



Queensland Trauma Education

**CHEST TRAUMA**

# Blunt cardiac injury

Case discussion

Facilitator resource kit

## Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

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### Queensland Trauma Education

**Chest Trauma – Blunt cardiac injury: Case discussion – Facilitator resource kit  
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## About this training resource kit

This resource kit provides case-based scenario to discuss the investigation and management options for a patient with possible blunt cardiac injury following trauma.

### National Safety and Quality Health Service (NSQHS) Standards



### Target audience

Emergency department medical and nursing clinicians.

### Duration

30 minutes.

### Group size

Suited to small group participation.

### Learning objectives

By the end of this session the participant will be able to:

- Discuss the risk factors for developing a blunt cardiac injury (BCI)
- Outline the investigations used in diagnosis of BCI
- Explore management of BCI, including local referral guidelines

### Facilitation guide

1. Discussion can be small group learning or individual case review.
2. Facilitator can use the supplementary materials as relevant to the clinical environment.

### Supporting resources (in printable resources)

1. CXR
2. Coronal CT chest
3. Troponin result
4. ECG

## Case discussion

### Case study

An 82yo M is brought to the ED after being the driver of a single vehicle RTC into a pole. He was helped from his car by bystanders and complains of chest pain. He was wearing a seatbelt, the airbags deployed and the ambulance state there was significant damage to the front of his car, but the speed was unknown.

His vital signs are within normal limits. He has a PMHx of hypercholesterolaemia, hypertension and reflux. His medications are ramipril, esomeprazole and rosuvastatin. He has no medication allergies and lives at home with his wife.

## Question and answer guide

### 1. From the mechanism of trauma, what injuries are likely in this patient?

The patient is complaining of chest pain and with a frontal impact including airbag deployment and wearing a seatbelt he is at risk for chest injuries, including rib fractures, sternal fracture, pulmonary contusion, haemo-pneumothorax. Other thoracic injuries including spinal, scapular and shoulder girdle are also possible. Other trauma injuries are more likely in the elderly, and so assessment to explore head, spine, abdominal, pelvis and limb trauma should be undertaken.

### 2. He complains of tenderness on palpation of his left chest wall and sternum. What investigations will help to identify his injuries?

In the trauma room a chest and pelvic xray can be performed. These tests will give broad information regarding injury profile and help direct the clinical team to immediate interventions required. They are insensitive, however, for subtle and minor injuries which often necessitates CT imaging.

An ECG is a readily accessible bedside test which can be used to identify cardiac ischemia and arrhythmias. These findings may suggest the reason for the car crash occurring, and help risk stratify for blunt cardiac injury.

### 3. What is blunt cardiac injury?

Blunt trauma involving direct impact to the chest wall may result in compression of the heart between the sternum and the spine, with the deceleration mechanism potentially causing a blunt cardiac injury (BCI). Injury mechanisms include motor vehicle crashes, falls, crush injuries, assaults, and sport-related injuries. BCI may be present with or without sternal fracture/s.

The resulting clinical presentation can range from mild to severe and include myocardial contusion, cardiac rupture, valvular disruptions, and great vessel injury. Therefore, any patient who has experienced high-impact chest wall trauma should be considered 'at risk' for potential BCI.

### 4. How is the ECG used in the diagnosis of BCI?

- A **normal** ECG in a patient who is haemodynamically stable, with no evidence of a new arrhythmia or pre-hospital hypotension, is **adequate in ruling out** severe cardiac injury, with a negative predictive value 95% (1).
- An **abnormal** ECG warrants further investigation to define if ECG changes are secondary to an underlying medical condition or the result of a BCI.

### 5. Does having a sternal fracture mean you have BCI?

No! Whilst it does increase the risk, having a sternal fracture does not automatically mean the patient has a BCI. All patients who have sustained chest trauma should be considered to have BCI and a risk stratification undertaken.

### 6. Is there a role for cardiac enzyme tests in BCI?

Yes! (in some patients) It can be used to help with the risk stratification, including the need for further investigations and monitoring. The first step is still performing an ECG.

An **abnormal** ECG warrants further investigation to define if ECG changes are secondary to an underlying medical condition or the result of a BCI. In this case a hsTnI may be performed.

A **normal** hsTnI, in addition to a **normal** ECG, will exclude major blunt cardiac injury or cardiac contusions in **all cases**, with a negative predictive value of 100% (1).

hsTnI is a cardiac-specific biomarker that can be used to monitor the progression of a proven BCI. Repeating the hsTnI again at 4-6hrs will increase the negative predictive value alone (2), however, it is recommended to be used in conjunction with the ECG.

The relationship between hsTnI and BCI is nonlinear and therefore cannot be relied upon for injury severity (1).

Indications for performing a hsTnI include:

- abnormal ECG
- haemodynamic instability with chest trauma
- multi-system trauma with possible cardiogenic shock.

### 7. Does CT imaging help in the diagnosis on BCI?

A CT chest with arterial contrast, is the investigation of choice to delineate all the thoracic injuries, however it is not specific for diagnosing blunt cardiac injuries.

The CT may show associated injuries which are *suggestive* of blunt cardiac injury including:

- sternal fractures
- retrosternal haematoma
- mediastinal injury
- pericardial effusion
- coronary artery dissection.

### 8. In this patient, there is suspected BCI. What should happen next?

The patient needs prolonged telemetry monitoring to reduce the risk of unrecognised arrhythmias.

The continuous telemetry should be commenced in all patients with evidence of arrhythmias, ongoing ECG abnormalities, haemodynamic instability or confirmed BCI. Continuous telemetry should be performed for a minimum of 24 to 48hrs, given that arrhythmias usually manifest within this time period (3).

## 9. Who needs an ECHO performed?

ECHO is the gold standard investigation for BCI diagnosis by direct visualisation of injury and should be utilised in those who are symptomatic (1) and/or have an abnormal ECG ***and*** elevated hsTnl.

An ECHO may be difficult to perform if the patient has significant chest wall tenderness, presence of a haemothorax/pneumothorax, or has difficulty with body positioning.

Trans-oesophageal ECHO (TOE) has an increased diagnostic capability for BCI compared with Transthoracic ECHO (TTE).

A TOE can be performed when a TTE is limited by the chest wall injury, including those that are haemodynamically unstable (4). However, in patients with haemodynamic instability the timing of the TOE may be delayed due to the need for sedative medications.

Abnormalities that may be visualised with a TTE/TOE include:

- abnormal cardiac wall motion
- pericardial effusion
- decreased cardiac contractility
- valvular pathology and
- septal injury.

## 10. Where should the patient be admitted?

This is facility dependant and may be a variety of critical care areas as available. If there are other injuries identified, or he has ongoing chest pain or any haemodynamic instability this may be ICU or HDU. Other centres may use ward-based telemetry or coronary care units for these patients. In some settings this may trigger the need for RSQ and transfer to another centre.

## Acronyms and abbreviations

Term	Definition
<b>RTC</b>	Road traffic collision
<b>PMHx</b>	Past medical history
<b>CT</b>	Computed tomography
<b>ECG</b>	Electrocardiogram
<b>hsTnl</b>	High sensitivity Troponin I – cardiac biomarker
<b>ECHO</b>	Echocardiogram
<b>ICU/HDU</b>	Intensive care unit / high dependency unit
<b>RSQ</b>	Retrieval services Queensland

## References

1. Clancy, K., Velopulos, C., Bilaniuk, J., Collier, B., Crowley, W., Kurek, S., Lui, F., Nayduch, D., Sangosanya, A., Tucker, B. & Haut, E. (2012). Screening for blunt cardiac injury: An Eastern Association for the Surgery of Trauma practice management guideline. *Journal of trauma and Acute Care Surgery*, 73(5), S301-S306. <https://doi.org/10.1097/ta.0b013e318270193a>
2. Alborzi, Z., Zangouri, V., Paydar, S., Ghahramani, Z., Shafa, M., Ziaeiian, B., Radpey, M., Amirian, A., & Khodaei, S. (2016). Diagnosing Myocardial Contusion after Blunt Chest Trauma. *J The Univ Heart Ctr*, 11(2), 49-54. <https://pmc.ncbi.nlm.nih.gov/articles/PMC5027160/>
3. Lieshout, E., Verhofstad, M., Van Silfhout, D. & Dubois, E. (2020). Diagnostic approach for myocardial contusion: a retrospective evaluation of patient data and review of the literature. *Eur J Trauma Emerg Surg*, 47(4), 1259-1272. <https://doi.org/10.1007/s00068-020-01305-4>
4. Shoar, S., Hosseini, F. S., Naderan, M., Khavandi, S., Tabibzadeh, E., Khavandi, S., & Shoar, N. (2021). Cardiac injury following blunt chest trauma: diagnosis, management, and uncertainty. *International journal of burns and trauma*, 11(2), 80–89. <https://pubmed.ncbi.nlm.nih.gov/34094699/>



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