

Color Flow Signal in the Left Atrium as a Mirror Image Artifact Suggesting One Leaflet Constriction of the St. Jude Medical Valve: A Case Report

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Abstract

Color Doppler echocardiography detected an abnormal color flow signal originating from the prosthetic mitral valve and extending to the left atrium during diastole in an 84-year-old woman with St. Jude Medical valve replacement. The flow was away from the transducer and almost identical to the left ventricular inflow signal except for the direction. Cinefluoroscopy showed one of the leaflets fixed at systole whereas the other leaflet was mobile. After reinforcement of anticoagulant therapy, this abnormal color flow signal disappeared and motion of both leaflets normalized. This color flow signal, presumably a mirror image artifact of the left ventricular inflow caused by the immobilized leaflet, could be a sign of one leaflet constriction in patients with St. Jude Medical valve replacement.

J Cardiol 2000; 35(1): 55–58

Key Words

- Prosthetic valves (dysfunction)
- Echocardiography (transthoracic)
- Mitral valve (replacement)
- Thrombolysis

INTRODUCTION

Echocardiography is important for the diagnosis of prosthetic valve dysfunction. Diagnosis of stenosis of a prosthetic valve can usually be made based on increased flow velocity or changing flow pattern across the valve as well as motion of the leaflets^{1,2}.

We describe a case of valve thrombosis detected as a diastolic color flow signal in the left atrium in a patient with a St. Jude Medical valve dysfunction in the mitral position.

CASE

An 84-year-old woman was admitted to our hospital because of sudden onset of palpitation and dyspnea on exertion. The patient had undergone mitral valve replacement with a 27 mm St. Jude Medical valve 13 years earlier and had maintained sinus rhythm. On admission, heart rate was

140/min with atrial fibrillation. Her body surface area was 1.12 m². Transthoracic echocardiography showed a slightly enlarged left atrium and a peak transmitral flow velocity of 2.5 m/sec with prolonged deceleration time. A color flow signal originating from the mitral prosthesis and extending to the left atrium was seen only in the apical view, and was not visualized by transesophageal echocardiography. We administered urokinase for 4 days followed by anticoagulation with a prothrombin time of 27–30 sec for a diagnosis of thrombosed valve.

One week later, cinefluoroscopy showed that one leaflet was immobilized in all cardiac cycles but the other leaflet was mobile. The measured opening angle was 72 degrees and closing angle was 130 degrees (Fig. 1). However, the peak transmitral flow velocity had decreased to 1.5 m/sec. The pulmonary capillary wedge pressure was as low as 5 mmHg, so electrical cardioversion was performed

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Manuscript received July 12, 1999; revised September 20, 1999; accepted September 24, 1999

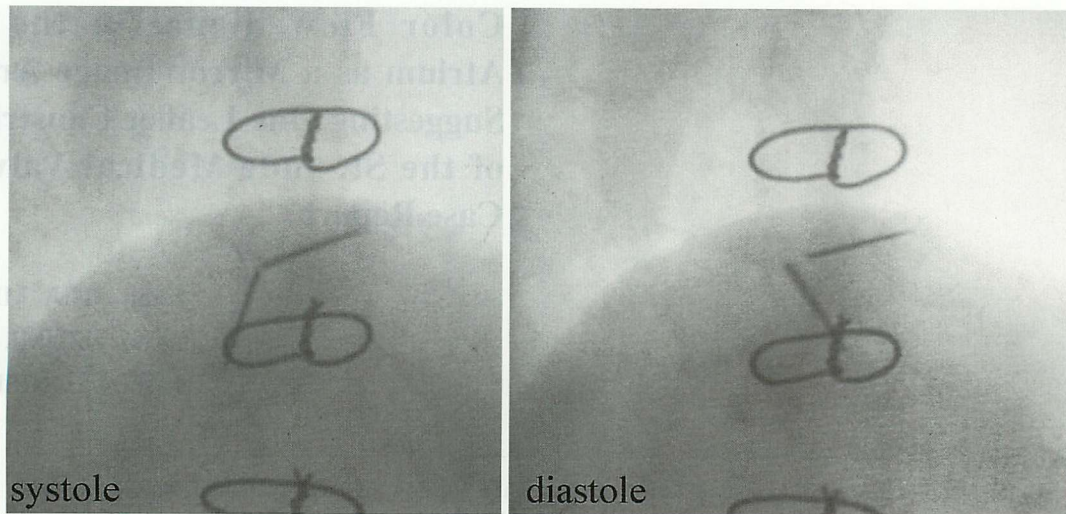


Fig. 1 Cinefluoroscopy scan showing one leaflet fixed during the entire cardiac cycle
Left: Systole. Right: Diastole.

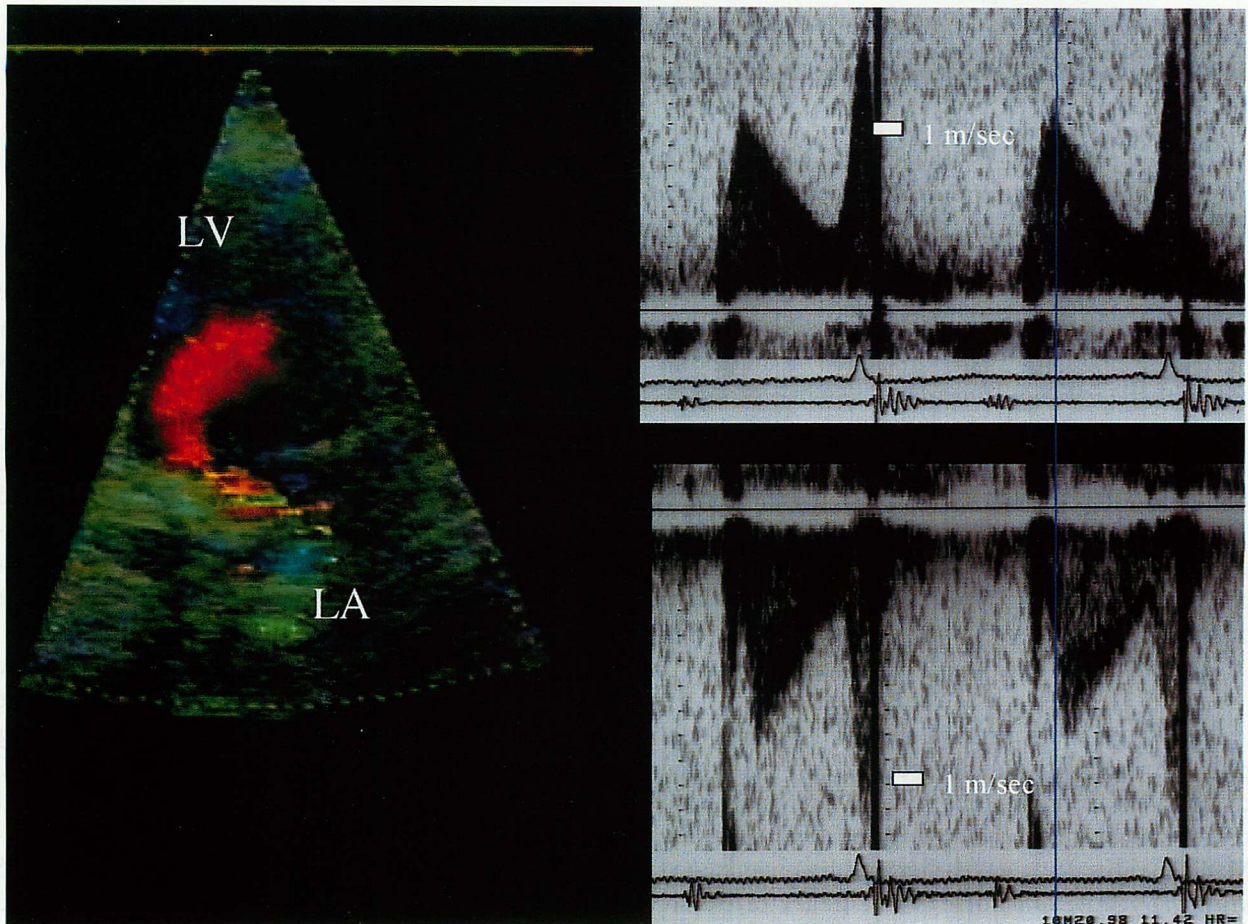


Fig. 2 Color echocardiogram showing an abnormal color flow signal in diastole from the prosthetic valve extending to the left atrium (left), and pulsed Doppler echocardiograms demonstrating a mirror image signal (right lower) almost identical to the left ventricular inflow (right upper) except for the direction
Blue line showing peak E wave. LV = left ventricle; LA = left atrium.

which resulted in the disappearance of palpitation and dyspnea. One week later, pulsed Doppler echocardiography showed that this color flow signal was directed away from the transducer and was almost identical to the left ventricular inflow signal except for the direction (Fig. 2). Time to peak E from S₂ was rather longer in left ventricular inflow. When the abnormal color flow signal disappeared 6 weeks later, motion of both leaflets improved with a closing angle of 23 degrees.

DISCUSSION

The St. Jude Medical valve is a bileaflet mechanical valve, so 2 types of the thrombosed valve are possible: both leaflets may be equally involved or one leaflet is exclusively involved³⁾. In this patient, cinefluoroscopy, the gold standard for leaflet immobilization, revealed that one leaflet was fixed during systole which was successfully treated medically⁴⁾.

The color flow signal originated from the prosthetic valve and extended into the left atrium during diastole. After improvement of the prosthetic valve stenosis and maintenance of sinus rhythm, the peak velocity of this signal decreased as measured by pulsed Doppler echocardiography. The pattern and timing of this flow signal were almost identical to those of the left ventricular inflow but the direction was totally opposite.

The color flow signal was seen only in the apical view by transthoracic echocardiography, so was thought to be an artifact and not a true signal. The echo beam was reflected by the immobilized echogenic leaflet and directed to the left ventricular inflow. Therefore, the echocardiography recognized

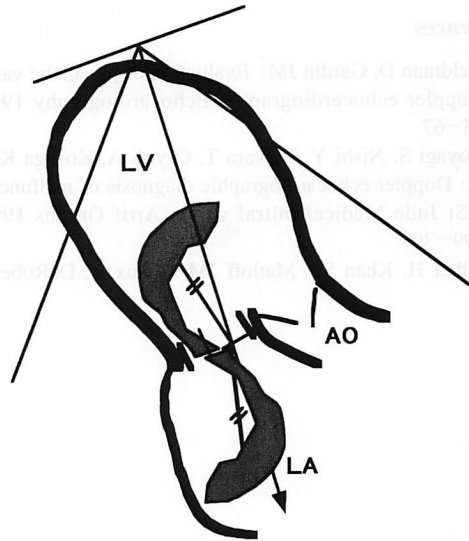


Fig. 3 Schematic drawing of the mirror artifact

The echo beam reflected by the immobilized leaflet is directed to the left ventricular inflow, forming a mirror image at the same distance opposite to the prosthetic valve.

AO = aorta. Other abbreviations as in Fig. 2.

this as a flow over the prosthetic valve making the time difference between the 2 flow signals (Fig. 3). The color flow signal in the left atrium was a mirror image artifact of left ventricular inflow caused by the echogenic immobilized leaflet. Such artifacts are known as mirror image artifacts, and usually result from strong echoes from vessel walls⁵⁾.

Such mirror image artifacts in color Doppler images could be as indication of St. Jude Medical valve dysfunction caused by one leaflet immobilization.

要 約

St. Jude Medical 弁の 1 葉弁機能不全を示唆する

鏡像としての左房内カラー血流シグナル

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13年前に St. Jude Medical 弁にて僧帽弁置換を受けた 84 歳の女性に、拡張期に人工弁から左房へ広がる異常血流シグナルがみられた。シネ撮影では一方の弁葉が収縮期の位置に固定されているのが観察された。この異常血流シグナルは、高速フーリエ変換分析では左室流入血波形と同一であるが、方向が逆であった。抗凝固療法を強化して 2 枚の弁葉がともに良好な開放を示すと、この異常血流は消失した。僧帽弁位の St. Jude Medical 弁では、2 葉弁のうちの 1 葉が血栓などで収縮期に固定されれば、他の 1 葉を通過する左室流入血由来の鏡像アーチファクトが生じ、これが血栓弁を示すカラードップラー心エコー図の一つの所見になると考えられた。

J Cardiol 2000; 35(1): 55-58

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