VIDEO CLIP

Successful Off-Pump Management of a Penetrating Anterior Chest Injury to the Heart

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Case Summary

A 27-year-old married woman from Omdurman, Sudan, was admitted to Omdurman Hospital's casualty department following a penetrating injury to the anterior chest caused by a large sewing needle. The needle, commonly used for sewing sacks (referred to as “Masala”), was reported to have resulted from a domestic accidental injury. This large needle, measuring 12 cm in length and 3 mm in diameter, penetrated the right lower anterior chest below the breast and moved with the heartbeat, as indicated on the ECG systolic waveform.

The patient was otherwise stable, with no history of medical or psychological illness, and was not on any medication. She was well-supported by her family, and neither the patient nor her family reported any unusual incidents.

The patient was admitted to the Intensive Care Unit (ICU) overnight and transported by ambulance to El Shaab Teaching Hospital's cardiothoracic unit in Khartoum, a maximum 20-minute drive away. The following morning, she was taken directly to the operating room.

The heart-lung machine was primed, and after inserting an arterial pressure line and a jugular central line under general cardiac anesthesia, the chest was opened via median sternotomy.

The pericardium was opened in the usual manner but dissected laterally to the penetrating needle, which was found fixed to the right ventricle, approximately two millimeters to the right of the anterior descending artery. There was less than 30 cc of blood present. The surgeon removed the needle and used a finger to close the needle hole. A pledgetted 4-0 Prolene stitch was successfully employed to close the perforation in the right ventricle without the need for cardiopulmonary bypass. The upper third of the pericardium was sewn continuously, and a pericardial drain was left in place, connected to an underwater seal drainage bottle. The sternum was then closed in the usual manner.

The patient stayed in the ICU overnight, where monitoring indicated minimal bleeding. The drain was removed the following day, and the patient was discharged on the fifth post-operative day without further complications.



Figure 1. *Chest X-ray demonstrating the penetrating needle in situ.*



Figure 2. *Intra-operative view of the surgical repair.*

Commentary and Lessons Learned

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1. Pre-Operative Assessment and Triage

The “Moving Needle” Phenomenon: The observation that the needle moved in sync with the ECG systolic waveform is a classic clinical sign confirming myocardial engagement.

Stabilization and Transfer: International guidelines emphasize that stable patients with penetrating cardiac trauma should be transferred rapidly to a definitive cardiothoracic center. The medical team's decision to monitor her overnight in the ICU and transfer her under stable conditions to El Shaab Teaching Hospital (within the crucial 20-minute window) aligns with safe transport protocols.

Avoidance of Pre-operative Removal: A critical guideline rule is never to remove a penetrating foreign body in the emergency department or during transit. The object itself often acts as a temporary tamponade plug. The team correctly left the needle in situ until the chest was open.

2. Intra-Operative Strategy and Surgical Approach

Median Sternotomy: This is the gold-standard incision recommended by international trauma guidelines for anterior chest penetrating wounds. It provides maximum exposure to the anterior right ventricle (RV), great vessels, and the entire pericardial cradle.

Cardiopulmonary Bypass (CPB) Standby: Priming the heart-lung machine beforehand was a stellar adherence to safety guidelines. Even if a beating-heart repair is intended, sudden catastrophic hemorrhage or ventricular fibrillation upon pulling the foreign body can occur. Having CPB immediately available is standard for high-risk cardiac trauma.

Off-Bypass Repair: Because the needle was lodged in the low-pressure right ventricle (rather than the high-pressure left ventricle), and the patient was hemodynamically stable, performing an “off-pump” repair was highly appropriate. It avoided the systemic risks of anticoagulation and CPB-induced inflammatory responses.

Digital Control and Pledgetted Suture: The surgeon's use of a finger for initial digital control, followed by a pledgetted 4-0 Prolene suture, is the textbook technique for closing ventricular lacerations. Pledgets are vital in the right ventricle to prevent the suture from cutting through the thin, friable ventricular myocardium.

Proximity to Coronary Anatomy: The needle was located just 2 mm from the anterior descending artery (likely referring to the left anterior descending, LAD, artery). The surgeon's precision in placing the stitch without compromising or distorting this critical coronary artery aligns perfectly with guidelines aimed at preventing intraoperative myocardial infarction.

3. Post-Operative Care and Outcomes

ICU Monitoring and Early Drain Removal: The minimal drainage post-operatively justified the early removal of the pericardial drain on day one.

Length of Stay: Discharging a patient on post-operative day five following a median sternotomy for penetrating cardiac trauma represents an excellent clinical outcome, indicating no post-operative arrhythmias, structural defects (such as a ventricular septal defect), or infectious complications.

Global Health and Resource-Limited Context

This case is a testament to the high-level expertise of the Sudanese surgical and anesthesia teams. Managing an acute cardiac perforation successfully with selective, minimal interventions (avoiding bypass while prepared for it) shows how international standard-of-care guidelines can be masterfully applied in resource-challenging environments to save lives.

This commentary was prepared with the aid of AI, according to the guidelines of the Eastern Association for the Surgery of Trauma (EAST), the Advanced Trauma Life Support (ATLS) protocols, and the European Society of Cardiology (ESC) guidelines on pericardial diseases.