

Long-term follow-up of myocardial perforation following trocar catheterization using two-dimensional and Doppler echocardiography: A case report

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Key words

Myocardial perforation
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Two-dimensional echocardiography

Color Doppler

Myocardial perforation was caused by trocar catheterization in a patient with purulent pericardial and pleural effusions and chronic renal failure. This patient was followed up for seven months by two-dimensional and Doppler echocardiography.

Case report

A 54-year-old woman was referred to Nampuh Hospital due to cardiac tamponade with pyopericardium treated with multiple pericardiocenteses. She had been treated for 10 years with hemodialysis for chronic renal failure.

On admission, emergency subxiphoid pericardiectomy with extrathoracic drainage was performed. Immediately after pericardial drainage, her symptoms and hemodynamic findings dramatically improved. On her 10th postadmission day, pericardiectomy was repeated due to recurrent pericardial and pleural effusions. A huge sac with a thickened wall was detected along the posterolateral surface of the left ventricle. A trocar catheter was inserted into the sac. Following drainage of pus and blood clots, fresh blood flowed from the trocar, and she went into shock. Immediately after the catheter was removed, the

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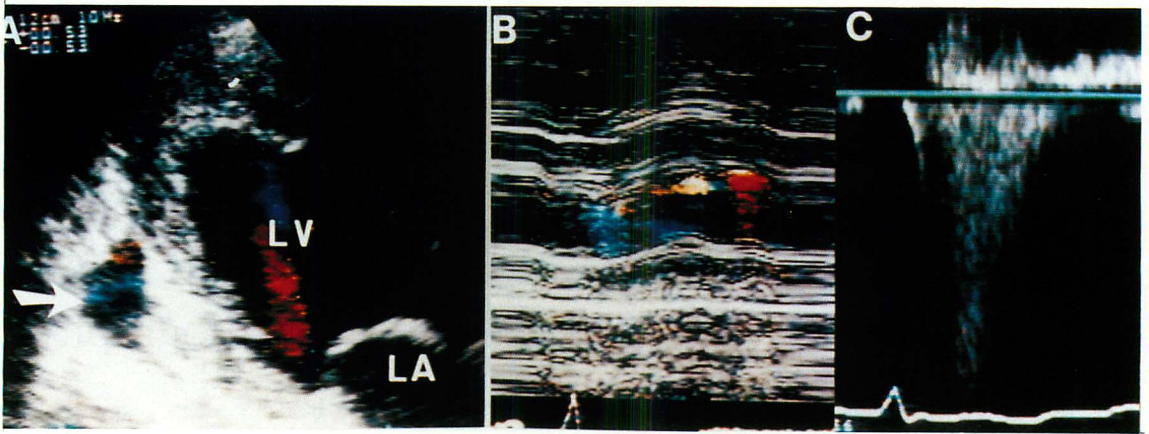


Fig. 1. Two-dimensional and Doppler echocardiograms of myocardial perforation induced by trocar catheterization.

Two-dimensional color Doppler echocardiogram (A) shows a pericardial sac with a shunt flow signal behind the left ventricular posterior wall (white arrows). M-mode color (B) and pulsed wave (C) Doppler echocardiograms demonstrate a flow in the pericardial sac directed away from the left ventricle (LV) in systole and toward it in early diastole.

LA=left atrium.

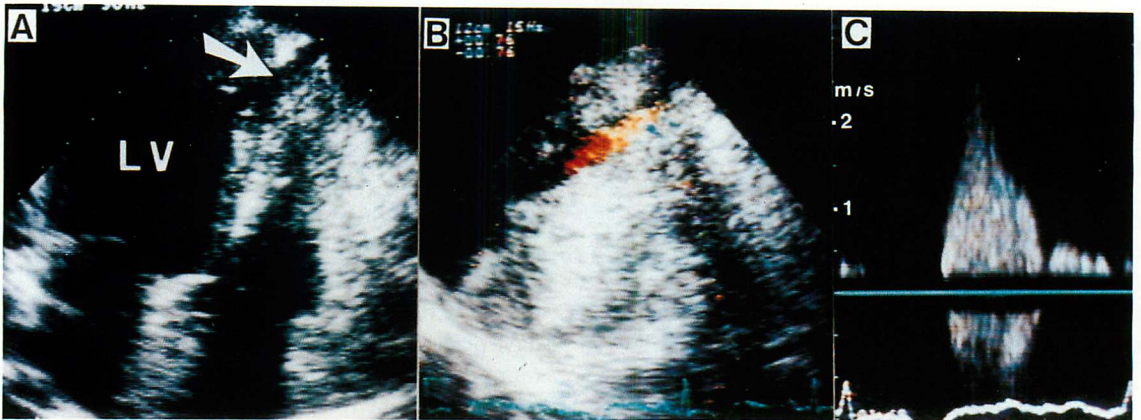


Fig. 2. Two-dimensional and Doppler echocardiograms of right ventricular perforation and an interventricular septal defect.

A white arrow indicates the perforation of the interventricular septum (A). Color Doppler echocardiogram demonstrates a shunt flow signal between the left and right ventricles (B). Pulsed wave Doppler echocardiogram shows the shunt flow directed from the left to the right ventricle in early and mid-diastole (C).

LV=left ventricle.

injured right ventricular wall was surgically repaired. Her postoperative course was uneventful except for a newly-developed Levine III/VI

systolic murmur and a Levine II/VI early diastolic murmur at the lower left parasternal border.

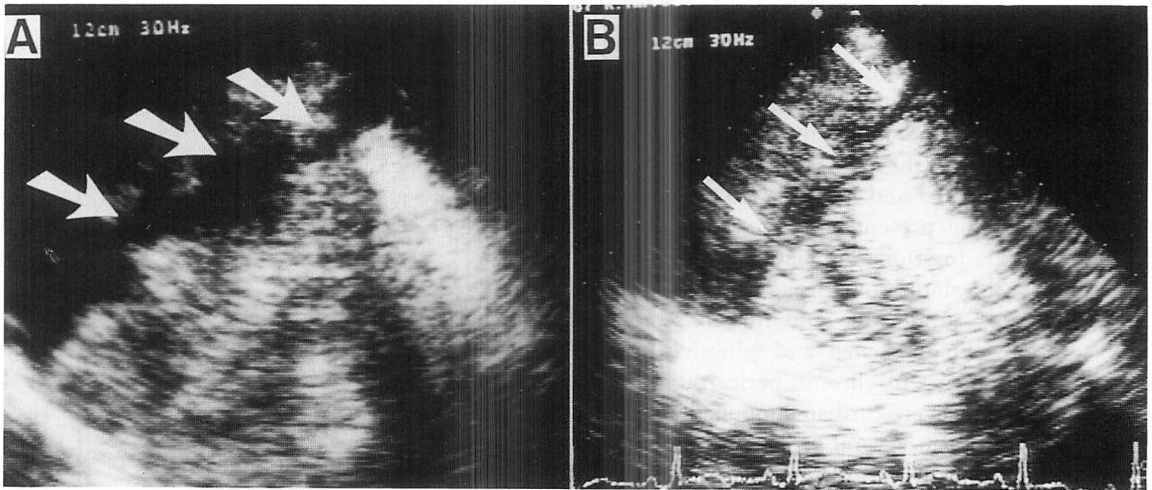


Fig. 3. The change in the penetrating wound during the follow-up study by two-dimensional echocardiography.

The trocar catheter track is more than 1 cm in diameter (A). After 7 months, it is significantly smaller (B).

Echocardiography after the perforation demonstrated normal sized cardiac chambers and good left ventricular function, but on the two-dimensional color Doppler echocardiogram, a loculated pericardial sac with a shunt flow signal was detected immediately behind the posterior wall of the left ventricle (**Fig. 1A**). M-mode color (**Fig. 1B**) and pulsed wave Doppler echocardiograms (**Fig. 1C**) showed that the flow in the pericardial sac was directed away from the left ventricle in systole and toward it in early diastole. In addition, perforations were detected in the right ventricular wall and the interventricular septum on the apical four-chamber view (**Fig. 2A**). The color Doppler echocardiogram demonstrated a shunt flow signal between the left and right ventricles (**Fig. 2B**). The pulsed wave Doppler echocardiogram recorded by placing the sample volume at the level of the perforated ventricular septum showed the shunt flow only in early and mid-diastole (**Fig. 2C**). In a more inferiorly-angulated view, a tunnel-like echo-free space suggesting the track of the trocar catheter was shown from the apex of the right ventricle to the posterior wall of the left ventricle through the interventricular septum (**Fig.**

3A). Both ends of the track were surrounded by the bulging pericardial sacs.

In spite of these complicating cardiac injuries and her renal failure, her condition gradually improved with conservative medical treatment and hemodialysis. The sizes of the myocardial perforations and surrounding sacs were gradually reduced and the shunt flow signal was also reduced. As shown in **Fig. 3B**, the sizes of the myocardial perforations were significantly reduced after seven months.

Discussion

Traumatic myocardial perforation has generally demanded aggressive management¹. There are some reports of conservative management for mild cases, of penetrating cardiac injuries². Spontaneous closure of traumatic ventricular septal defects (VSD) has been reported³. A small penetrating VSD less than one cm in diameter can close spontaneously by contraction of the surrounding viable myocardium or by clot formations⁴. In the present case, there were multiple injuries of both ventricular walls and the interventricular septum, and each perforation was more than one cm in diameter. Spon-

taneous decreases in sizes of perforations are quite different from myocardial ruptures associated with myocardial infarction. The difference seems to depend on the integrity of the surrounding myocardium. In acute myocardial infarction, the myocardium around the rupture is damaged and its ability to contract is impaired. In the present case the myocardium around the perforation was viable. This is one reason why the shunt flow through the VSD was observed only in diastole and not in systole. In addition, the thickened and adhesive pericardium secondary to chronic pericarditis may have prevented severe cardiac tamponade.

There have been several reports of penetrating cardiac injuries in which echocardiography was helpful in diagnosing and assessing the extent of damages^{5,6}. Two-dimensional and Doppler echocardiography are valuable tools for assessing cardiac injuries and shunt flow through perforation sites.

和文要約

トロッカール心カテーテルによる心筋穿孔：断層およびドップラー心エコー図法による長期追跡の1例

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10年来，慢性腎炎で血液透析を受けていた54歳女性が膿性心膜炎による心タンポナーデのため当科に入院した。心膜切開により好転したが，二度目の心膜切開時，左室背側部に大きな囊状突出部がみられ，トロッカールにて排膿したところ心

穿孔を生じた。右室傷害部は手術的に治療した。心エコー図で左室後壁に短絡血流シグナルを発見，それに伴うものと考えられる第3度の収縮期雑音と第2度の拡張早期雑音が聴取された。カラードップラー心エコー図法により，左室後壁の短絡血流は，収縮期に左室から囊状突出部へ，拡張期にはその反対方向へ向かう血流であることが示され，また心尖部心室中隔の短絡血流は拡張早～中期にのみ観察された。内科的治療6ヵ月後にはこれらの短絡血流はほとんど消失し，自覚的にも軽快した。

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