

Clinical Case

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Traumatic Tricuspid Valve Rupture after Blunt Chest Trauma - A Case Report and Review of the Literature

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Rezumat

Ruptura traumatică de valvă tricuspidă după contuzie toracică - prezentare de caz și revizie a literaturii

Introducere: În ciuda frecvenței mari a leziunilor toracice prin accidente rutiere, leziunile valvulare cardiace sunt extrem de rare.

Metodă: Prezentare de caz și review al literaturii folosind bazele de date PubMed/MEDLINE și EMBASE.

Rezultate: Pacientă în vârstă de 38 de ani, victima unui accident rutier a fost internată de urgență. La evaluarea primară pacienta era conștientă, cooperantă, stabilă hemodinamic și respirator. Evaluarea secundară relevă fractură deschisă de femur bilateral și marca traumatică a centurii de siguranță. Scanarea completă Computer Tomografică a evidențiat contuzie minimă hemoragică cerebrală, hemopneumotorax stâng și pneumotorax drept, fracturi costale bilaterale, contuzie hepatică, fractura de col femural stâng și fractură de coloană vertebrală lombară. După montarea pleurostomiilor bilaterale pacienta a devenit instabilă hemodinamic, dar fără semne de sângerare externă. Ecografia cardiacă transtoracică a arătat regurgitare tricuspidiană severă și reflux al venelor hepatice. După intervențiile chirurgicale orto-

pedice, ruptura de valvă tricuspidă a fost managerizată prin înlocuirea acesteia cu o bioproteză. Spitalizarea a fost de 122 de zile.

Concluzii: Doar un grad înalt de suspiciune poate pune în evidență leziunile valvulare cardiace prin contuzie ca fiind cauza instabilității hemodinamice la pacienții traumatizați.

Cuvinte cheie: valvă tricuspidă, ruptură, contuzie

Abstract

Introduction: Despite the high frequency of thoracic injuries secondary to traffic related accidents, the blunt cardiac valve rupture is extremely rare.

Method: Case report and review of the literature using PubMed/MEDLINE and EMBASE databases.

Result: A 38 year old female patient, victim of car accident was admitted. On primary survey the patient was conscious, cooperative and hemodynamic and respiratory stable. On secondary survey was found a bilateral open leg fracture and a "seat belt" sign. Whole body Computed Tomography revealed minimal haemorrhagic contusion of the cortex, left hemo-pneumothorax and right pneumothorax, bilateral rib fractures, liver contusion, left femoral neck fracture and fracture to the lumbar spinal column. After bilateral pleurostomy, the patient becomes hemodynamically unstable, but with no signs of external bleeding. The transthoracic echocardiography revealed an acute severe tricuspid regurgitation with hepatic veins reflux. After orthopaedic surgeries, the tricuspid valve rupture was managed by replacing the valve with a bio-prostheses. The hospital stay was 122 days.

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Conclusion: Only a high index of suspicion may reveal blunt cardiac lesions as a cause for hemodynamic instability in acute setting.

Key words: tricuspid valve, rupture, blunt trauma

Introduction

Blunt thoracic trauma has become a regular occurrence courtesy of high-speed motor vehicle accidents (1) especially in the last decade (2). Cardiac valve injury after blunt chest trauma is extremely rare. The most frequently involved valve in blunt chest trauma is the aortic valve, followed by the mitral and tricuspid valves (3). However, the most common cause of tricuspid regurgitation is secondary to right ventricle failure with dilatation of the tricuspid ring. Isolated tricuspid valve lesions are rare, most common facing associated heart diseases (4). The traumatic tricuspid regurgitation is usually well tolerated in acute setting, the tricuspid valve replacement being performed for delayed presentations (5).

Method

Case report of a traumatic tricuspid valve rupture after thoracic blunt trauma, managed in Emergency Hospital of Bucharest, Romania. For literature review, in PubMed/Medline and EMBASE databases, we used different combinations of "tricuspid valve", "blunt trauma", "injury", "cardiac valve", "traumatic rupture", as truncated words or MeSH terms.

Case report

A 38-year-old female was admitted in our hospital following a car accident. She had no previously reported medical

problem. In the emergency room the patient was conscious, cooperative and hemodynamic and respiratory stable. Primary clinical examination showed bilateral open leg fracture and a "seat belt" sign localized in the left upper part of the thoracic region (Fig. 1) and left subcutaneous emphysema.

There were no penetrating injuries over her chest. The electrocardiogram was normal without an ischemic finding. After the primary assessment, the patient was transported to the CT department and a whole body scan was performed. The Computed Tomography showed minimal haemorrhagic contusion of the cortex, left hemo-pneumothorax and right pneumothorax due to bilateral rib fractures (Fig. 2), liver contusion, left femoral bone fracture and fracture to the lumbar spinal column. The complete radiological scan of the bones revealed complex fracture of the inferior part of the right femur which involved also the tibial plateau, fracture of the left femoral neck (Fig. 3 R) and left comminute fracture of the femoral condyle (Fig. 3 L).

After the placement of the bilateral thoracic drainage tubes, the patient becomes hemodynamically unstable and was admitted to the ICU. Because of the uncertain cause of the hemodynamic instability, a cardiac ultrasound was performed and showed acute severe tricuspid regurgitation with hepatic veins reflux. There was a rupture on subvalvular segments of the anterior tricuspid valve leaflet with accompanying prolapse leading severe tricuspid valvular regurgitation (Fig. 4).

The Injury Severity Score (ISS) was 34. During hospitalization the patient had numerous orthopaedic surgeries. The tricuspid valve rupture was managed with a bio-prosthetic replacement. The total in-hospital stay was 122 days. The patient was referred to the rehabilitation centre.

Discussions

Traumatic tricuspid valve insufficiency after blunt chest



Figure 1. Seat belt sign



Figure 2. CT showing right pneumothorax and left hemothorax



Figure 3. X-Ray showing complex fracture of the lower third of the femoral bones

trauma is extremely rare, the autopsy studies indicating the aortic valve as the most commonly involved, followed by the mitral and the tricuspid valve (6). The Centre for Disease Control and Prevention's estimate regarding the incidence of blunt cardiac injuries is 30,000 cases per year in the United States (7). Malangoni et al. reported only one such case after reviewing 6,312 trauma admissions (8). Approximately 100 cases have been described in the literature, most being single case reports (9). Only a large registry can offer a clear picture of their epidemiology and traumatic pattern (10). Traumatic cardiac injuries vary from simple myocardial contusion to severe damage of intracardiac struc-

tures, generating life-threatening hemodynamic instability (11).

The incidence of traumatic tricuspid valve injury has increased because of traffic accidents and advances in diagnostic echocardiography (12). Injuries can occur from a simple fall, shot in the chest or airbags, kick in the chest or automotive airbag deployment. Injuries related to blunt cardiac trauma can be benign, such as myocardial contusion, or fatal, such as chamber rupture.

Tricuspid valve injuries are often initially undetected (13), clinical manifestations being correlated with the severity of the lesions and varying from acute heart failure to slow and progressive clinical impairment (11). In isolated tricuspid valve ruptures may be found a new heart sound, a bifascicular block on ECG, or elevated cardiac markers.

Tricuspid valve mechanism of injury is uncertain and it is subjected to discussion. One of the theory is a "blowout" of the tricuspid valve secondary to severe and sudden impact during end-diastole (14). Because of anteroposterior compression from the adjacent sternum, the right ventricle presents a vulnerability to injury, making it sensitive to sagittal shear forces. Increased hydrostatic pressure in the right ventricle is worsening this vulnerability during diastole. Subsequent rupture is caused by severe tension on both leaflets and subvalvular structures generated by the increased pressure. In most of the cases, this disease does not produce any symptoms, but the progress is insidiously, with right cardiac chambers and the annulus being dilated progressively (15). But in case of severe damage, it can produce hemodynamic instability and symptomatic clinical deterioration (16). Regurgitation of tricuspid valve is increased by progressive dilatation, inducing right ventricle failure.

The injury most frequently reported is the chordal rupture, succeeded by rupture of the anterior papillary muscle and leaflet tear (17). After chordal rupture, usually the valve function is preserved, particularly in the anterior leaflet, causing a subacute presentation, while rupture of the papillary muscle determines severe, immediate insufficiency with an acute pres-

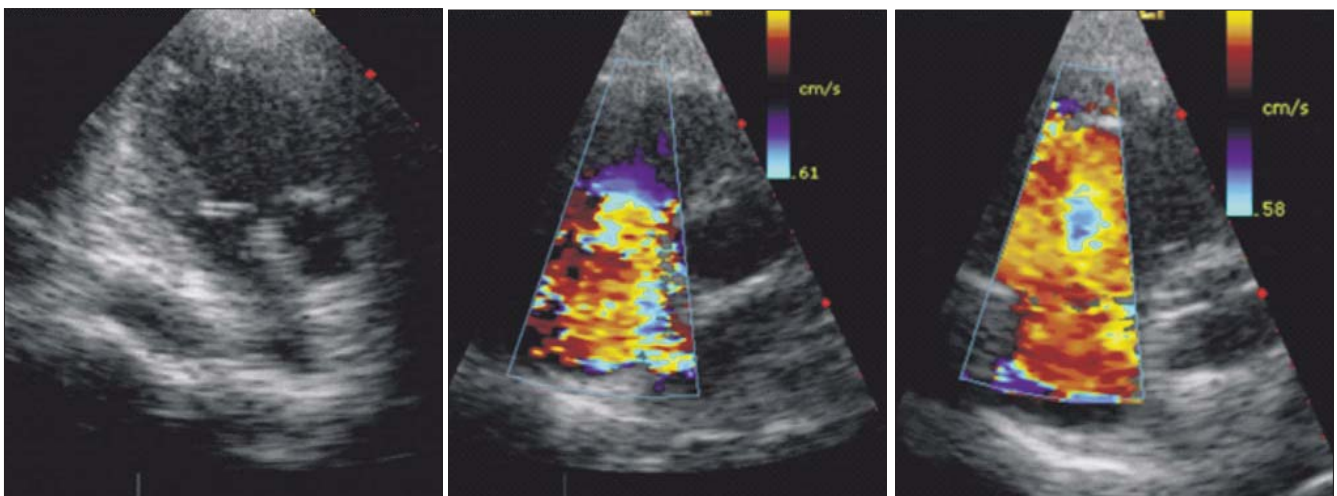


Figure 4. Transthoracic echocardiography showing flail anterior papillary muscle of tricuspid valve

entation (18). Associated injuries, such as hemopneumothoraces, pulmonary contusion, clavicular and rib fractures, extremity fractures and intra-abdominal solid organ injuries could conceal the clinical presentation of traumatic tricuspid valve insufficiency (18-20), injuries that have been reported also in our case.

A transesophageal echocardiogram should be performed, if the transthoracic echocardiogram is normal, mainly in patients whose hemodynamic deterioration cannot be explained by concomitant injuries (21, 22).

The timing of surgical intervention after traumatic tricuspid regurgitation is controversial. Symptomatic heart failure is a strong indication for surgery and an early operation allows preservation of myocardial reserve by preventing secondary myocardial changes (23).

Surgical treatment for tricuspid injuries includes valve repair or replacement, depending if excessive fibrosis and shortening of the chordae occurs. The former is generally superior to the latter. However, the success rate for valve repair (11 to 38%) is not favourable (24).

Conclusion

Only a high index of suspicion may reveal blunt cardiac lesions as a cause for hemodynamic instability in acute setting.

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