

Highly Acute Course of Ruptured Papillary Muscle of the Tricuspid Valve in a Case of Blunt Chest Trauma

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Summary

The sudden onset of tricuspid insufficiency following a blunt chest trauma is extremely rare. We operated on a young woman in a state of severe shock following a riding accident, in whom complete severing of the papillary muscle of the posterior tricuspid leaflet had occurred. The valvuloplasty operation itself and the postoperative course ran smoothly, apart from a late pericardial tamponade which required surgical revision. In accordance with other reported cases we believe that traumatic tricuspid insufficiency is still a very underestimated pathological occurrence. Echocardiographic examination should therefore be regarded as an essential standard procedure in all cases of blunt chest injury.

Key words

Tricuspid insufficiency – Blunt chest trauma – Riding accident

Operative Behandlung einer akuten Trikuspidalinsuffizienz nach stumpfem Thoraxtrauma

Es wird über den seltenen Fall einer Trikuspidalinsuffizienz nach stumpfem Thoraxtrauma berichtet. Es handelt sich um eine 26jährige Frau, die von einem ausschlagenden Pferd einen Tritt gegen den Brustkorb erhielt. Bei der Aufnahme befand sie sich im schweren Schock. Echokardiographisch fand sich an der Trikuspidalklappe eine massive Regurgitation, außerdem ein Perikarderguß. Nach Perikardpunktion besserte sich die Kreislauftsituation umgehend. Als Zeichen der Herzkontusion fanden sich ventrikuläre und supraventrikuläre Extrasystolen. Bei der Operation zeigten sich ein nicht-perforierender Riß im Vorhofseptum sowie eine Durchtrennung des hinteren Papillarmuskels der Trikuspidalklappe. Beide Läsionen konnten durch Nähte repariert werden. Der postop. Verlauf war zunächst glatt, am 18. postop. Tag mußte allerdings via medianer inferiorer Thorakotomie ein Perikarderguß beseitigt werden. Die zunächst postoperativ noch vorhandenen EKG-Veränderungen waren 15 Monate später nicht mehr nachweisbar. Es wird auf die Bedeutung der Echokardiographie nach solchen Thoraxtraumen hingewiesen.

Introduction

Tricuspid insufficiency is rarely seen as an acute complication of non-penetrating chest trauma. Cardiac involvement is found in 5–20% of blunt chest injuries. Of these, damage to the aortic valve is predominant, accounting for 59%, with mitral insufficiency occurring in 30% of patients; damage to the tricuspid valve is apparently only seen in 6% of cases. The clinical course is often asymptomatic (4, 8).

The case reported here of a very acute course of traumatic tricuspid insufficiency following a blunt chest injury is therefore highly noteworthy.

Case Report

A 26-year-old asthenic female in good physical health sustained a severe blow to the chest from a kicking horse during a riding event.

On admission to the casualty department of the regional hospital she was found to be in profound shock (systolic blood pressure 50 mmHg): immediate intubation and

circulatory stabilising procedures were performed. On radiography a widened heart silhouette and fractures of the 7th/8th left ribs were seen. Transthoracic echocardiography showed a haemodynamically relevant pericardial effusion as well as a massive regurgitation across the tricuspid valve. Pericardial puncture with aspiration of 380 ml of haemorrhagic fluid resulted in an immediate improvement of the circulatory state.

Biochemical analysis showed the following significant values: CK 134 U/L, CK-MB 69 U/L, LDH 330 U/L, GOT 92 U/L, GPT 85 U/L. There was no indication of large blood loss. The patient was transferred to our heart-surgery intensive care unit 8 hrs after the injury.

Under continuous administration of minimal amounts of adrenalin, blood pressure was 100/60 mmHg, heart rate 160/min. Arterial and venous blood gas estimations were insignificant under mechanical ventilation. There was a holosystolic murmur over the left sternal border and the neck veins were distended.

Despite a suspected ascites, the liver was not palpable. Cardiac contusion was expressed in the ECG by marked

sinus tachycardia with frequent multifocal ventricular, as well as supraventricular, extrasystoles.

Immediate bedside transthoracic echocardiography demonstrated a moderate effusion in the 4-chamber view, the ventricles showing normal contractility. The posterior leaflet of the tricuspid valve prolapsed into the non-enlarged right atrium. Doppler imaging showed a strong systolic reflux from the right ventricle. No further pathological evidence was obtainable.

Operative Technique

Operation began 10 hours after injury. Through a median sternotomy, pericardiotomy was performed and 100 ml of mainly serous fluid aspirated. Under cardiopulmonary bypass and cardioplegic arrest a longitudinal right atriotomy was performed.

On inspection we found a deep 3.5-cm-long tear in the interatrial septum which did not however perforate into the left atrium. This was oversewn using 4/0 polypropylene. The papillary muscle of the posterior leaflet was severed and there was a free muscular fragment of approximately 8 mm in length, the leaflet itself beating through into the right atrium. Apart from a small haemorrhage in the diaphragmal area of the right ventricle, there were no further macroscopic findings. The papillary muscle fragments were reinserted using several pledget-reinforced 5/0 braided sutures. After repeated functional tests on the arrested as well as on the beating heart, and an aortic clamp time of 43 minutes, cardiopulmonary bypass was ended without complications.

In view of the acute onset there was no dilatation of the annulus so that we saw no indication for the use of an annuloplasty ring.

A few hours after the operation and following abdominal sonography, we carried out an ascites puncture and aspirated 800 ml of fluid.

Computed tomography of the head and abdomen proved no further injuries. On the same day cardiological examination using transoesophageal echocardiography showed a trivial systolic reflux on the tricuspid valve with otherwise normal structures. Extubation ensued 20 h post-op.

Holter ECG monitoring on the 10th postoperative day showed intermittent bundle branch block, atrial extrasystoles, supraventricular extrasystoles with block and intermittent bigeminal ventricular complexes. On the 18th postoperative day an inferior median thoracotomy was performed due to a pronounced pericardial effusion, and 500 ml of clear serous fluid were evacuated. 10 days later, after an uneventful recovery and a further transthoracic echocardiographic check the patient was discharged.

Transthoracic echocardiography performed 15 months postoperatively in the outpatient clinic showed normally sized right atrium and ventricle and a trivial tricuspid reflux. There were no pathological changes evident on the ECG.

Discussion

Although tricuspid insufficiency is a very rare occurrence in non-penetrating chest trauma, with higher density and quality echocardiography techniques at our disposal we can expect a distinctly greater comprehension of the clinical picture (3, 7). To date there have been over 100 cases published worldwide (1, 4, 5, 6, 9, 10).

The causes of injury are mainly traffic-, industrial- and sporting accidents in which a blunt rebound occurs at high velocity (9).

Besides the general problems of a contusio cordis, there have been injuries to the tricuspid valve described involving tearing of the chordae tendinae, complete severing of the papillary muscle, and, more rarely, tears in the valve leaflets (8). They are extremely seldomly combined with perforation of the atrial or ventricular septum.

According to *Perlroth*, tricuspid insufficiencies are more likely to show symptoms if they are due to rupture of the papillary muscle (8).

There are profound difficulties in diagnosis as there are no typical symptoms. Heart murmur may be absent, or may only occur on inspiration. All other symptoms are unspecific. Diagnosis is further hampered as a number of patients are admitted in a polytraumatic state with cranio-cerebral injuries, multiple rib fractures, or blunt abdominal trauma presenting other diagnostic or therapeutic priorities (4). To our knowledge, accounts of acute decompensation are extremely rare. The latency period between injury and diagnosis can be up to 10 years, when cardiomegaly and "ventricularisation" of the right atrium become dominant.

Valve replacement is often unavoidable following a long latency period between injury and surgical treatment as pronounced secondary changes to the tricuspid apparatus and the right heart have occurred (9).

Acute right-heart failure forced swift surgical intervention in only a negligibly small number of patients (2, 3, 4). Whether or not a reconstruction or valve replacement is preferable depends not only on the local findings but to a large part on the type and extent of the other injuries: a uniform opinion on this is not obtainable from the available literature. The surgical risk in valvular reconstruction or replacement is minimal, the postoperative late results are usually good if the operation is performed before irreversible damage to the myocardium of the right ventricle has occurred.

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Contemporary Cardiothoracic Surgery

Information: Office of Continuing Medical Education, Washington University School of Medicine, Campus Box 8063, 660 South Euclid Avenue, St. Louis, MO 63110-1093

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Information: Prof. Dr. H. Oelert, Klinik für Herz-, Thorax- und Gefäßchirurgie, Johannes-Gutenberg-Universität, Langenbeckstraße 1, D-55131 Mainz, Germany

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