical valve (31-M) was implanted on the tricuspid position. The removed porcine xenograft is shown in Fig. 3. Two perforations on one cusp were detected and the cusp pliability was maintained.

Case 3: A 31 year-old man was able to enjoy normal activity after mitral valve replacement (Carpentier-Edwards 31-M) for 10 years. He suddenly developed dyspnea and became orthopnoic. Under the diagnosis of congestive heart failure, he was given digitalis, diuretics and vasodilators. He recovered but remained in the grade III of NYHA classification. ECG revealed atrial fibrillation, a cardiothoracic ratio of 69% and the liver was swollen in 5 cm width on the right midclavicular line. A loud cooing murmur was heard at the apex. An echocardiogram showed the prolapsed cusp vibrating with a cycle of 300/sec which was accorded with a cycle of phonocardiogram (Fig. 1-case 3). Peak velocity of tricuspid valve regurgitation was 4.3 m/sec in doppler study indicating a high right ventricular pressure (84 mmHg).

The failed xenograft was replaced with a Björk-Shiley valve (29-M). Tricuspid annuloplasty with a Carpentier ring (34 mm) was added simultaneously. In the removed xenograft, one of cusps revealed a tear while the remaining two cusps had perforations (Fig. 4). Leaflets were pliable and soft without calcification.

DISCUSSION

A musical cooing murmur has a determined cycle in frequency and is distinguishable from a noisy murmur which relates to a broad spectrum of cycles in frequencies, phonocardiographically. A specific condition of vibrations of intracardiac structures produces those monotonic musical murmurs. Echophonocardiographic study in our three cases showed that a cooing murmur has a cycle in accordance with a frequency of cusp vibrations. Musical murmurs in native valve failures are relatively rare, but have been reported in aortic, mitral and tricuspid regurgitations, and more commonly in non-rheumatic aortic regurgitations with cusp tears or perforations. It is noteworthy that all reported and our failed xenografts with cooing murmurs were made of porcine aortic valves.

Some reports stressed the high incidence of cooing murmur in degenerated bioprosthetic valves. Stein et al. showed 4 cases with coo-
ing murmurs out of 41 failed xenograft valves (9.1%)\(^1\) In our experience, 21 cases with degenerated bioprostheses at mitral positions required replacements. Of these 3 cases were accompanied by typical cooing murmurs (14.3%). Our concern is to find out the pathologic conditions of valve properties that relate to a musical murmur. We found common characteristics in both clinical features and morphological changes of the valves between the reported and our cases:

1) Onset of symptoms or heart sound change was sudden in almost all cases; 2) A tear and/or perforation on the cusp was a common lesion, thereby all cases revealed valve regurgitations, and 3) the failed cusp was not thickened and its pliability was maintained without heavy calcification. The lesions in the prosthetic cusp are very similar to those of native aortic regurgitations with musical murmurs. Gabbay et al. reported seven cases of failed Ionescu-Shiley pericardial xenografts\(^9\)

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They noted a difference in murmur depending on the types of cusp rupture; that is, a regular regurgitant murmur appeared in a perforated cusp (Type I) and a "seagull" murmur (the same as a cooing murmur), in a torn or lacerated cusp (Type II). In our three cases, a cooing murmur was present in both types of lesions. In the other 18 degenerated bioprostheses without musical murmurs, we found similar lesions of 5 cusp perforations and 3 cusp tears with or without calcification. Therefore, findings of perforation or cusp tear do not always cause musical murmurs. However, our experiences suggest a close relationship between pathological findings of the cusp described elsewhere and the occurrence of typical cooing murmur of the prosthetic valve. Gaby et al. also speculated that Type I lesions progress in both directions rapidly resulting complete cusp ruptures which necessitate emergency operations. On the other hand, Type II lesions have chronic clinical course allowing elective operative procedures. Two of our cases with torn cusps suddenly developed severe congestive heart failures. The other case with perforated cusp complained of progressive heart failure. Therefore, prompt reoperation is recommended once a musical cooing murmur appears regardless of types of cusp rupture.

REFERENCES

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