# Undiagnosed Myocardial Tear Blocked by an Omental Plug: Potentially Lifethreatening Condition

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**Abstract**

Blunt chest trauma carries a high mortality when associated with cardiac rupture. Rapid diagnosis represents a true challenge for clinicians, with CT scan examination playing a central role. We report a case of a traumatic myocardial tear, plugged by the greater omentum through a diaphragmatic rent in an hemodynamically stable patient. This condition, identified during laparoscopy, was not suspected preoperatively at both clinical examination and CT. This case illustrates that a transparietal cardiac rupture can be sealed off by surrounding structures. This phenomenon explains why CT can be unable to detect traumatic cardiac rupture, with the potential risk of a delayed fatal bleeding. This case also emphasizes the risk of using laparoscopy in traumatic diaphragm rupture repair.

**Key Words**

Thorax and abdominal trauma · Chest trauma · Trauma management and education

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## Introduction

Blunt chest trauma is an important cause of death with a reported mortality rate of 15.5% [1]. Heart injury is encountered in 20% of fatal blunt chest trauma, consecutive to motor vehicle accident [2]. Diagnosis of traumatic pericardial and cardiac rupture is difficult to assess clinically and is usually established at surgery or at necropsy. Until recently, heart injuries were considered fatal. Due to recent improvements in pre-hospital care, an increasing percentage of patients with heart injuries are brought alive in trauma centers [3]. Some of these patients can be successfully managed if the diagnosis can be rapidly made, to allow immediate surgical repair [3]. Since the clinical manifestations of cardiac rupture are not specific, an admission CT plays a major role in the early detection of this entity [4].

## Case Study

A 78-year-old woman, who was involved in a high-velocity motor vehicle accident, was found unconscious. The initial clinical assessment reported normal hemodynamic parameters and closed bilateral upper arm fracture. The chest, abdominal, and pelvis examinations were considered normal. Chest X-ray showed an elevation of the stomach, possibly displaced into the thorax, associated with a left lung atelectasis (Figure 1). These findings were confirmed in CT (Figure 2). A shallow gastric narrowing was also depicted on CT, reported to be associated with diaphragmatic rupture. No other major findings were reported on chest CT (no hemomediastinum, hemopericardium, or hemothorax). Since the patient remained in a good general condition in the emergency room, without hemoperitoneum at the abdominal CT, the surgical team questioned the diagnosis of left diaphragmatic rupture. Despite the evocative images of a traumatic rupture on initial CT, a possible left non-trauma-related diaphragmatic paresis was evoked. In order to avoid the impact of a laparotomy, it was decided to use laparoscopy to check the diaphragm integrity. An open celioscopy with the introduction of three trocars under direct vision was performed. At supramesocolic

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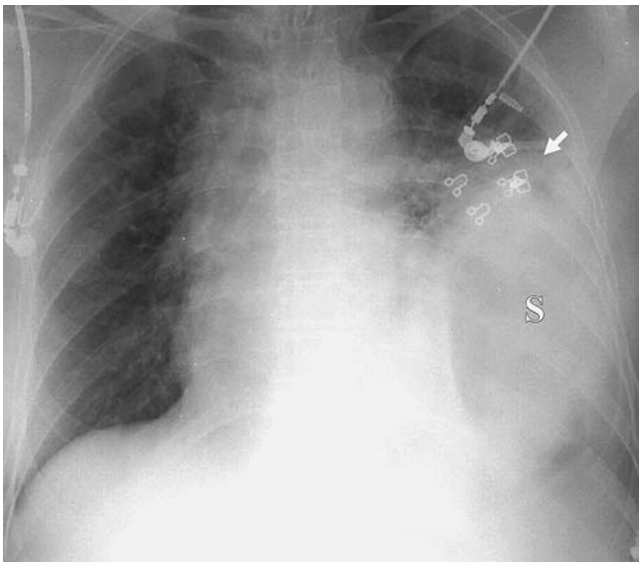


**Figure 1.** Admission chest X-ray shows an elevation of the stomach (S) associated with a left lung atelectasis (arrow).

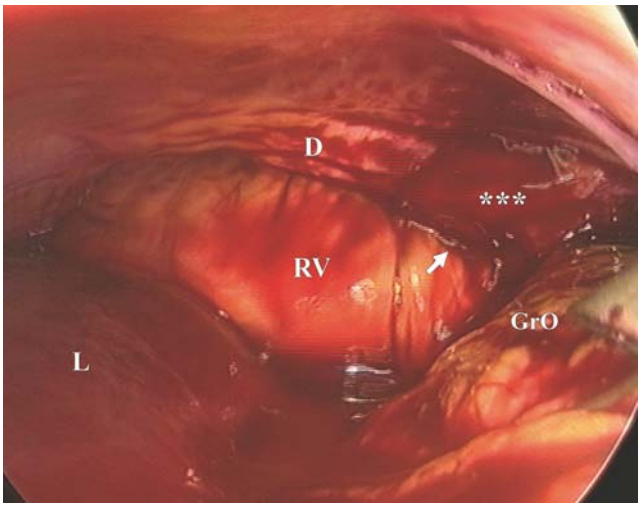


**Figure 3.** Laparoscopic image performed immediately after mobilization of the greater omentum (GrO) shows a 1 cm rent (arrow) with a pulsatile blood stream (stars) within the distal aspect of the right ventricle (RV), visible through a large diaphragmatic breech (D); L: liver.

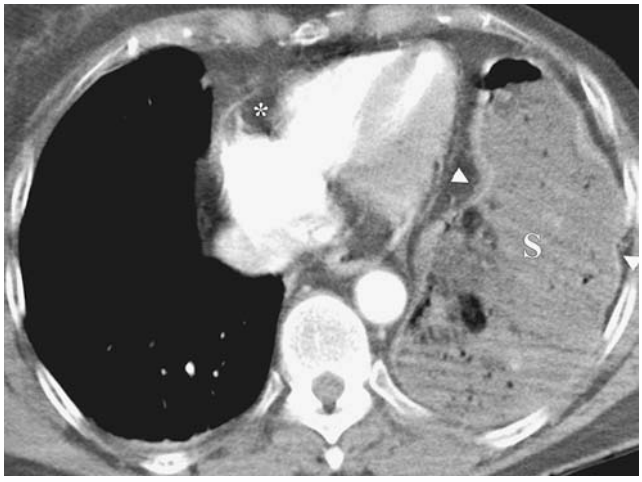


**Figure 2.** Admission chest CT confirms the elevation of the stomach (S) with a shallow narrowing on both sides (arrowheads). A notching at the atrio-ventricular junction (asterisk) was retrospectively considered a possible sign of diaphragmatic rupture.

examination, part of the greater omentum was found to pass through a large diaphragmatic tear. The gentle mobilization of the greater omentum, using surgical forceps, triggered a continuous pulsatile bleeding, originating from a myocardial rupture (Figure 3). Bleeding was consecutive to removal of an omental plug, located within a 1 cm linear breach in the distal aspect of the right ventricle. A vertical medial sternotomy was immediately performed and direct suture of the right ventricle tear was achieved. Owing to the large amount of blood loss, a cardiac arrest occurred in the same time requiring transient extracorporeal circulation. The pericardium was closed using a patch of bovine pericardium and the diaphragmatic tear was repaired. The patient had an uneventful outcome after surgery and was transferred 1 month later to a rehabilitation center.

## Discussion

The current case reports a clinically silent traumatic cardiac rupture. It illustrates that a transparietal myocardial rent can be sealed off by surrounding structures such as the greater omentum in the case of pericardial rupture. The low pressure within the right ventricle may explain the reason why cardiac rupture can be well tolerated for a long period of time. Delayed post-traumatic cardiac rupture is very uncommon and only some cases have been reported, occurring up to 40 days after trauma [5–7]. Delayed cardiac bleeding may have also occurred in our patient after spontaneous displacement of the omental plug, even if no surgical removal had been done. This mechanism of temporary plugging, although probably uncommon, could help us to explain some delayed presentations of traumatic heart rupture.

This case demonstrates also that a traumatic cardiac rupture can remain radiologically undetected.

Some authors have recently reported that CT signs could be helpful to suggest cardiac and pericardial injuries in hemodynamically stable patients [4, 8]. Hemopericardium or massive hemothorax (if the peri-

cardium has been lacerated) was constantly reported in association with myocardial rupture [4, 8].

In the present case, neither hemopericardium, hemothorax nor hemomediastinum was present at admission CT. The shallow gastric narrowing was depicted, demonstrating that the "collar sign", a waist-like gastric compression, is reported to be associated with diaphragmatic rupture [9, 10]. The only heart-related CT finding was a notching of the lateral aspect of the right ventricle, at the atrioventricular junction, retrospectively attributed to the strangulation of the right aspect of the heart through the diaphragmatic rent, similar to the gastric collar sign [9, 10]. However, this focal narrowing was not suggestive of cardiac rupture. There was no other direct or indirect sign suggestive of myocardial tear such as pericardial fluid, extravasation of contrast media, or a ventricular wall deformation (pseudoaneurysm). The absence of mediastinal blood or massive hemothorax has never been reported yet at CT in patients with traumatic heart rupture.

In spite of the fact that the use of laparoscopy has been advocated in traumatic diaphragmatic repair [11], this case suggests that the standard of care for diaphragmatic rupture remains exploratory laparotomy, Obviously, extracorporeal circulation could have been avoided if an immediate open surgical procedure were performed instead of laparoscopy.

## Conclusion

This case illustrates that both clinical examination and CT analysis can be fully unreliable to detect traumatic cardiac rupture when myocardial rent is plugged by adjacent fatty structures.

This probably exceptional observation could help us to explain some delayed presentations of traumatic heart rupture. This case also emphasizes the risk of using laparoscopy in traumatic diaphragm rupture repair.

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