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Immediate chest wall stabilization following thoracotomy for hemorrhage in severe blunt thoracic trauma

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CASE SUMMARY

An adult patient in his 50s presented to an outside hospital after a fall precipitated by a coughing episode which caused syncope. The patient struck his right chest on the corner of a table. On initial evaluation at the referring facility, the patient was noted to have three right-sided rib fractures and was discharged. The following day, the patient became light-headed and diaphoretic, with another near-syncope event. He subsequently called emergency medical services and was transported to our facility for further care. On presentation, the patient was hypotensive with a systolic blood pressure of 90 mm Hg. The airway was intact, the patient was phonating without issue, but he had diminished breath sounds on the right. Blood transfusion was initiated and a large right-sided hemothorax was noted on a chest X-ray. A 24 F tube thoracostomy was placed into the right hemithorax with the return of 1200 mL of blood within the first 20 min (figure 1). Cross-sectional imaging revealed significant right-sided chest trauma with rib fractures and confirmed no active extravasation (figure 2). No other traumatic injuries were identified and patient continued to require blood transfusions to maintain blood pressure and a subsequent chest X-ray demonstrated a persistent large volume right hemothorax.

WHAT WOULD YOU DO NEXT?

A. Admit to intensive care unit with expectant chest tube management
B. Proceed with interventional arteriography for angiography and potential embolization.
C. Perform additional chest tube placement for further hemothorax evacuation.
D. Proceed to the operating room for thoracotomy and any indicated procedures.

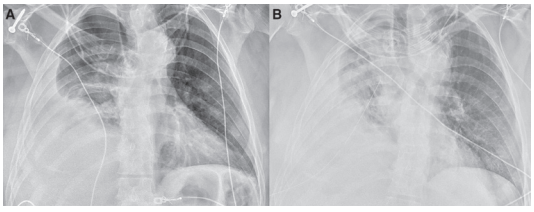

Figure 1 (A) Initial chest X-ray reveals a large right-sided hemothorax. (B) Subsequent chest tube placement resulted in 1.2 L of output but no resolution of hemothorax on plain radiograph.

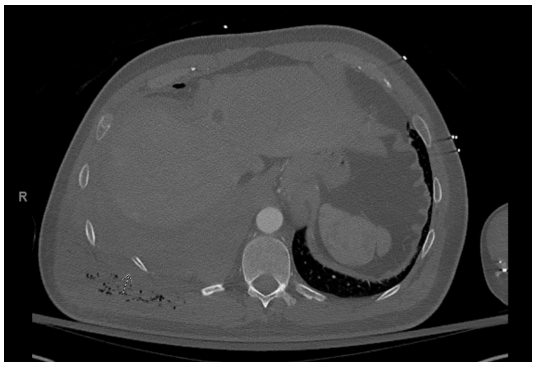

Figure 2 Initial CT scan demonstrating displaced rib fracture near the diaphragm.

WHAT WE DID AND WHY

D. Proceed to the operating room for thoracotomy and any indicated procedures.

The patient remained hemodynamically unstable following chest tube placement and blood product transfusion. Furthermore, there was concern for ongoing hemorrhage given a postplacement chest X-ray that revealed an increased size of the right hemothorax (figure 1). Given the patient's physiology and radiographic findings with continued sanguineous chest tube output, the patient was emergently taken to the operating room.

In the operating room, the patient was placed in the left lateral decubitus position. A right posterolateral thoracotomy was performed. A massive hemothorax was encountered with 2 L of both old

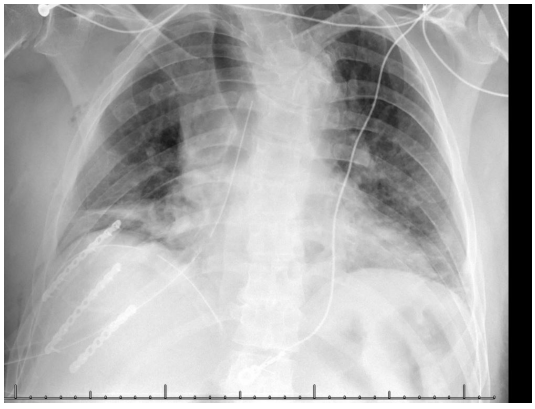

Figure 3 Immediate postoperative chest X-ray following thoracotomy for hemothorax evacuation and control of bleeding with immediate surgical stabilization of rib fractures.

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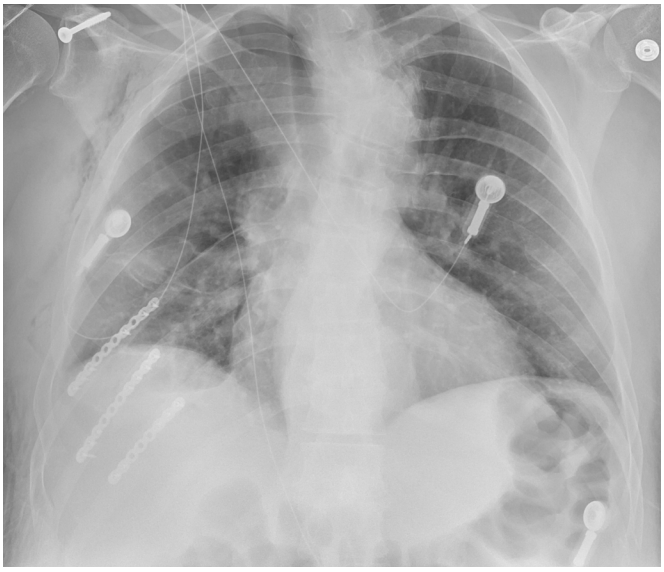

Figure 4 Final chest X-ray prior to discharge.

and fresh blood evacuated from the right chest cavity. There was active bleeding from a diaphragm laceration, presumably secondary to the severely displaced rib fractures. The diaphragm injury was repaired with permanent suture. The patient received four units of whole blood and one unit of packed red blood cells during the resuscitation and stabilized in the operating room. Given the hemodynamic stability and severe displacement of multiple rib fractures, the decision was made to proceed with immediate surgical stabilization of rib fractures (SSRF). As such, ribs 8–10 underwent an operative fixation through the same thoracotomy incision used to expose the intrathoracic bleeding.

DISCUSSION

The primary challenge in this case was twofold. First, the determination needed to be made regarding the initial therapeutic options. Chest tube outputs to help determine operative management following trauma are generally used following penetrating injury. However, in this case, the patient's physiology dictated the need for emergent exploration, as there was no target for angioembolization or other non-operative interventions. The second challenge in this case was regarding SSRF in the hyperacute setting. The patient did have severe rib fractures that, based on anatomy, would be candidate for fixation, but current recommendations state that ongoing resuscitation may be a contraindication to fixation. The Chest Wall Injury Society Consensus Statement advocates for early fixation but states that 'acceptable exceptions to early fixation include hemodynamic instability.'[1] In this novel description, the patient's rapid normalization of his hemodynamics provided an opportunity for immediate fixation of the patient's ribs, which likely would have saved the patient a potential second operation in the coming days. In addition, it was believed the displaced fractures were responsible for the diaphragmatic laceration and we proceeded with fixation to prevent relaceration. Although the optimal timing of SSRF remains debated, this case highlights the feasibility of emergent and immediate chest wall reconstruction with SSRF during a thoracotomy, even in the setting of initial hemorrhagic shock. In the correctly selected patient, especially those with normalization of vital signs and normal or near-normal acid base status, immediate SSRF appears safe and feasible.

In the immediate postoperative period, the patient had a chest X-ray that showed reduction of severely displaced rib fractures, and resolution of his hemothorax (figure 3). The patient recovered without issue postoperatively and was transferred out of the intensive care unit on postoperative day (POD) 1. The patient was discharged home on POD 8 after an uncomplicated hospital course. The postchest tube removal chest X-ray shows a well-expanded lung, no retained hemothorax, and appropriate reduction of the severe rib fractures (figure 4). The patient's pain was well controlled postoperatively and remained so at the outpatient follow-up.

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