

# THORACOSCOPIC REPAIR OF WOUND IN CARDIAC INFUNDIBULUM

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**ABSTRACT**

Cardiac trauma is an entity with high mortality, an accurate diagnosis in the emergency room allows us to choose the most suitable treatment for every patient. Patients with hemodynamic instability have an immediate surgical indication. However, patients with hemodynamic stability require additional studies to detect an underlying cardiac injury. When a pericardial window is indicated, the surgical approach could be either subxiphoid or through videothoracoscopy; if the outcome of the pericardial window is favorable, a surgical thoracotomy or sternotomy will be needed to repair the underlying cardiac injury. This is the case of a 65-year-old male patient with multiple precordial stab wounds with ultrasound signs of pericardial effusion treated with pericardial window through videothoracoscopy. A cardiac infundibulum wound was revealed that was successfully treated through surgery. As far as we knowledge, to this day, no cases in the medical literature available have been reported of a cardiac injury induced by a blunt object repaired through videothoracoscopy.

**Keywords:** *Thoracoscopy, Cardiac tamponade, heart injuries, fibrin tissue adhesive*

## INTRODUCTION

El traumatismo del corazón y los grandes vasos es una entidad con elevada mortalidad, en algunas series alcanza hasta Cardiac and great vessel injury is an entity with a high mortality rate. In some series it is as high as 66%<sup>(1)</sup>, which is why it is very challenging for the medical team. Patients with injuries to the precordial region who are hemodynamically stable not always show the typical clinical findings of cardiac tamponade, which is why additional studies are required.

The introduction of the ultrasound into the emergency setting has been crucial because it allows the diagnosis of hidden cardiac injuries, the conservative management of some injuries, and the correct classification of stable patients who are eligible for surgery<sup>(2)</sup>. In the presence of pericardial effusion, a pericardial window is required. This procedure can be performed through the traditional subxiphoid approach or through videothoracoscopy if the heart team is experienced enough<sup>(3)</sup>. If the pericardial window is negative, the presence of cardiac injuries is discarded. If positive, open surgery is required to correct the underlying cardiac injuries.

Similarly, patients with an injury located in the precordial region who are hemodynamically unstable have an immediate surgical indication. In this context, conventional approaches include thoracotomy or sternotomy that facilitate access to both the heart and the major vessels to perform the necessary corrections. As far as we know, no cases have been reported in the medical literature available on how to correct trauma-induced cardiac injuries through videothoracoscopy. Ours is the very first case ever reported that we know of.

## CASE REPORT

This is the case of a 65-year-old male admitted to the ER after sustaining 3 stab wounds in the precordial region: left infraclavicular and left and right parasternal regions. The patient's vital signs were BP, 116/84; HR, 90; RR, 22; and O<sub>2</sub>Sat, 90%.

An early thoracic x-ray was performed that confirmed the presence of bilateral pneumothorax. The follow-up ultrasound performed at the ER revealed the presence of pericardial effusion.

It was decided to attempt a bilateral thoracostomy that produced air flow and a left hemothorax of 200 cc. According to the center protocols and due to the finding of pericardial effusion and the presence of hemodynamic stability, the patient was considered eligible to perform a pericardial window. The Cardiovascular Surgery unit and the Trauma unit

both agreed to perform a videothoracoscopy in the presence of bilateral thoracostomy.

Surgery started and the femoral vessels were exposed in the right inguinal canal. Tobacco-pouch suture sac was performed for an eventual fast cannulation. The catheters were ready to go as well as the extracorporeal circulation system (with two active rolls) to start the cardiopulmonary bypass if necessary. Also, the equipment necessary to perform a sternotomy was ready too.

During the surgical act, the patient was monitored on a transesophageal echocardiography that confirmed the presence of a pericardial effusion only in the posterior and lateral space in a position adjacent to the left ventricle with a 1.5 cm separation from the pericardial leaflets.

A left videothoracoscopy was performed with one 10 mm-port (that was placed in the 5th intercostal space at anterior axillary line level) and two 5 mm-ports (that were placed in the intercostal space at parasternal line level, and in the 2nd intercostal space at midclavicular line level). The early examination of the pleural cavity confirmed the presence of an 800 mL residual hemothorax, a healthy subclavian artery, and a tense pericardial sac. A pericardial window was performed on the lateral wall. The hemopericardium was initially drained under pressure (*Figure 1*). A wider pericardiectomy was performed using an ultrasonic dissector that drained a 400 mL hemopericardium. A diagnostic pericardioscopy was performed to assess the intrapericardial major vessels and heart chambers. It revealed the presence of a 5 mm laceration at the infundibulum of the pulmonary artery with sheet-like bleeding (*Figure 2*).

Given the patient's hemodynamic stability, sheet-like bleeding, and availability of an extracorporeal circulation system, it was decided to perform mechanical compression for 5 minutes (*Figure 3*) to stop the bleeding. Additionally, the hemostasis was reinforced with fibrin sealants.

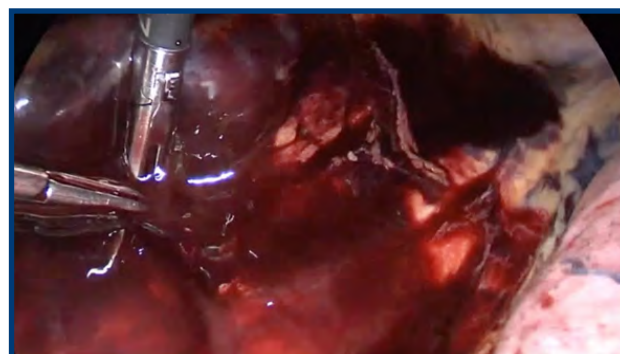


FIGURE 1. Hemopericardium removal.

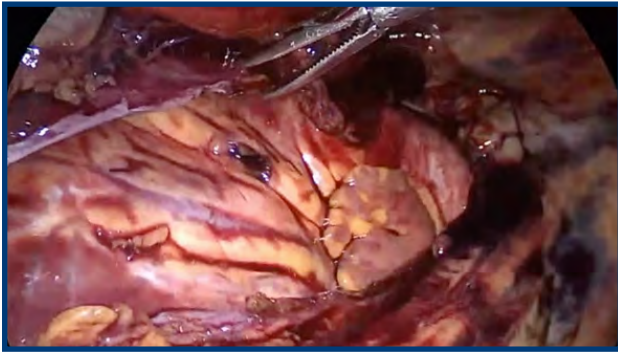


FIGURE 2. Wound to the subpulmonary infundibulum.



FIGURE 3. Mechanical compression with common gauzes.

The intraoperative echocardiography performed revealed the proper drainage of the hemopericardium and no other injuries in neighboring cardiac structures were found.

The patient was extubated in the operating room and transferred to the intensive care unit. He remained hemodynamically stable with low cardiac output through the pleural drainage catheters.

A transthoracic echocardiogram was performed at the 24-hour follow-up that revealed a proper ventricular function and no residual pericardial collections. The thoracic drains were removed 48 hours later. The patient was discharged from the hospital 72 hours later without any complications.

## DISCUSSION

The use of videothoracoscopy has become very popular for the management of acute traumas because it allows us to identify thoracic injuries and correct small pulmonary, diaphragmatic, and esophageal injuries<sup>(3)</sup>. Its benefits have also been confirmed in a variety of complications after thoracic trauma such as to prevent coagulated hemothorax or empyema<sup>(4)</sup>. Similarly, it can be used to perform pericardial windows and eventually diagnose cardiac injuries. However, until just a few years ago, suspected cardiac injuries were considered a contraindication to perform videothorascopies<sup>(5)</sup>.

Goodman y col.<sup>(6)</sup> published their results with the use of videothoracoscopy in 23 patients with acute thoracic trauma. There was no need for conversion to open surgery in any of the cases, not even after performing pulmonary wedge resection surgery due to pulmonary lacerations in 6 patients. We should mention, though, that none of the patients had cardiac injuries.

In our case, the patient had multiple injuries in the precordial region and given his hemodynamic status and pericardial effusion confirmed on the ultrasound with an indication to perform a pericardial window, the possibility to perform a videothoracoscopy was discussed, which allowed the detection of the site of the bleeding. Also, the proper hemostasis was achieved through mechanical compression and fibrin sealants.

Fibrin sealants are human thrombin and fibrinogen compounds that simulate the formation of a clot in its final stage regardless of the patient's coagulation system, which allows the sealing and reinforcement of the hemostasis; it is often used in different types of surgery including cardiovascular surgery. Its benefit in selective surgery has been confirmed in a meta-analysis by reducing the risk of hematomas (OR, 0.62, 95%CI 0.44-0.86; P = .01) without any significant adverse events<sup>(7)</sup>. To this date, their use for the management of acute traumas has not been assessed yet. However, in our case, fibrin sealants were used to complement the process of hemostasis with favorable results.

Finally, we should stress out the importance of interdisciplinary management between the trauma and the cardiovascular surgery units, which facilitated this approach. One of the potential advantages of videothoracoscopy is that it can detect the exact site of the bleeding. Also, if the injury is not exsanguinating, it has the resources and capabilities to solve the bleeding using the same access site, thus avoiding the morbidity and mortality associated with thoracotomy or sternotomy.

Similarly, these patients should be treated in centers with cardiothoracic surgical instruments available in case their cardiac injuries may need repair with extracorporeal circulation systems. The clinical case presented here showed the use of videothoracoscopy to correct cardiac injuries, a strategy that had not been assessed up until now.

## Conflicts of interest

Authors report no disclosures.

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