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Case Report

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Saint Sebastian's Case Reloaded Penetrating Multiorgan Chest Injury Caused by Arrow

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Abstract

Penetrating chest injuries pose multispecialty challenges even within tertiary care trauma centers. A suicidal crossbow injury resulting in heart, aorta and esophageal injury is presented. The surgical repair regarding the cardiac and aortic reconstruction was complicated by thoracic empyema possibly caused by a latent esophageal perforation. Several attempts in failed esophageal stenting were followed up using endoluminal vacuum therapy. The complete closure of the empyema cavity was achieved and a full recovery recorded over a span of seventy-one days of hospitalization. In the following, various challenges and decision-making points are discussed.

Introduction

Penetrating torso injuries caused by multiple arrows are one of the most frequent motifs throughout martyrology related art history **[1].** Modern high-power crossbows are not any less a lethal weapon than when compared with their fire arm counterparts, surfacing Saint Sebastian's narrative to the present.

Case Presentation

A 39-year-old male attempted suicide through a self-inflicted injury delivered by the use of a crossbow. Upon admission to the Emergency Ward, the patient was alert, cardiovascular and ventilatory functions within normal range and no signs of pneumo/haemothorax or cardiac tamponade. At the left rim of the sternum, between the

VII-VIII ribs, the feathery end of the arrow was detected, entering the chest cavity in a down an inwards direction, pointing to the abdomen. Oxygenation was normal, heart rate 90/min and normotension supported a negative ECG and FAST ultrasonography findings. No further images were required prior to emergency surgical procedures **(Figure 1).**

Figure 1: Emergency Room Admission.

The intubated, ventilated patient was placed on a Cell Saver and a fast upper midline laparotomy was performed since the location and inclination of the arrow implied the likelihood of a transdiaphragmatic "twin box" injury. As a result, in excluding the abdominal cavity involvement, a left anterolateral thoracotomy was performed extending to the sternum. The shaft of the arrow was left intact in situ. The pericardium was free of blood. The

arrow penetrated the right ventricle narrowly missing the coronary vessels, and entered the body of thoracal X. vertebra. A purse string stitch encircling the entering site on the anterior wall was executed. The posterior aspect of the heart was exposed and the metal tip of the arrow removed from the vertebra body **(Figure 2).** Cautiously, it was withdrawn from the exit wound opening while on the back of the right ventricle a Fogarty catheter was delicately inserted, poised and prepped for immediate inflation. The removal of the arrow continued and the previously situated purse string stitch located in the anterior aspect of the right ventricle immediately closed. The secured Fogarty catheter inserted in the patient's back was soon after removed and the cardiac exit hole subsequently closed. A persistent bleeding from the right supradiaphragmatic paraaortic region made an extension of the approach mandatory. Extending the original incision to right, resulting in a full clamshell revealed an injury on the anterior face of the supraaortic region of the aorta measuring some 5 mm. The operative field was secured and both the anterior and the posterior holes on the aorta wall were closed. Direct suture controlled the posterior wall injury and a Dacron mesh applied to the anterior injury. The patient's condition stabilized and hemorrhaging controlled. The total loss of blood measured 5800 ml of which was soon replenished. Additionally, intraoperative cardiac arrest occurred no fewer than three different times requiring direct heart massage. The patient was next put on a ventilator for the ensuring seventy-six hours **(Figure 3).**

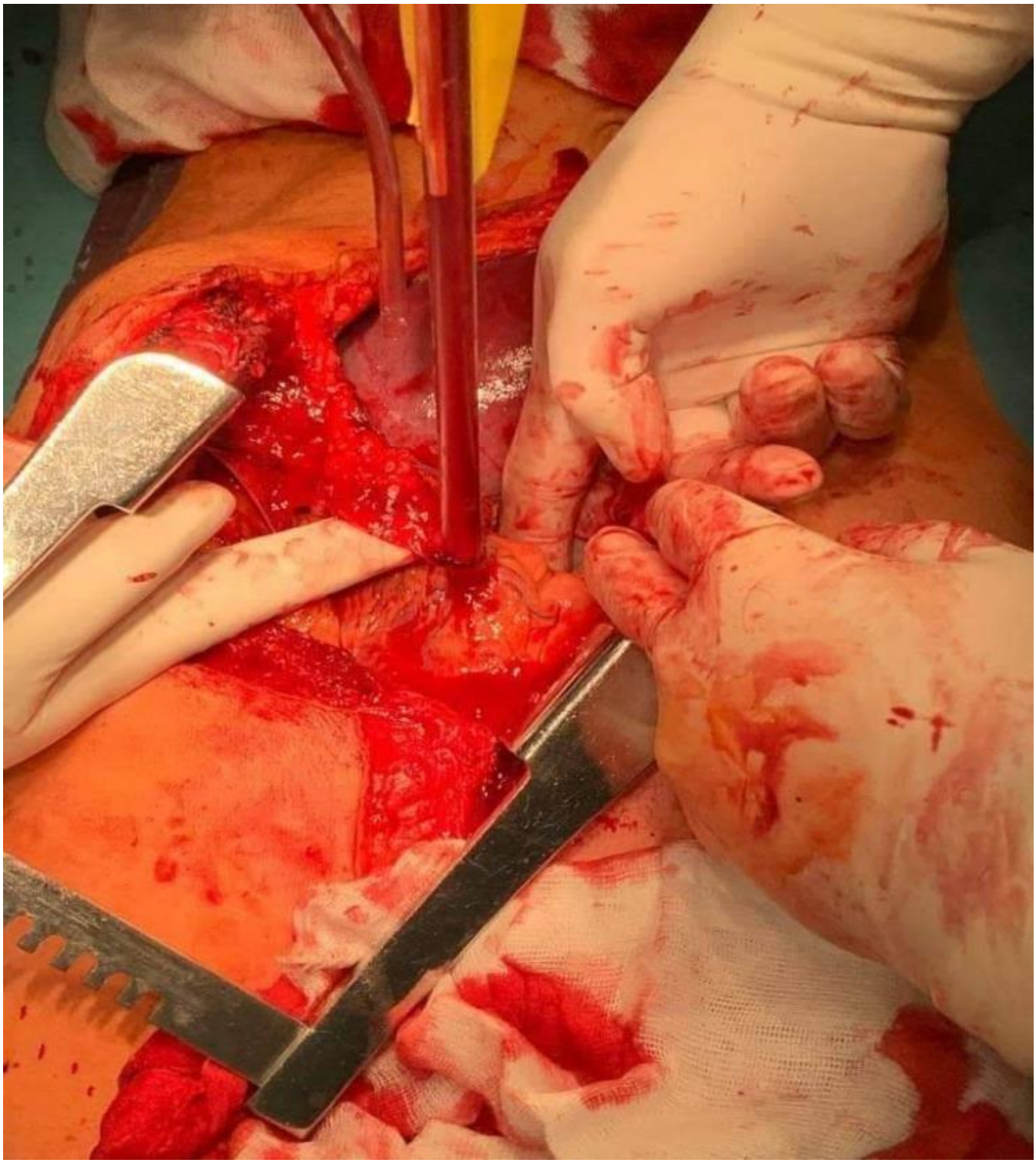

Figure 2: Arrow in situ.

Figure 3: Endoesophageal vacuum foam in action.

Postoperative course

On the fifth postoperative day, thoracic empyema developed on the left side requiring irrigation via the original chest drains. Targeted antibiotic and antimycotic therapy were administered. The patient was discharged from the Intensive Therapy Ward on the seventeenth postoperative day in good general condition. Three days later, the drain content became highly suggestive regarding esophaegopleural communication in the region of the empyema cavity on the left side. The CT images were unable to confirm the clinical suspicion. The septic patient had undergone decortication. Concrete-like granulomatous tissue prevented proper identification in the aortoesophageal angle just above the diaphragm. An intercostal muscle flap had rotated and covered the suspected lesion. A self- expanding metal esophageal stent was introduced via a flexible esophagoscope to secure the internal wall of the gullet. Three further attempts in stenting failed to control the situation resulting in repeated dislocation and migration. The application of an endoesophageal vacuum assisted foam tube system was decided upon. A properly positioned 7 cm long sponge (Vivano, Hartman) was put under computer controlled continuous suction. 80 Hg mm vacuum pressure was intimated in continuous suction mode. The sponge was exchanged at five-day intervals. Jejunostomy was implemented regarding internal feeding. Standard sponge & vacuum therapy of the empyema cavity was avoided in consideration of the previous aortic surgery. The inflammatory process was under control and the patient was discharged following seventy-one days of

treatment. During the six-month follow-up period, there was no further need regarding potential surgical interventions. The CT images confirmed the complete closure of the left-sided thoracic empyema. Cardiology control was negative and the patient's ability to swallow deemed normal **(Figure 4 and 5).**

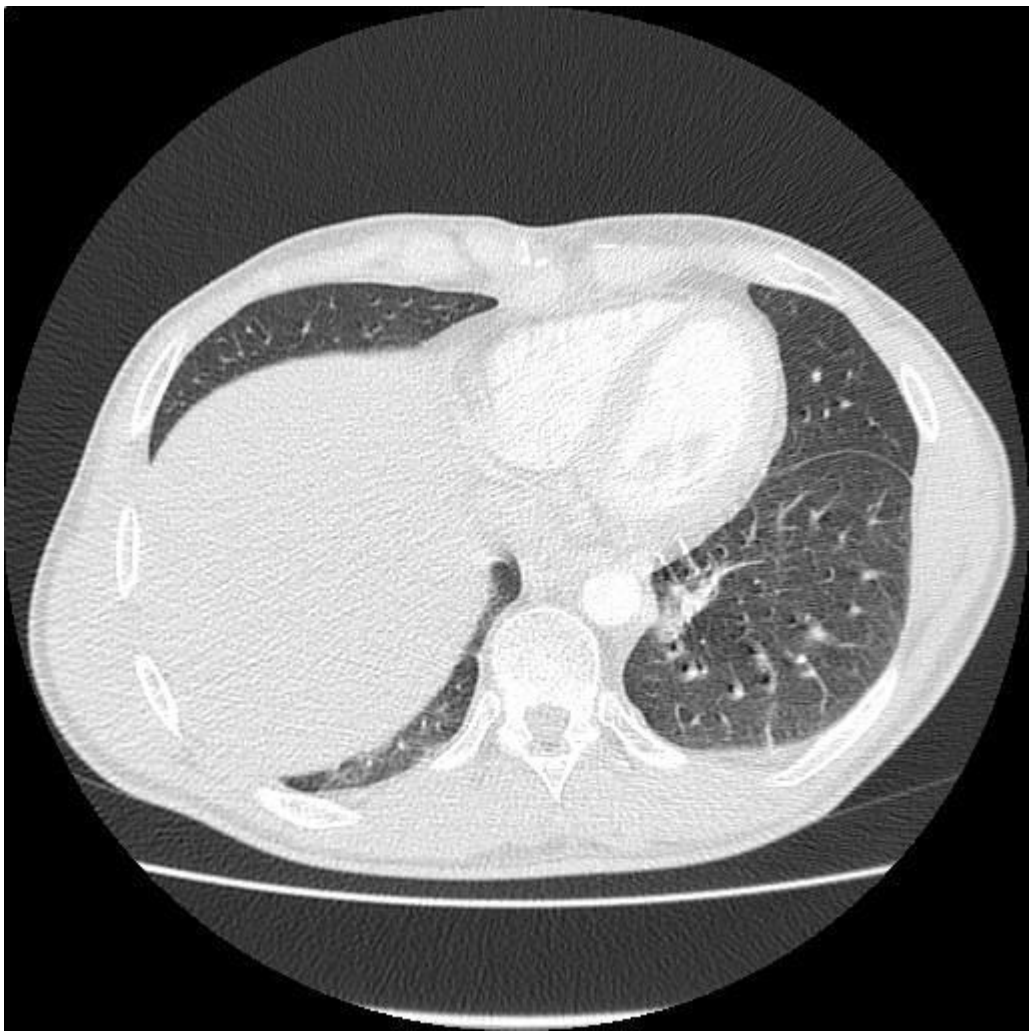

Figure 4: Six months CT control.

Figure 5: Complete recovery.

Conclusions

Reported mortality of penetrating complex chest injuries ranges between 13-15% [1]. The chances of adverse outcome doubles if more than one chest structure is affected. While oesophageal involvement in chest trauma is considerably rare, if it remains undiagnosed in the first twenty-four hours, the likelihood of mortality increases more than 50%. The penetrating injuries of cardiac silhouette are accompanied by cardiac tamponade in 80-90% of the cases [2]. Mechanism, location, physical examination and FAST ultrasound may be sufficient for the decision regarding prompt exploration. The shot chest trauma caused by the crossbow is a high- power injury expending 7.5 J worth of energy. The shape and material of the bolt's point affects the characteristic type of injury.

In our case, the tip of the arrow featured a pencil-tip type sharp end. The high energy penetration of the arrow caused point-like damage with minimal myocardial destruction explaining the lack of pericardial tamponade and significant hemothorax. Without lung tissue damage, no pneumo/hemothorax developed, and the patient remained hemodynamically stable **[3].** Extracorporeal cardiopulmonary bypass is typically available only in cardiac surgery theaters. Myocardial and aortic injury control requires an occlusion catheter, a fully prepared surgeon with cold blood and the capacity to perform simple exclusion techniques, such as inflatable catheters and clamps. The anatomical location of the gullet makes the mediastinal oesophagus injury rare but mortality high, mainly in reference to missed perforation. Supradiaphragmatic thoracic empyema may be consequential while the inflammatory process extension to the esophageal wall is yet another option. Minimally invasive techniques such as endoscopic stentings are preferred among these fragile patients and in theses inflamed operative fields. Failed repeated stenting may result in a need for endoesophageal vacuum therapy **[4,5].** No mechanical means makes the supportive therapy unnecessary.

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References

1. Liman ST, Kuzucu A, Tastepe AI, Ulasan GN, Topcu S. Chest injury due to blunt trauma. Eur J Cardiothorac Surg. 2003;23(3):374-8.
2. Nicol AJ, Navsaria PH, Beningfield S, Hommes M, Kahn D. Screening for occult penetrating cardiac injuries. Ann Surg. 2015;261(3):573-8.
3. Loogna P, Bonanno F, Bowley DM, Doll D, Girgensohn R, Smith MD, et al. Emergency thoracic surgery for penetrating, non-mediastinal trauma. ANZ J Surg. 2007;77(3):142-5.
4. Jung CFM, Müller-Dornieden A, Gaedcke J, Kunsch S, Gromski MA, Biggemann L, et al. Impact of Endoscopic Vacuum Therapy with Low Negative Pressure for Esophageal Perforations and Postoperative Anastomotic Esophageal Leaks. Digestion. 2021;102(3):469-79.
5. Pournaras DJ, Hardwick RH, Safranek PM, Sujendran V, Bennett J, Macaulay GD, et al. Endoluminal Vacuum Therapy (E-Vac): A Treatment Option in Oesophagogastric Surgery. World J Surg. 2018;42(8):2507-11.

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