

# *Chest Trauma*

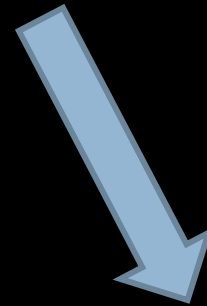
Cathy West

# Chest trauma



**Blunt**

Pressure from impact



**Penetrating**

Direct injury

# *Blunt chest trauma*

- Motor accidents
- Crush fractures
- Falls
- Kicks
- Sports injuries “commotio cordis”

# *Cardiac Injury*

- Compression of heart between spine & sternum
- Abrupt pressure fluctuations in the chest & abdomen
- Shearing from rapid deceleration
- Blast injury
- Fragments from rib fractures

# *Cardiac Injury*

- Anterior structures most commonly injured
  - Right atrium, right ventricle, aorta
- Myocardial rupture, haemopericardium
- Aortic dissection
- Septal & valvular injury
- Acute MI
- Cardiac dysfunction “contusion”

# *Cardiac Contusion*

- “Intramural haematoma in absence of direct injury to other structures”
- RWMA
- Ventricular dilatation
- Change in wall thickness
- Pericardial effusion

## REVIEW

# Myocardial contusion injury: redefining the diagnostic algorithm

M K Bansal, S Maraj, D Chewaproug, A Amanullah

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*Emerg Med J* 2005;22:465–469. doi: 10.1136/emj.2004.015339

- Most susceptible structures:
  - Right ventricle: anterior
  - L sided valves: high pressure chambers, pre-existing pathology
    - MV – leaflet laceration, subvalular rupture
    - AoV – leaflet laceration, annular rupture
  - Coronary arteries: thrombosis, vasospasm, laceration
  - IVS rupture, often near apex

## *Cardiac Contusion – Late complications*

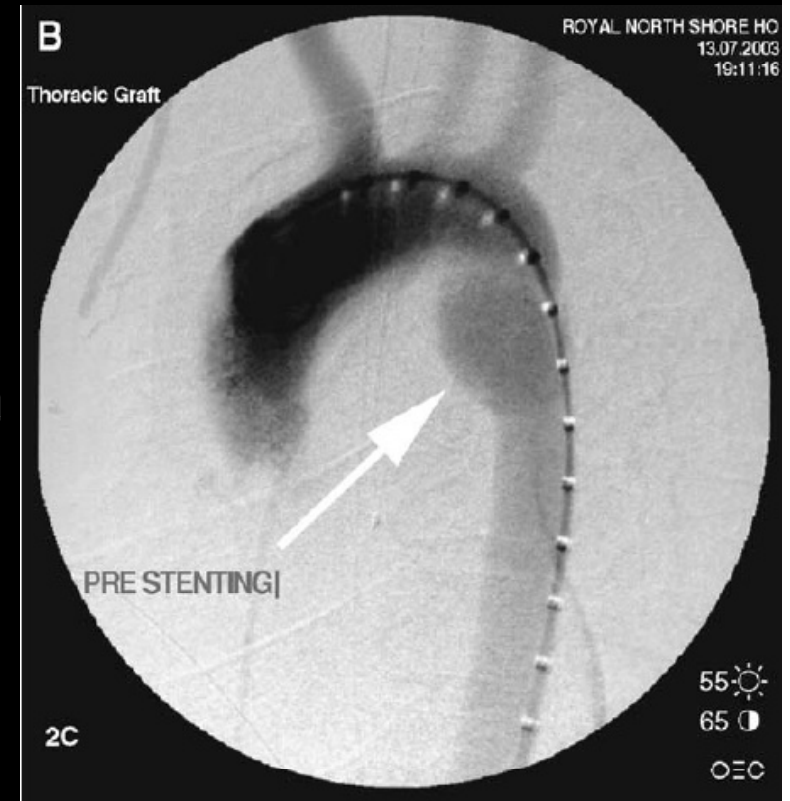
- Ventricular aneurysm
- Chronic dilated cardiac dysfunction
- Cardiac dysfunction caused by structural lesions
- Constrictive pericarditis
- Ventricular arrhythmias (scar tissue or aneurysm)

# *Traumatic Aortic Injury*

- 2<sup>nd</sup> most common cause death in blunt injuries
- >80% pts with TAI die at the scene
- Skews pathology seen in ED
- Partial thickness

# Traumatic Aortic Injury

- Findings:
  - Dilated aortic isthmus
  - Intimal flap with pseudoaneurysm
  - Medial flap
  - Intimal tear or mural thrombus
  - Intramural hematoma
  - Mediastinal hematoma (usually anteromedial)



# Chest trauma



Blunt

Penetrating

# *Penetrating Chest Trauma*

- Low velocity injuries disrupt only the structures penetrated: stab wounds, impalement
- Medium-velocity injuries include bullet wounds from most types of handguns and air-powered pellet guns and are characterized by much less primary tissue destruction than wounds caused by high-velocity forces
- High-velocity injuries include bullet wounds caused by rifles and wounds resulting from military weapons.

The amount of tissue damage is directly related to the amount of energy exchange between the penetrating object and the body part.

# *Penetrating Chest Trauma*

- Small stab wounds can seal by clot & adjacent fat, delaying tamponade
- GSW – extensive myocardial trauma leaving large rents in pericardium & continuing haemorrhaging into a haemothorax

# *Penetrating Cardiac Injury*

Sudden blood loss

- ↓ RV volume
- ↑ compliance

- ↑ blood in pericardium
- acute ↑ in intrapericardial pressure

Tamponade



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DOI: 10.1007/s00268-005-0463-5

## Penetrating Cardiac Injuries: Recent Experience in South Africa

Elias Degiannis, PhD, Peter Loogna, MD, Dietrich Doll, MD, Fabrizio Bonanno, MD, Douglas M. Bowley, MBBS, FRCS, Martin D. Smith, MB, Bch, FCS

*Department of Surgery, Chris Hani Baragwanath Hospital, University of Witwatersrand, Johannesburg, South Africa*

*Materials and Methods:* A structured diagnostic and management approach is used in our trauma unit to deal with penetrating cardiac injury. A retrospective study of 117 patients with penetrating trauma to the heart was conducted over 32 months; the purpose of this study was to describe our protocol and review overall outcome with this type of injury. Demographic details, mechanism of injury, and mode of presentation were recorded. Mortality and morbidity data were collated and echocardiographic follow-up was performed.

# *RSA experience*

- n=117: 96 SW, 21 GSW
- 46% precordium, 40% chest, 14% elsewhere

Most common injuries:

- RA, RV (including through & through injuries)
- LV
- Aorta n=4
- SVC n=2
- PA n=7

# Case reports

- n=66 54SW, 9GSW

Table 2: Localisation of cardiac wounds in 66 patients.

LOCALISATION	PATIENT	%
Right Ventricle	27	40.90
Left Ventricle	24	36.36
Right Atrium	5	7.57
Isolated Pericardium	3	4.54
Left Ventricle and Right Ventricle	3	4.54
Left Ventricle Double	1	1.51
Right Ventricle Double	1	1.51
Right Ventricle and VCI	1	1.51
Left Ventricle and Left Atrial Appendix	1	1.51
TOTAL	66	99.94

# *TTE or TOE?*

- 50 pts thoracic trauma underwent TOE & TTE
- Cardiac contusion detected in 21pts by TOE & only 6 pts by TTE
- $P < 0.001$  for contusion
- TOE evaluation of the aorta

# *Clinical Vignettes*

- Stab wound to chest
- Developed sudden haemodynamic instability
- Echo confirms tamponade
- Percutaneous pericardiocentesis
- Surgical bovine patch on anterior LV wall
- Recovery complicated by heart failure

# *Clinical Vignettes*

- ECG – acute anterior MI
- Angio – cut off in mid LAD
- TOE:
  - hyperdynamic LV
  - Papillary muscle rupture
  - Akinetic anterior wall
  - Apical aneurysm
  - Apical VSD

# *Clinical Vignettes*

- a 3-cm stab wound was located in the right fifth intercostal space 6 cm lateral to the mid-clavicular line
  - The knife had penetrated the upper lobe, entered the pericardium, and lacerated the anterior surface of the right ventricular outflow tract
- a left supraclavicular stab wound 2 cm lateral to the midclavicular line
  - TEE demonstrated a torn anterior leaflet of the pulmonic valve with a minimal pulmonic insufficiency jet. A high velocity jet was noted proximal to the pulmonic valve; its velocity and direction raised the suspicion of an aortopulmonary shunt. Flow was localized from the aorta, 8-mm anterolateral to the origin of the left main coronary artery.

# *Clinical Vignettes*

- High speed MVA with seatbelt
  - Ruptured RAA, tamponade
  
- Nail gun-shot wound over precordium in the 5th intercostal space with surrounding charring of the skin
  - Nail lodged within myocardial wall

# *TPCH experience*

- 2004 – present
- “stab, MVA, accident, flail chest, gun, GSW, horse”
  - N>300
  - True n=44
  - 7 TOEs, 37 TTE

D3 ICU. Left **chest stab wound**. Pericardial puncture, small effusion, RLL collapse. Decreased O2 sats, decreased UO. ? Tamponade.

85 yo man with ischaemic heart disease, MVA with collapse. Troponin leak. ? LV function.

Multiple **stab wounds**. Enlarged heart on chest xray, assess for pericardial effusion.

MVA. Sternal fracture with ? heart contusion. Check for RWMA's.

History of descending aortic dissection/HTN. New left sided weakness. Exclude PFO. History of MVA 2002.

History of MVA with blunt trauma to chest, complaining of chest pain, transferred from Caboolture hospital ?pericardial effusion

**Single stab wound to chest**. ? Pericardial effusion / LV function.

Severe TR. Assess mitral and aortic valves, history of rheumatic heart disease and of MVA with sternal injury.

OHTx 1997. recent MVA + chest trauma. Pleural effusions. ? LV function.

**Post stabbing**, CT aorta-inconclusive with regard to aortic dissection

Closure of VSD and Mitral valve repair 25/0301993 by Peter Tesar after a **stabbing to the chest** that occurred in Bouliia. Closure of the right ventricular free wall.

Post surgery. **Stab wound to the chest**: Traumatic RV to LV and aortic fistula.

Prev MVA complicated by large pulmonary embolus. Pulmonary embolus aspiration. Follow up LV fxn/RVSP.

10 hours post **anterior chest wall stabbing**. Increased CTR on chest x-ray.

Day 3 post multiple **stab wounds to chest** and abdomen.

Stab victim in right stomach. ?effusion

Limited windows available. MVA 27/7/07 sustaining descending thoracic aorta injury and stented at RBWH. Represents with left arm swelling and left arm DVT and extensive PE.

Post motor-bike accident, L sided blunt chest trauma Fractured ribs ,haemodynamically stable ?aortic injury ?LV function

**Stab wound to chest**

10 days post repair of right ventricular injury secondary to **stabbing**. Pyrexia and tachycardic - ?cause.

Ventilated post motor cycle accident. ? pericardial effusion.

Motor Vehicle Accident: sternal fracture. Limited images due to sternal fracture. Patient unable to lay on left lateral side.

History of pre-syncope, recent back-out behind the wheel resulting in MVA.

Day 12 post MVA with SVC rupture. Pericardial effusion on CT chest.

Transfer from Logan Hospital with **stab wound**, query pericardial effusion

24 hours post motorcycle accident. Chest trauma. Chest pain.

MVA secondary to ? arrhythmia. VF arrest. Hx of CABG/AVR.

Transfer from Toowoomba with cardiogenic shock. ?cause. MR noted on brief TTE. Examination performed at the bedside in GICU. Patient developed VT and increasingly unstable haemodynamics resulting in premature termination of the procedure.

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Lung transplant assessment. Hx of impalement on a crowbar.

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Acute LVF. MVA with seatbelt injury 2 months ago. Gradually worsening SOB since.

Patient stabbed himself in epigastrium. Assess for pericardial effusion.

Traumatic aortic injury due to hang glider accident.

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Electric accident. Relief of reddish intra pulmonary fluid. Check for pericardial effusion and LV performance.

MVA (10/12/05). ECG - right atrial abnormality, RVH. Echo (23/1/05) - ASD, dilated RA.

**Stab wounds**. Assess for pericardial tamponade.

n=13

D3 ICU. Left chest stab wound. Pericardial puncture, small effusion. Decreased O2 sats, decreased UO. ? Tamponade.

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  - True n=44
- “fall”
  - n=80

# *Chest trauma: key pathologies*

- Pericardial collection
  - Fluid
  - Blood
  - Air
- Aorta
- RV size & function
- Valves
- VSDs
- LV size & function

# *Traps*

- Epicardial fat
- Pericardial haematoma
- Empty pericardium in presence of haemothorax