Case report

Blunt chest trauma: a right pulmonary vein rupture

A. Le Guyader*, F. Bertin, M. Laskar, E. Cornu

Department of Thoracic and Cardiovascular Surgery, Dupuytren’s University Hospital, Limoges, France

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Abstract

This report describes the case of a 37-year-old man who fell from 6 m height and presented an isolated rupture of the right pulmonary vein. The patient had a low blood pressure without any sign of intrathoracic injury. An echocardiogram revealed a tamponade with hemodynamic intolerance. The repair was made using cardiopulmonary bypass which made the inspection and total repair of the lesions easier. This case is unusual because of the isolated lesion and the few articles about similar reports founded in an extended literature review. Mechanisms and generation of blunt chest trauma lesions are discussed. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Blunt chest trauma; Pulmonary vein injury

1. Case report

Blunt chest trauma can lead to cardiac and great vessels injuries, frequently unsuspected in patients with multiple systems injuries. Car crash is the main cause of blunt chest trauma. We report an unusual case of isolated pulmonary vein rupture after a patient’s fall off a scaffolding.

A 37-year-old man with no previous history of cardiac disease was admitted to the emergency ward of Dupuytren’s University Hospital after falling off a 6 m height scaffolding on his left side, with no cranial trauma. At the admission, he was agitated and described a dorsal pain without any neurological deficit. Pupils were normal and reactive. Breath sounds were decreased on the left and heart sounds were hardly audible. Chest examination didn’t show any contusion and the abdomen was just distended. Systolic blood pressure was 70 mmHg, pulse 120/min and was non-paradoxical. X-Ray film showed an enlarged cardiac silhouette with disappearance of the aortic knob, left pneumothorax and lung contusion without rib fractures (Fig. 1). The electrocardiogram didn’t show any sign of pericardium effusion. Abdominal ultrasound examination was normal but revealed a pericardium extravasation that was confirmed by an echocardiogram. There was a compression of the right heart cavities with hemodynamic intolerance. Decision of pericardium drainage was taken and the patient was sent to the operative room. A subxiphoid pericardial window released a large amount of blood under pressure and the patient became profoundly hypotensive. The pericardial window was closed and a median sternotomy was performed. At the pericardium opening, blood gushed out the atrium. While bleeding was controlled by digital compression, an assist cardiopulmonary bypass was started with aortic canulation and only one venous canulation through the right atrium. The examination showed a rupture of the right inferior pulmonary vein, which was repaired by a simple suture with a non-resorbable suture. The heart and proximal great vessels were then carefully inspected and an aortic chest haematoma was identified. The patient’s blood pressure remained at 140 mmHg. After opening the left pleura, the hemothorax was drained. There was no extrapericardial vessel injury. After the first weaning of cardiopulmonary bypass, the patient presented a severe bradycardy followed by cardiac arrest. Cardiopulmonary bypass was started again and the weaning was possible with an external pace-maker and some drugs quickly stopped in the postoperatives days.

Postoperatively, a transoesophageal echocardiogram and an aortography were normals. The patient developed clinical and X-ray findings of right atelectasis. Bronchoscopy revealed the presence of old blood in the right lower lobe bronchus. Aspiration obtained a satisfactory lung expansion. A transitory pericarditis was noted. The patient left our intensive care unit on the 4th postoperative day and was transferred to a rehabilitation center on the 15th postoperative day. Two months postinjury, he had no cardiac or pulmonary sequelae.

* Corresponding author. Cardiovascular Surgery, 2 Avenue M.L. King, Hôpital Dupuytren, 87042 Limoges Cedex, France. Tel.: +33-5-55-05-63-71; fax: +33-5-55-05-63-84.
E-mail address: a.leguyader@libertysurf.fr (A. Le Guyader).

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2. Discussion

After an extended literature review, we have found just a few articles about traumatic rupture of the pulmonary veins and isolated injury of this vein is uncommon. It can be associated with a left atrial injury, as reported by Giordano [1], and Nahodil [2], or a right atrial laceration, as reported by Di Marco [3]. Hanline [4] described a blunt traumatic rupture of the main pulmonary vessels of the both lungs. Blunt chest trauma can lead to isolated or multiple laceration or rupture of intrathoracic structures: cardiac chamber, which is the most frequently observed [5] but the most common unsuspected visceral lesion responsible for death in accident victims, great vessels, airway, pulmonary artery and veins. Ruptured pulmonary vessels can be drained in the pleural cavity making an hemothorax, or in the pericardium with or without cardiac tamponade according to the existence of a pericardial tear.

Generally, the most frequent cause of blunt chest trauma is car crash [5]. We found in the literature another case of pulmonary vein rupture, after patient’s falling from an overpass. It was extended to the left atrium with a complete transection of the right lower lobe bronchus [6]. Table 1 summarises the five articles about pulmonary vein injury.

Usually, major intraabdominal injury is first suspected in patients with multiple system injuries and hypotension. The absence of physical signs of chest trauma, as rib fractures, doesn’t mean that there is no internal thoracic injury. Several mechanisms can explain this lesion: deceleration effects on the unfixed structures in the chest; bidirectional compression between the sternum and vertebral bodies; indirect force from the abdomen which increases intrathoracic pressure and produces rupture; and blast forces. In our case, the clinical and X-ray chest examination didn’t reveal contusion or rib fractures. There was no clinical signs of tamponade and the diagnosis was made by cardiac echography. Instead of using an occluding vascular clamp blindly to make the diagnosis of the lesions, we preferred a short cardiopulmonary bypass.

Instead of making first a subxiphoid pericardial window for drainage, a total medial sternotomy can be recommended when there is a suspicion of intraarterial structure injury. Initial examination, localization of the injury and bleeding control can be then obtained through this way. Bleeding arrest can be done by direct pressure, or using a Foley-catheter with a large balloon [6] or by application of an occluding vascular clamp. It allows to install cardiopulmonary bypass to repair injuries if necessary.

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*CPB, cardiopulmonary bypass.*

Fig. 1. Preoperative X-ray film of chest with an enlarged cardiac silhouette.
The cardiopulmonary bypass makes total examination of heart and great vessels easier. Repair of the lesions can also be rapidly done, without increasing coagulopathy (induced by hemorrhage and/or massive transfusion) and inflammatory troubles. McKeown [6] reported a right pulmonary vein rupture extending into the left atrium in a 22-year-old-man. Sutures attempted only under manual control of haemorrhage had compromised the inferior pulmonary vein, necessitating a right lower lobectomy. This case shows how dangerous it can be to repair the injury blindly.

In conclusion, blunt chest trauma is frequently associated with intrathoracic injuries which are usually unsuspected. The severity of the injuries is an important cause of death by massive hemorrhage or tamponade. A quick and efficient diagnosis and management can save patients with blunt cardiac and great vessels rupture. Examination and total repair of the lesions are easier under cardiopulmonary bypass.

References