

**CASE REPORT**

## A Flail Tricuspid Valve

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**KEY WORDS:** *tricuspid regurgitation;  
flail valve; echocardiography; traumatic  
tricuspid insufficiency; anterior  
tricuspid leaflet; posterior tricuspid  
leaflet*

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**ABSTRACT**

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A 30-year-old man was admitted to the hospital because of palpitations. He had a life-threatening liver rupture five years earlier, after a massive uncontrolled explosion of a big bunch of fireworks. Transthoracic echocardiography revealed severe tricuspid regurgitation due to a flail anterior leaflet of the tricuspid valve. Transesophageal echocardiography had an additive imaging value in demonstrating additionally a flail posterior leaflet. Flail tricuspid valve causing severe regurgitation is usually due to mechanical trauma. Since it is well tolerated for years, the diagnosis may be delayed or missed entirely. Echocardiography has allowed easier diagnosis of this condition resulting in earlier and, hence, more effective treatment.

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**INTRODUCTION**

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Posttraumatic tricuspid insufficiency is a rare clinical entity that is mostly associated with traffic accidents causing non-penetrating chest wall injury. Echocardiographic evaluation can significantly help in early diagnosis.

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**CASE REPORT**

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A 30-year-old man, smoker, was admitted to the cardiology department of Euroclinic hospital complaining of palpitations, which had began over a year ago. He did not have any history of systemic illness. However, five years earlier he had suffered a severe open trauma of his upper abdomen with a life-threatening liver rupture, following a massive uncontrolled explosion of a big bunch of fireworks during a festival. He was treated surgically and since then he has remained well.

On admission, physical examination revealed a grade III-IV/VI pansystolic murmur best heard at the fifth intercostal space along the left sternal border. The ECG showed normal sinus rhythm with incomplete right bundle branch block and right axis deviation. Routine laboratory tests were normal. On chest X-ray there was evident a slight increase of the dimensions of the right atrium.

Transthoracic echocardiography revealed normal left ventricular wall thicknesses, dimensions and ejection fraction, without any left-sided valvulopathy. However, severe tricuspid regurgitation (Figure 1, ) was identified together with dilated right atrium (minimal dimension of 49 mm) and right ventricle (RV) (dimension at proximal right ventricular outflow tract-RVOT measuring 38 mm, dimension at mid-RV level in 4-chamber view measured at 50 mm) with slight increased wall thickness (6 mm) and normal systolic function (tricuspid annular plane systolic excursion-TAPSE,

**ABBREVIATIONS**

ECG = electrocardiogram  
RV = right ventricle  
RVOT = right ventricular outflow tract  
TAPSE = tricuspid annular plane systolic excursion

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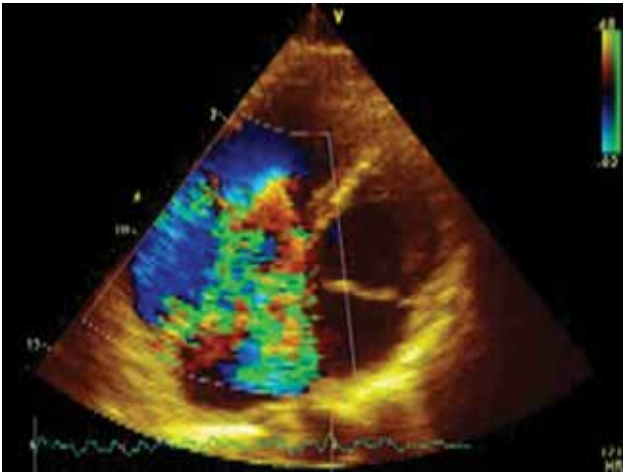
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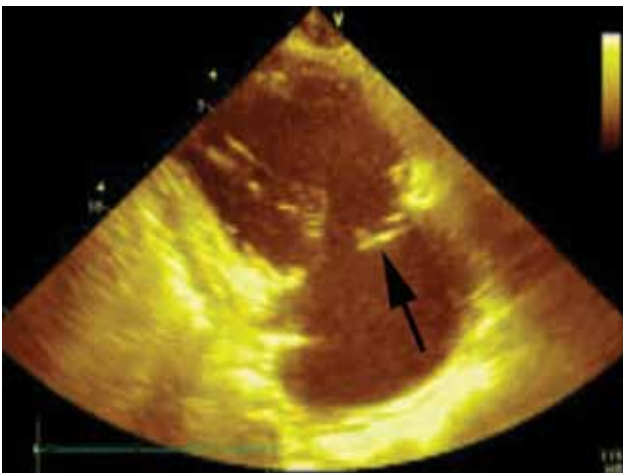
## FLAIL TRICUSPID VALVE



**FIGURE 1.** Transthoracic echocardiography (TTE) -Color Doppler study shows severe tricuspid regurgitation.

33mm; pulsed Doppler peak velocity at the annulus, 20 cm/sec). Using the tricuspid regurgitation velocity formula, we estimated that the pulmonary arterial pressure was 43 mm Hg (diameter of inferior vena cava, 33 mm). A flail anterior leaflet of the tricuspid valve was demonstrated, and seemed to be the predominant cause of the severe insufficiency of the valve (Figure 2).

Transesophageal echocardiography was then performed and besides the flail anterior leaflet (Figure 3), a flail posterior leaflet of the tricuspid valve was also demonstrated (Figure 4). It was concluded that the tricuspid valve had possibly become injured after the upper abdominal trauma 5 years earlier. The recommendation to the patient was to have repair surgery with chordae reconstruction and annuloplasty, but he elected to



**FIGURE 2.** Transthoracic echocardiography (TTE) 2-chamber view showing flail anterior leaflet (black arrow).



**FIGURE 3.** Transesophageal echocardiography (TEE)/transgastric view 120° demonstrating flail anterior leaflet (white arrow) in the right ventricular inflow tract (2-chamber view).



**FIGURE 4.** Transesophageal echocardiography (TEE)/midesophageal 4-chamber view 0° shows flail posterior leaflet (white arrow).

defer it, as he has had no severe symptoms.

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## DISCUSSION

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In cases of severe chest or upper abdominal trauma, great attention should be paid at the anatomy and function of the tricuspid valve. Flail leaflets of the tricuspid valve causing severe regurgitation are usually due to mechanical trauma and can be identified years later.<sup>1-3</sup> Its frequency is probably underestimated, because initial attention is usually placed on other organ injuries. The right ventricle is immediately posterior to the sternum thus being vulnerable to blunt trauma.

Acute elevation of right intraventricular pressure results in injury of the tricuspid valve apparatus. The most frequently reported mechanism of injury is chordal rupture, followed by rupture of the anterior papillary muscle and leaflet tear, primarily of the anterior leaflet.

Three-dimensional echocardiography can be very useful for the evaluation of spatial destruction of the tricuspid valve and papillary muscle.<sup>4</sup> Transesophageal echocardiography allows better visualization of much of the cardiac anatomy involved in tricuspid valve apparatus, and according to the guidelines<sup>5</sup> can provide details in each separate leaflet. However, even according to the recent recommendations for transesophageal echocardiography,<sup>6</sup> tricuspid valve anatomy has not been given much attention and a detailed echocardiographic approach of the relevant anatomy has not been proposed. The only meticulous echo-anatomy of the tricuspid leaflets that has ever been provided, are included in the guidelines for performing transesophageal echocardiography by the American Society of Echocardiography since 1999, not having been revised ever since.<sup>7</sup> According to these guidelines, a midesophageal four-chamber view (used in our study, Figure 4) is proposed and considered specific for the demonstration of the posterior tricuspid leaflet. Moreover, the anterior leaflet can be demonstrated either in a midesophageal view short-axis 60° or in a transgastric view 110-130° (used in our study, Figure 3) or in a more complicated transgastric 30° short-axis view.

The treatment for tricuspid regurgitation is usually surgical, preferably valve repair. Although chordal rupture is associated with a more benign course extending from 10 to 25 years, papillary muscle rupture becomes symptomatic and requires operation, usually within weeks to months. According to the European<sup>8</sup> and American guidelines,<sup>9</sup> the traditional indication for operation is symptomatic heart failure, with a class I and IIA recommendation respectively. However, when there are mild or no symptoms, even with right ventricular dysfunction, an operation is rather not recommended (class IIB and III recommendation, respectively).

The present case highlights the importance of early diagnosis and invites discussion of the mechanisms that can underlie delayed tricuspid valve rupture. Because the clinical diagnosis of tricuspid valve rupture can be difficult, we believe that echocardiography should be used early and, if necessary,

repeatedly in all patients who sustain blunt chest-wall trauma. The importance of transesophageal echocardiography in the evaluation of patients following blunt chest trauma is also highlighted by this case.

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