When Seconds Matter: Surgical Rescue in Penetrating Cardiac Injuries

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Background
Penetrating cardiac injuries represent one of the most dramatic challenges in trauma surgery. Despite advances in trauma care, mortality rates remain as high as 80–90% when patients do not reach hospital in time. Survival is determined by rapid recognition, immediate operative access, and skilled repair of cardiac lacerations. We present two cases from different Malaysian cardiothoracic centres, illustrating distinct injury patterns and management strategies that culminated in survival.

Case Series
Case 1 : A 42-year-old man sustained a precordial stab wound with a retained knife tip embedded in the sternum. He arrived unstable, with FAST showing pericardial effusion and CT confirming a mediastinal hematoma with hemopericardium. Emergency sternotomy enabled safe foreign body extraction, evacuation of hemopericardium, and repair of a 2 cm right atrial laceration using pledgeted 4-0 Prolene sutures. He was extubated on day two and discharged on day seven.

Case 2 : A 47-year-old man was assaulted with a pair of scissors, presenting with confusion, hypotension, and impending tamponade. EFAST and CT revealed global hemopericardium. Emergency sternotomy revealed a 1 cm right ventricular puncture wound, repaired with pledgeted sutures and hemostatic sealant. He recovered uneventfully, with discharge by postoperative day three.

Discussion
Penetrating cardiac trauma accounts for only 6% of penetrating thoracic injuries, yet it is disproportionately lethal. The right ventricle is most commonly affected due to its anterior location, followed by the left ventricle and atria. Mortality depends on the chamber involved, size of defect, mechanism of injury, and—most importantly—timing of intervention. In both our cases, survival was achieved through early recognition of hemopericardium, rapid transfer to cardiothoracic units, and timely surgical repair.

Role of Imaging: Focused cardiac ultrasound (FAST) is highly sensitive for detecting hemopericardium and is recommended as the first-line modality in unstable trauma patients. In stable or borderline cases, CT angiography provides valuable anatomical detail to guide operative planning, as demonstrated in Case 1, where the retained knife fragment and mediastinal hematoma were clearly delineated.

Surgical Strategy: Emergency department thoracotomy is life-saving in selected patients with witnessed arrest, but sternotomy remains the gold standard when time allows, providing optimal exposure of all chambers and great vessels. Both our patients benefited from sternotomy, enabling controlled repair under direct vision. Pledgeted Prolene sutures remain the cornerstone for atrial and ventricular lacerations, with adjuncts such as hemostatic sealants (e.g., Coseal) offering added security.

Prognostic Factors & Evidence: Literature highlights that prehospital arrest, profound hypotension, and associated great vessel injury predict poor outcomes. Conversely, patients presenting with organized tamponade physiology—such as in our cases—have the best chance of survival when managed swiftly. Reported survival rates for right ventricular lacerations can approach 30–40% with rapid surgical intervention, aligning with our successful outcomes.

Conclusion
These dual-centre cases underscore that penetrating cardiac injuries, although rare and lethal, are survivable with structured trauma protocols, early imaging, rapid operative access, and skilled surgical repair. They highlight the importance of a multidisciplinary approach and the evolving role of imaging and adjunctive technologies in improving outcomes in cardiac trauma.