

Blunt Cardiac Injury

Update on diagnosis and treatment

Intro

- 1. Epidemiology
- 2. Mechanism
- 3. When to suspect
- 4. How to diagnose
- 5 . Treatment

Intro

- True incidence is not known, as many of death on scene likely are BCI
- No clear definition or gold standard lab test
- Incidence in literature from 8-71%, depending on population and what mechanism is studied
- 20 % of all blunt thoracic trauma
- Higher incidence in autopsy studies
- Schultz, 2004, "myocardial contusion" the most common form of BCI (60-100%)
- Right side of heart more commonly injured as it is in front behind chest wall
- Right: RV 17-32% , RV 8-65%; Left: LV 8-15%, LA 0-31%

Mechanism



- Mechanism of injury:
- Usually high speed MVC
- Pedestrian/MVC
- Severe Abdominal compression with IVC rapid bolus to heart can cause
- Rare: commotio cordis in which a high speed object such as a baseball strikes the precordium at a precise moment in the cardiac cycle.

Types of injury Common

1. Myocardial contusion
2. Blunt coronary artery injuries—almost always in conjunction with severe myocardial contusions, usually LAD—can cause acute MI
3. Valve injuries or rupture of papillary muscle—rarer
4. Aortic valve >> mitral valve
5. Blunt pericardial rupture with laceration of pericardium—can lead to cardiac herniation into thoracic cavity or even abdomen
6. BCI associated with nearby injuries—multiple rib fractures, sternal fracture, pneumo or hemothorax, pulmonary contusions

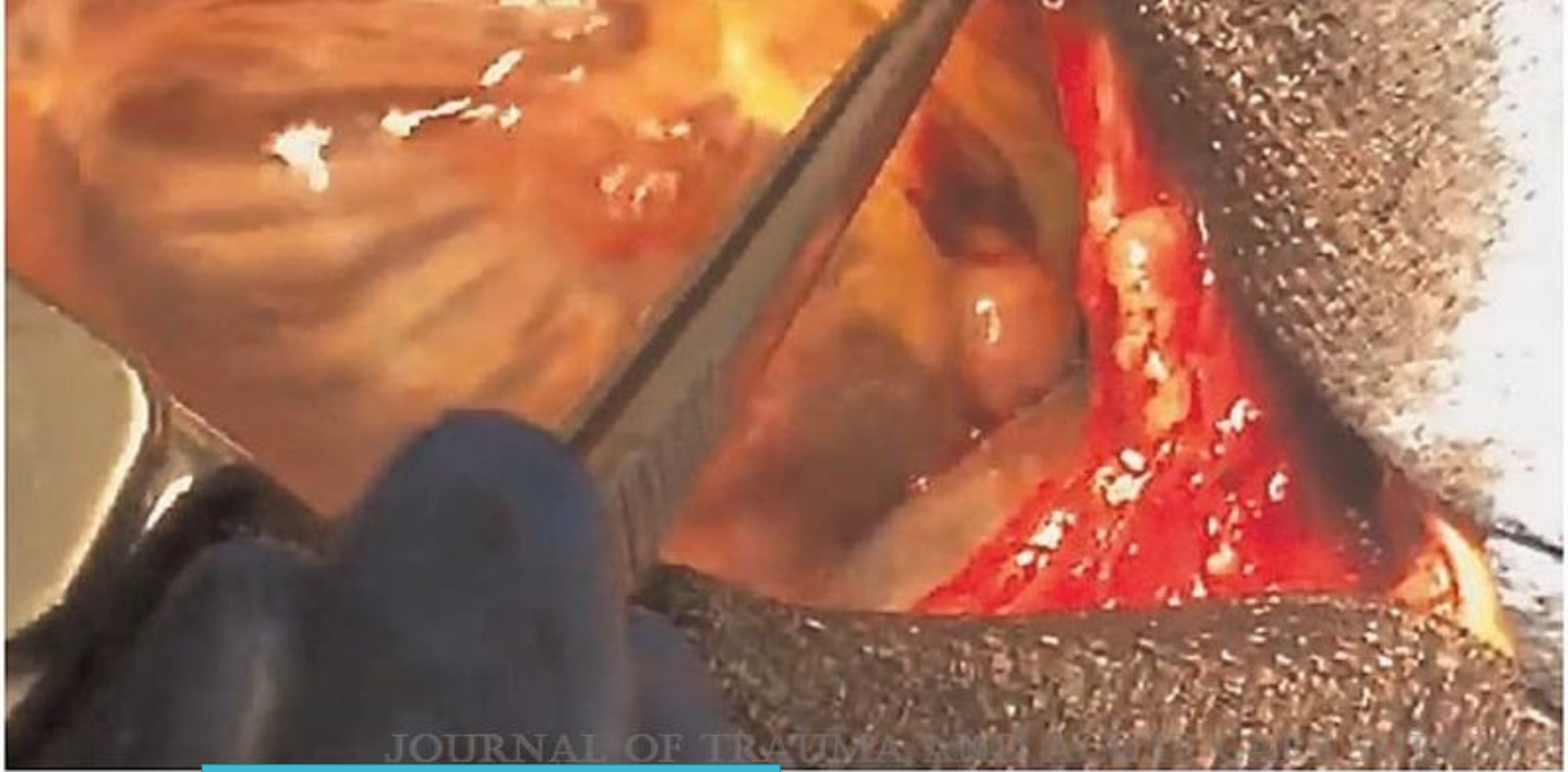
Table 3
Cardiac injury organ scale

Grade	Injury Description	ICD-9	AIS-90
I	Blunt cardiac injury with minor ECG abnormality (nonspecific ST or T wave changes, premature atrial, ventricular contraction or persistent sinus tachycardia)	861.01	3
II	Blunt or penetrating pericardial wound without cardiac injury, cardiac tamponade or cardiac herniation		
	Blunt cardiac injury with heart block (right or left bundle branch, left anterior fascicular, or atrioventricular) or ischemic changes (ST depression or T wave inversion) without cardiac failure	861.01	3
III	Penetrating tangential myocardial wound up to, but not extending through endocardium, without tamponade	861.12	3
	Blunt cardiac injury with sustained (≥ 5 beats/min) or multifocal ventricular contractions	861.01	3-4
	Blunt or penetrating cardiac injury with septal rupture, pulmonary or tricuspid valvular incompetence, papillary muscle dysfunction, or distal coronary arterial occlusion without cardiac failure	861.01	3-4
IV	Blunt pericardial laceration with cardiac herniation		
	Blunt cardiac injury with cardiac failure	861.01	3-4
	Penetrating tangential myocardial wound up to, but not extending through endocardium, with tamponade	861.12	3
	Blunt or penetrating cardiac injury with septal rupture, pulmonary or tricuspid valvular incompetence, papillary muscle dysfunction or distal coronary arterial occlusion producing cardiac failure	861.12	3
V	Blunt or penetrating cardiac injury with aortic or mitral valve incompetence		
	Blunt or penetrating cardiac injury of the right ventricle, right atrium, or left atrium	861.03 861.13	5
	Blunt or penetrating cardiac injury with proximal coronary arterial occlusion		
VI	Blunt or penetrating left ventricular perforation	861.03 861.13	5
	Stellate injuries <50% tissue loss of the right ventricle, right atrium or left atrium	861.03 861.13	5
	Blunt avulsion of the heart; penetrating wound producing >50% tissue loss of a chamber		6

* Advance one grade for multiple penetrating wounds to a single chamber or multiple chamber involvement.

Transmural RV
Laceration





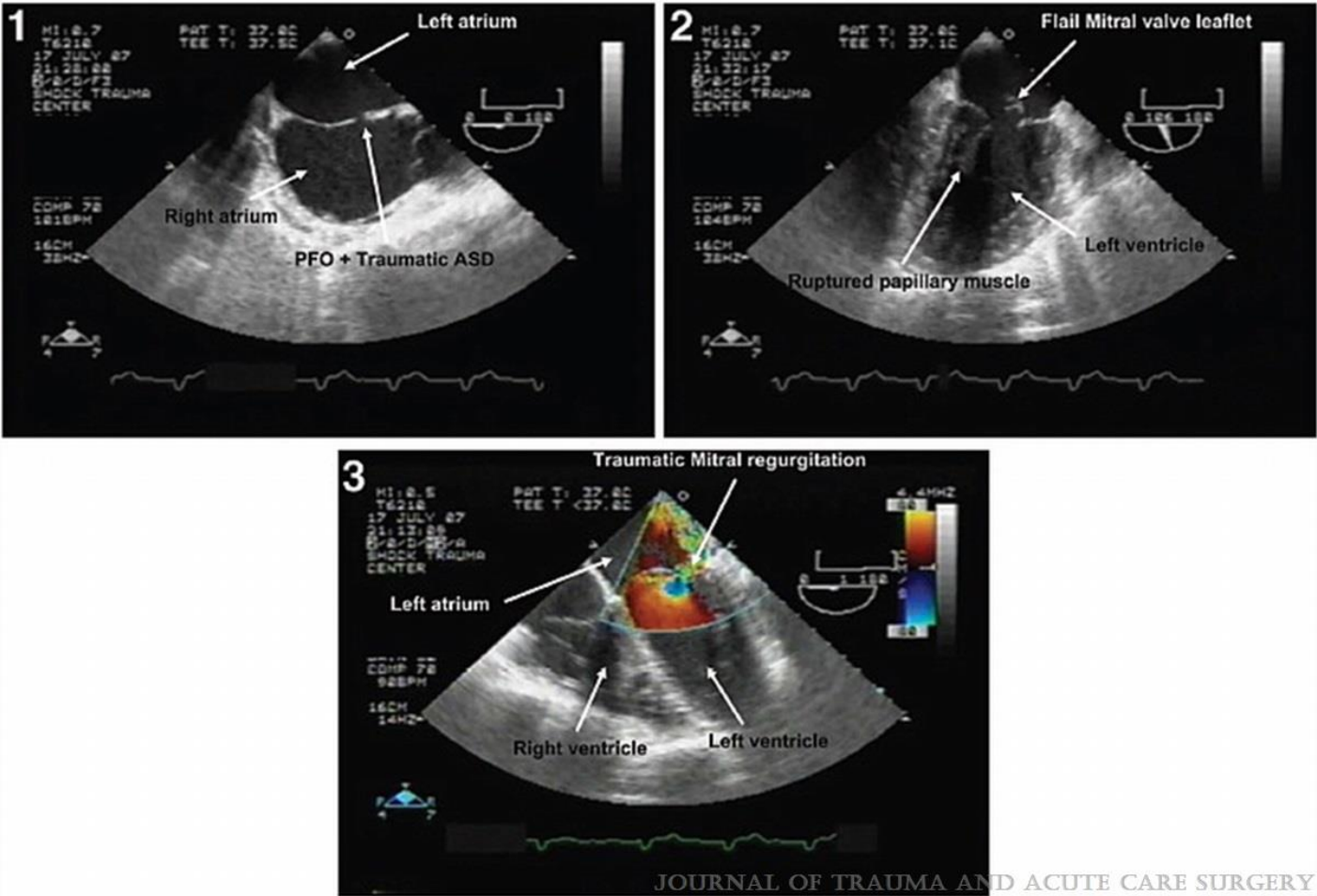
Blunt pericardial rupture with cardiac herniation

Diagnosis and management of blunt cardiac injury:
What you need to know

Biffi, Walter L.; Fawley, Jason A.; Mohan, Rajeev C.

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Echocardiographic images demonstrating traumatic atrial septal defect (panel 1), ruptured papillary muscle and flail mitral valve leaflet (panel 2), and color flow Doppler of mitral regurgitation (panel 3). Reproduced from Menaker et al.³⁴

Case at UMC

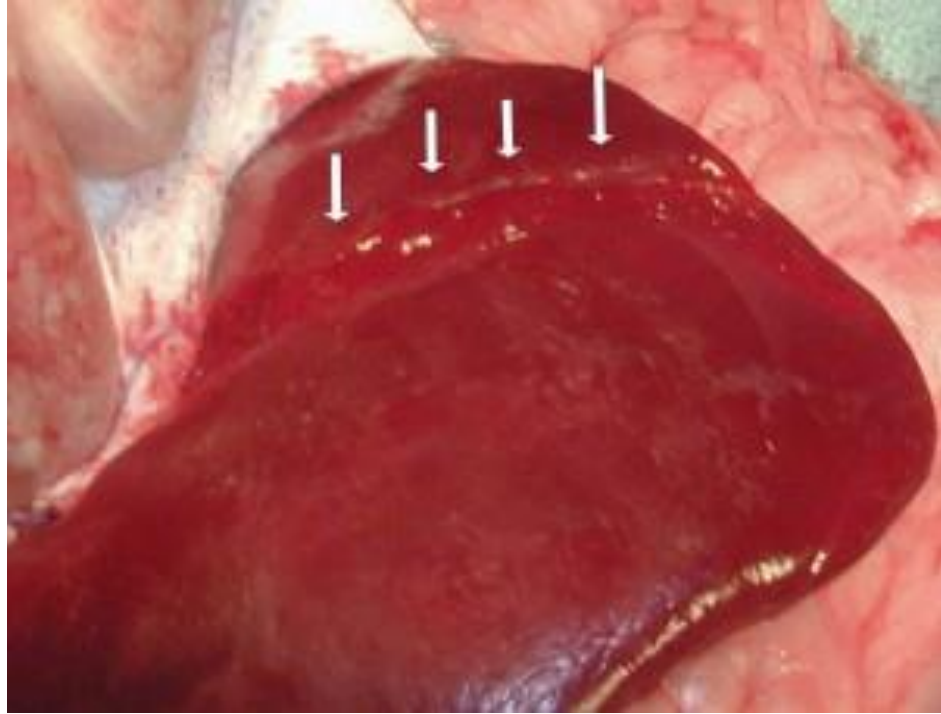
- CC: A 15 yo male presented to ED in shock
- BP 90/40. s/p MVC
- Side-of care impact
- FAST positive



Case at UMC

- Patient transfused and taken to OR

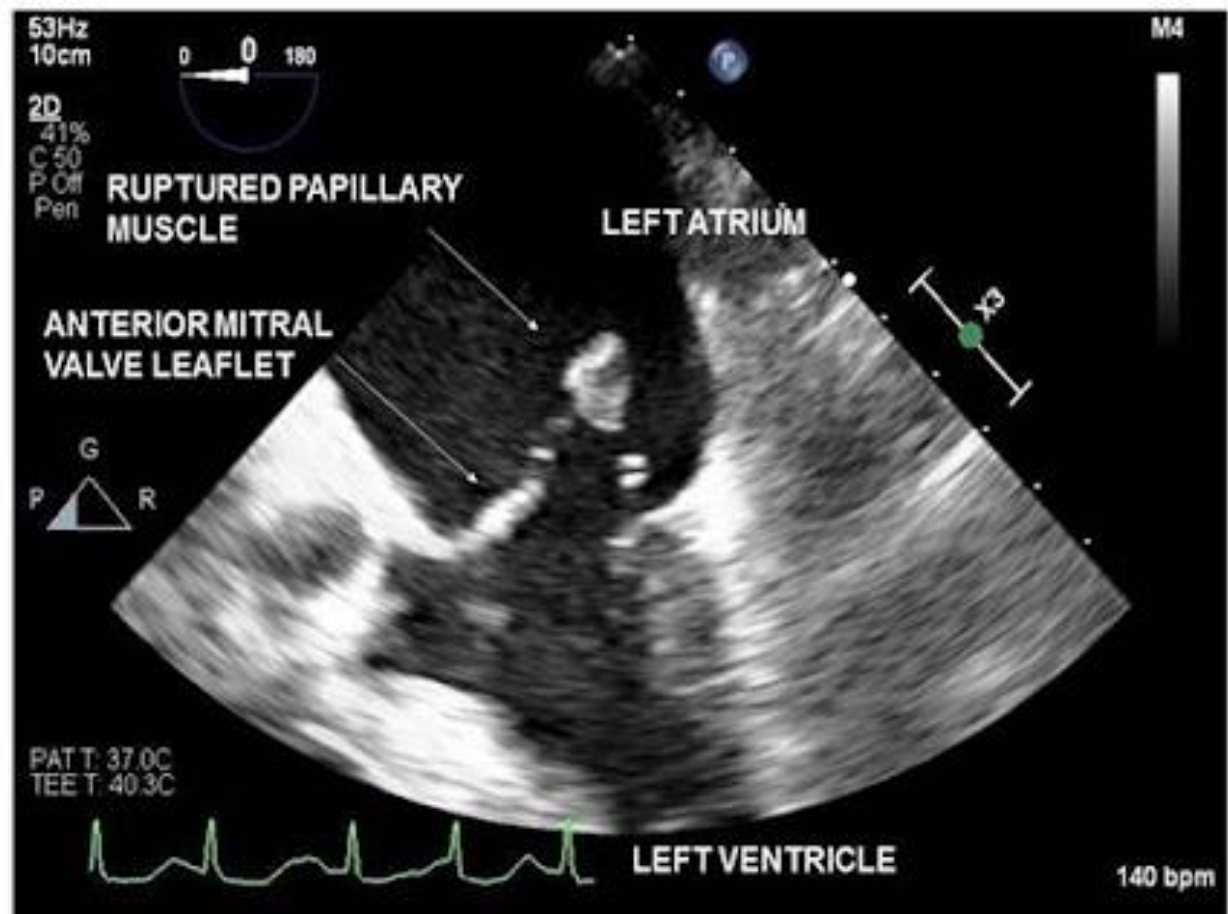
OR



Postoperative

- Postoperative, patient remained hypotensive with BP in the low 90s.
- Tachycardic.
- Patient had new holosystolic murmur

Postoperative course



Postoperative course

- Patient was diagnosed with acute rupture of papillary muscle of mitral valve with acute mitral regurgitation
- Managed initially with milrinone IV infusion
- Later weaned
- Was eventually transferred out of ICU
- Post-discharge TEE was still showing mitral regurgitation, although less.
- Eventually went back to school, went to San Antonio where family lived and was lost to follow up here.

How to diagnose Symptoms

- 1. patient has one of the mechanisms associated with BCIO
- 2. patient has chest pain
- 3. patient has hypotension or not
- 4. tachycardia
- 5. may be hard to diagnose by symptoms

How to diagnose Signs

- Associated injuries—chest wall
- Heart murmur
- hypotension
- ECG showing acute MI pattern
- Hemothorax or pneumothorax on CXR
- May have no signs initially

How to diagnose Tests

- EKG—although no specific finding, may show ST wave changes or arrhythmias
- Cardiac enzymes especially troponin. Not recommended if ECG normal
- Echocardiogram: can show wall motion abnormalities or valve dysfunction
- With Echocardiograms, TEE is more sensitive to detect wall motion abnormalities compared to TTE.
- NO use for radionucleotide scans because they are not sensitive nor specific for the diagnosis of BCI

Treatment

- Treatment depends on the specific cardiac injury
- For commotion Cordis, May need CPR and then treatment will depend on post-code function
- For mild cardiac contusion, if patient has arrhythmias in ED, monitoring, treat arrhythmias and consult cardiology.
- For blunt cardiac rupture—needs OR
- For pericardial tamponade—needs pericardial window. This should be done in OR, because if there is a hole in the heart, then will need repair.
- For free rupture of ventricle with no pulses, can do ED thoracotomy, but results are dismal

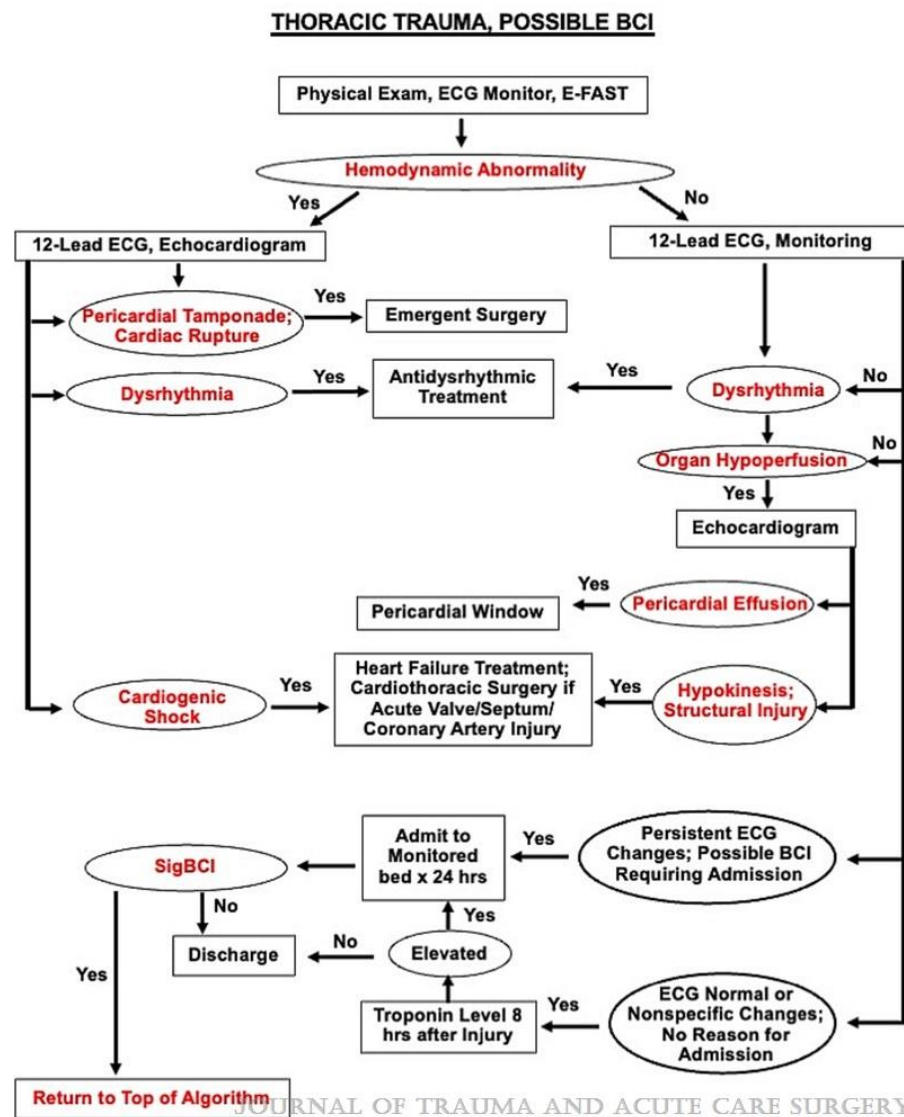
EAST Guidelines for BCI Level I and II evidence

- Level I Guidelines: “ Get EKG in all cases of suspected BCI”
- Level II: 1. “ If admission EKG abnormal, admit patient for continuous EKG monitoring for 24-48 hours. If admission EKG is normal, further pursuit of diagnosis should be abandoned.”
- 2. “If the patient is hemodynamically unstable, an imaging study such as TTE or TEE should be obtained.” Note: consult cardiology
- 3. “Nuclear medicine scans add little compared with echocardiography and are not useful if echocardiography has been performed.”

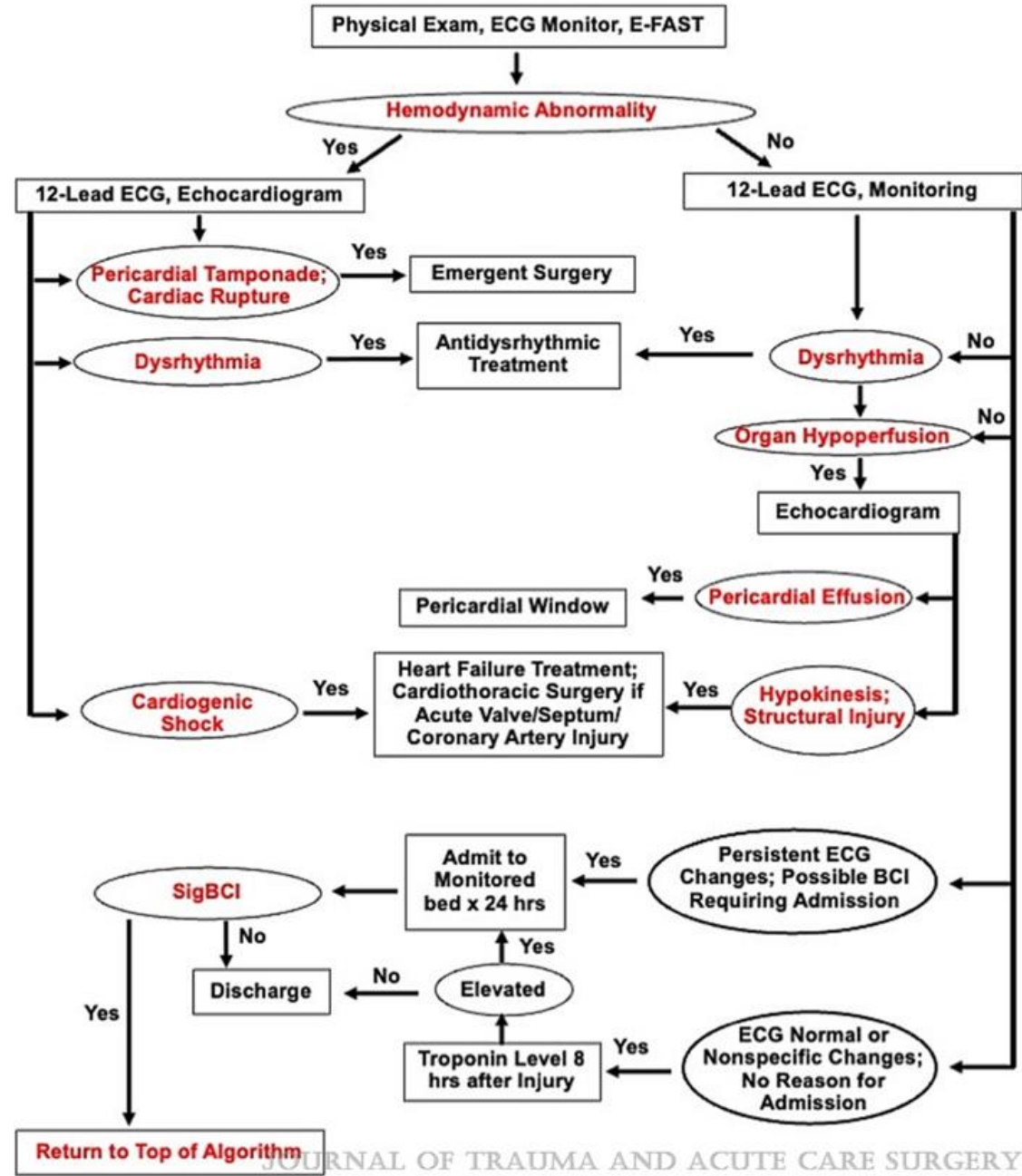
EAST guidelines level 3 evidence

- 1. “Elderly patients with known cardiac disease, unstable patients and those with abnormal EKGs can be safely operated on provided that they are closely monitored.” Note: if operation will normally wait, such as operations which it is normal to wait for swelling to go down, then wait.
- 2. “The presence of a sternal fracture does not predict the presence of BCI, and does not necessarily indicate that monitoring should be performed.”
- 3. “Neither CPK analysis nor measurement of circulating troponin T are useful in predicting which patients have or will have complication related to BCI.”

Putting it
all
together



THORACIC TRAUMA, POSSIBLE BCI



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