



IX Congresso
Novas Fronteiras
em Medicina
Cardiovascular

22 a 24 de Fevereiro 2019

The Village Praia
D'El Rey - Óbidos

TRAUMA CARDIACO & PULMONAR

Desafios atuais num hospital terciário

Ricardo Ferreira, Serviço cirurgia Cardio-Torácica, CHULN

Traumatismo Torácico

Números

20- 25% causa direta de morte ⁽¹⁾ ⁽²⁾

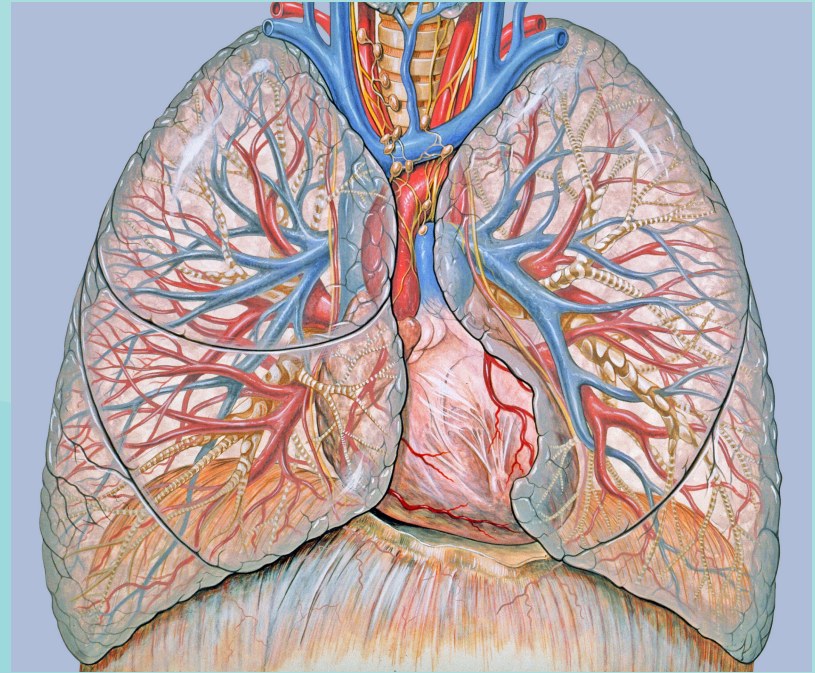
Aumenta

Poli trauma (50%)

Envolvimento cardíaco ou grandes vasos

Representa cerca 18% superfície corporal

Estruturas importantes



(1) Ludwig C, Koryllos A. *Management of chest trauma*. J Thorac Dis. 2017 Apr; 9(Suppl 3): S172–S177.

(2) Feng Lin FC, et al. *Morbidity, mortality, associated injuries, and management of thoracic trauma*. J Chin Med Assoc. Vol 79, Issue 6, June 2016, P329-334

(3) LoCicero J; Mattox KL, *Epidemiology of chest trauma*. Surg Clin North Am. 1989; 69(1):15-9 (ISSN: 0039-6109)

Traumatismo Torácico

Etiologia

Cardiovascular Injuries	Skeletal Injuries	Visceral Injuries
Aortic rupture	Flail chest	Ruptured diaphragm
Caval injury	Rib fracture	Pulmonary contusion
Pericardial effusion/tamponade	Sternoclavicular fracture/dislocation	Hemothorax
Subclavian artery injury	Scapular fracture	Tracheobronchial injuries
Intercostal artery injury	Clavicular fracture/dislocation	Esophageal injury
Commotio cordis	Vertebral or spinal injury	Pneumomediastinum
Cardiac laceration		

Traumatismo Torácico

Etiologia

Penetrantes



10-20% traumatismo torácicos
15-30% necessidade de cirurgia

Contundentes



80-90% traumatismo torácicos
<10% necessidade de cirurgia

Traumatismo Torácico

Penetrantes

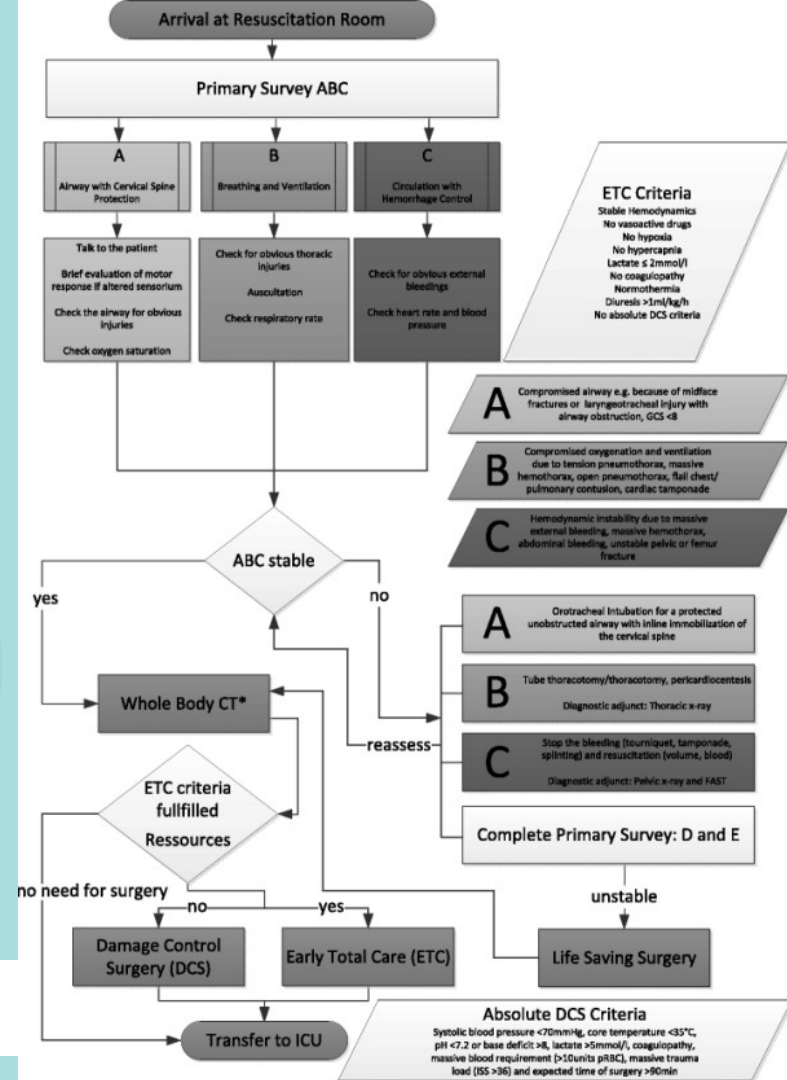
- A **apresentação pode variar amplamente**, desde doentes estáveis com poucas queixas até instabilidade hemodinâmica que necessitam de intervenções imediatas *life-saving*.
- As estruturas torácicas sob risco de trauma torácico penetrante incluem:
 - parede torácica (incluindo pedículos neurovasculares intercostais),
 - Pulmões
 - árvore traqueobrônquica
 - Coração
 - Aorta e grandes vasos torácicos
 - Esófago, diafragma
 - MO, vértebras torácicas e ducto torácico.



Traumatismo Torácico

Penetrantes

- Sintomas/sinais consistentes com lesão grave incluem:
 - Sinais vitais anormais (FC, TA, SpO2, etc..)
 - Dispneia
 - Dor torácica pleurítica
 - Sensação de corpo estranho na garganta ou disfonia
 - MV diminuído e Enfisema SC
 - Distensão venosa jugular.
- A avaliação inicial deverá seguir o ABC do ATLS.
- EOT imediata em doentes com tamponamento pericárdico ou PNTX hipertensivo pode exacerbar a hipotensão e causar colapso cardiovascular. Portanto, sempre que possível, a evacuação do derrame pericárdico ou descompressão do pneumotórax deve ser realizada primeiro.



Traumatismo Torácico

Best Pract Res Clin Anaesthesiol. 2009 Sep;23(3):343-62.

Ultrasound in trauma.

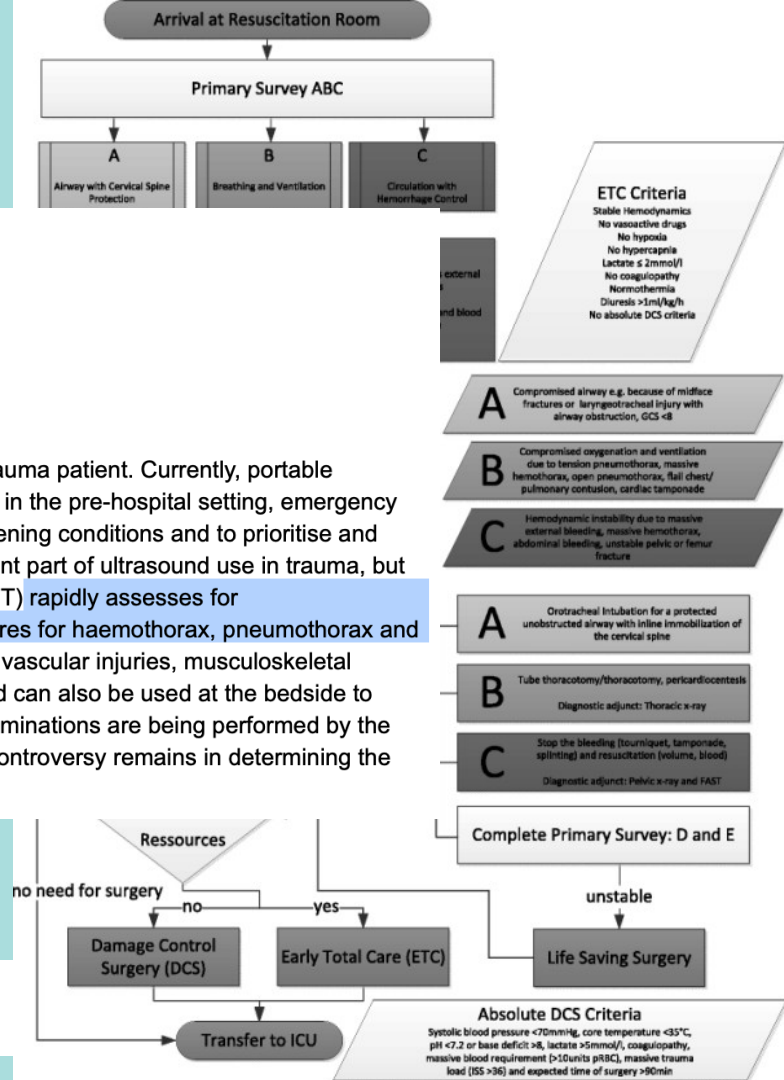
Rippey JC¹, Royse AG.

Author information

Abstract

Point-of-care ultrasound is well suited for use in the emergency setting for assessment of the trauma patient. Currently, portable ultrasound machines with high-resolution imaging capability allow trauma patients to be imaged in the pre-hospital setting, emergency departments and operating theatres. In major trauma, ultrasound is used to diagnose life-threatening conditions and to prioritise and guide appropriate interventions. Assessment of the basic haemodynamic state is a very important part of ultrasound use in trauma, but is discussed in more detail elsewhere. Focussed assessment with sonography for Trauma (FAST) rapidly assesses for haemoperitoneum and haemopericardium, and the Extended FAST examination (EFAST) explores for haemothorax, pneumothorax and intravascular filling status. In regional trauma, ultrasound can be used to detect fractures, many vascular injuries, musculoskeletal injuries, testicular injuries and can assess foetal viability in pregnant trauma patients. Ultrasound can also be used at the bedside to guide procedures in trauma, including nerve blocks and vascular access. Importantly, these examinations are being performed by the treating physician in real time, allowing for immediate changes to management of the patient. Controversy remains in determining the best training to ensure competence in this user-dependent imaging modality.

- Doentes com trauma penetrante em PCR ou peri-PCR podem beneficiar de uma **toracotomia de emergência**.

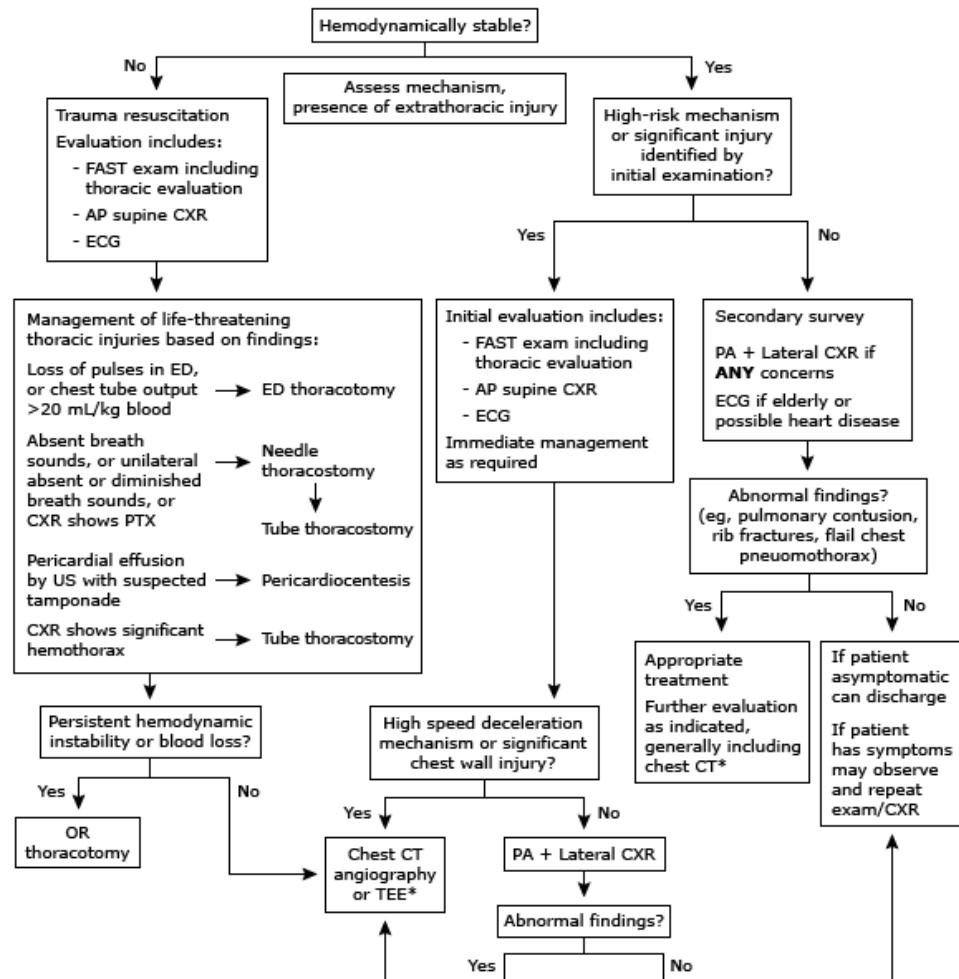


Traumatismo Torác

Contundentes

- O tratamento inicial do trauma torácico contuso segue também os princípios ATLS.
- A respiração (B) pode ter prioridade sobre as vias aéreas (A) se houver um pneumotórax hipertensivo.

Blunt chest trauma in adults ED management algorithm



Traumatismo Torácico

Abordagem ATLS

Abordagem Inicial

Lesões Potencialmente Fatais

A – Airway

B- Breathing

C- Circulation

○ Obstrução da via aérea	A
○ Pneumotórax hipertensivo	A + B + C
○ Pneumotórax aberto	B
○ “ <i>Flail chest</i> ”	B
○ Hemotórax maciço	C
○ Tamponamento cardíaco	C

Traumatismo Torácico

Abordagem ATLS

Abordagem Secundária
Lesões Potencialmente Críticas

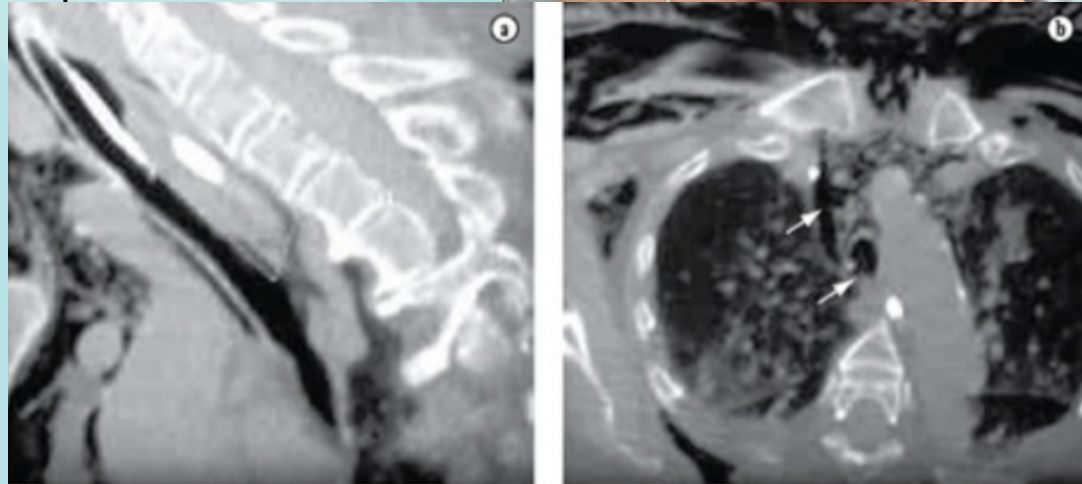
Vigilância
Tratamento conservador
Drenagem Torácica
Correção cirurgica

- Pneumotórax simples
- Hemotórax
- Contusão pulmonar
- Lesão da árvore traqueobrônquica
- Contusão cardíaca
- Disrupção traumática da aorta
- Rutura diafragmática
- Lesões penetrantes do mediastino

Traumatismo Torácico

Abordagem ATLS

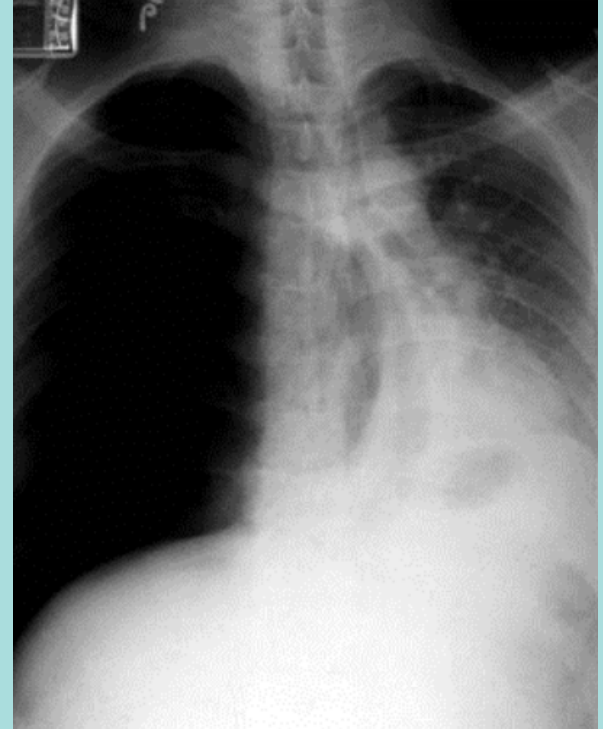
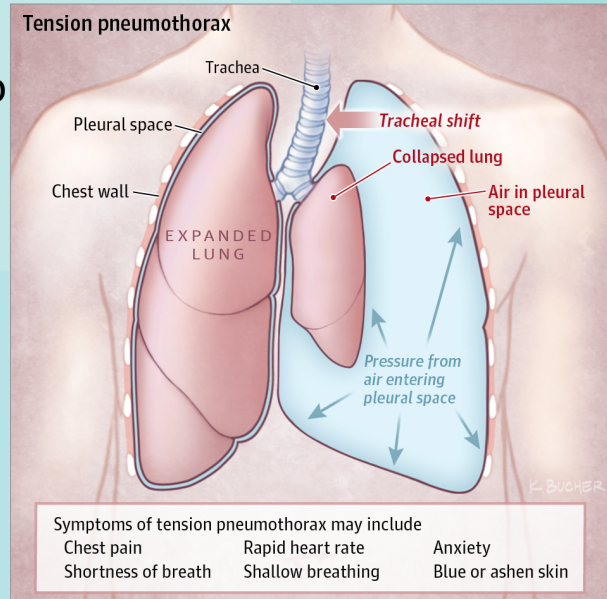
Obstrução Via Aérea
Lesão Traqueia ou Brônquio



Traumatismo Torácico

Abordagem ATLS

Pneumotórax Hipertensivo



Traumatismo Torácico

Abordagem ATLS

Pneumotórax Hipertensivo

Descompressão Imediata

Drenagem Torácica



Traumatismo Torácico

Abordagem ATLS

Pneumotórax Aberto

Potencial de Pneumotórax hipertensivo



Traumatismo Torácico

Abordagem ATLS

Pneumotórax Aberto

Encerramento provisório (Incompleto)

Drenagem Torácica

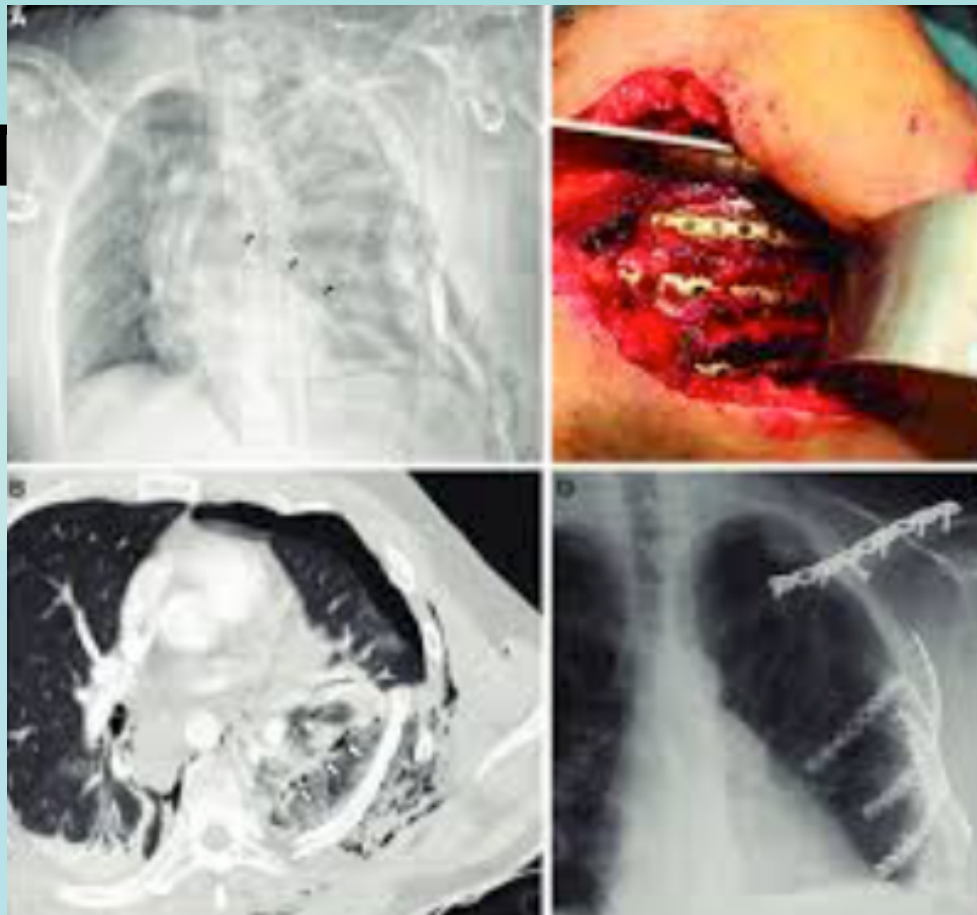
Encerramento definitivo



Traumatismo T

Abordagem ATLS

Flail Chest/ Vollet Costal



Traumatismo Torácico

Abordagem ATLS

Flail Chest/ Vollet Costal

Review Article

Chest wall stabilization in trauma

Jose Ribas Milanez de Campos¹, Thomas W. White²

¹Division of Thoracic Surgery, University of Sao Paulo, Sao Paulo, Brazil;
Lake City, Utah, USA

Contributions: (I) Conception and design: All authors; (II) Administrative :
(IV) Collection and assembly of data: None; (V) Data analysis and interpre
manuscript: All authors.

Correspondence to: Prof. Dr. Jose Ribas Milanez de Campos. Division of Thoracic Surgery, University of Sao Paulo, Sao Paulo, Brazil. E-mail: jribas@usp.br.

Journal of Thoracic Disease, Vol 10, Suppl 8 April 2018

Table 1 Potential benefits of CWS

Shortened duration of mechanical ventilation

Decreased incidence of pneumonia

Decreased need for tracheostomy

Shortened ICU length of stay

Shortened hospital length of stay

Decreased mortality in patients with flail chest

Rapid return to work

Cost effectiveness

Decreased use of narcotics

Earlier mobilization

CWS, chest wall stabilization; ICU, intensive care unit.

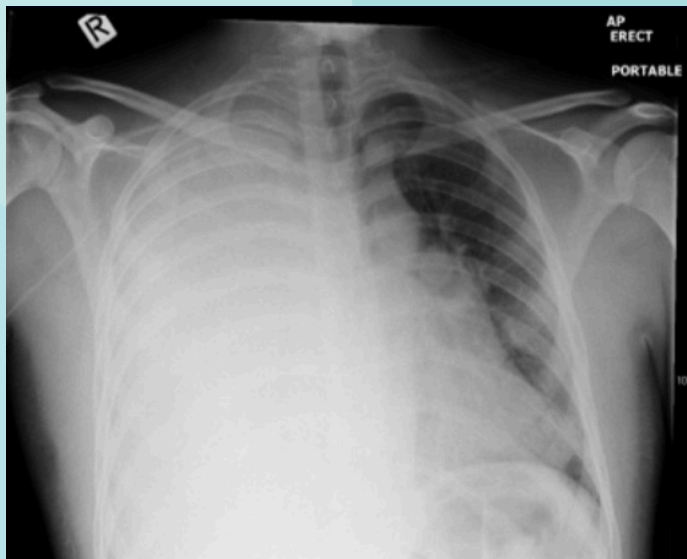
Traumatismo Torácico

Abordagem ATLS

Hemotórax Maciço

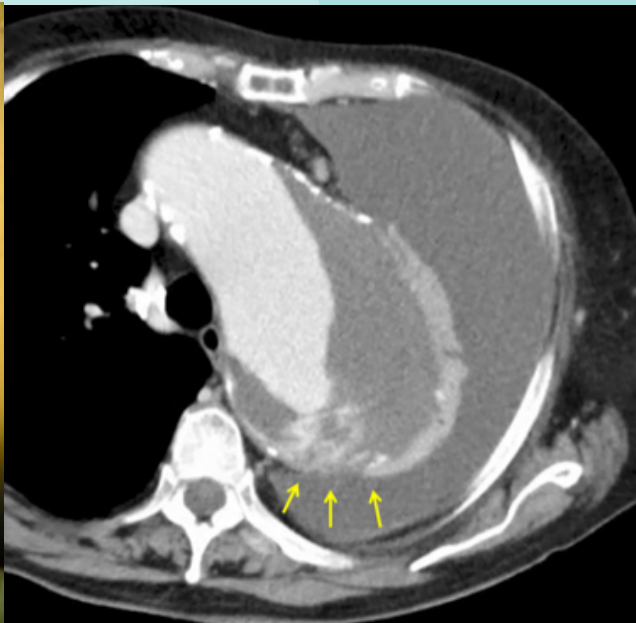
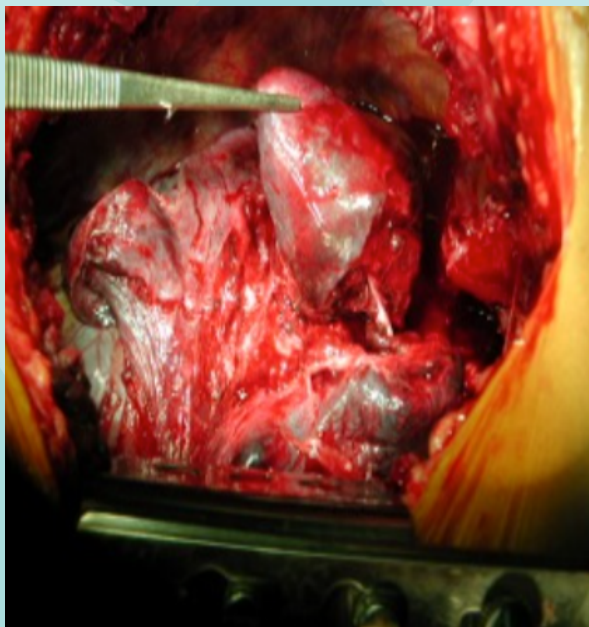
- 1500 imediato
- >250/h (3 horas)

Transfusões



Traumatismo Torácico

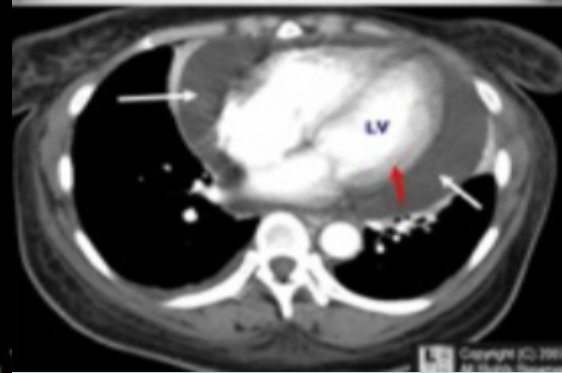
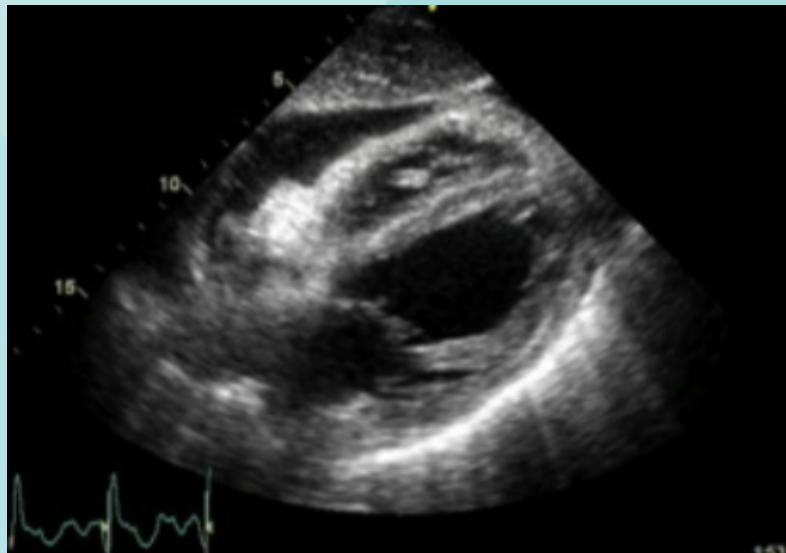
Abordagem



Traumatismo Torácico

Abordagem

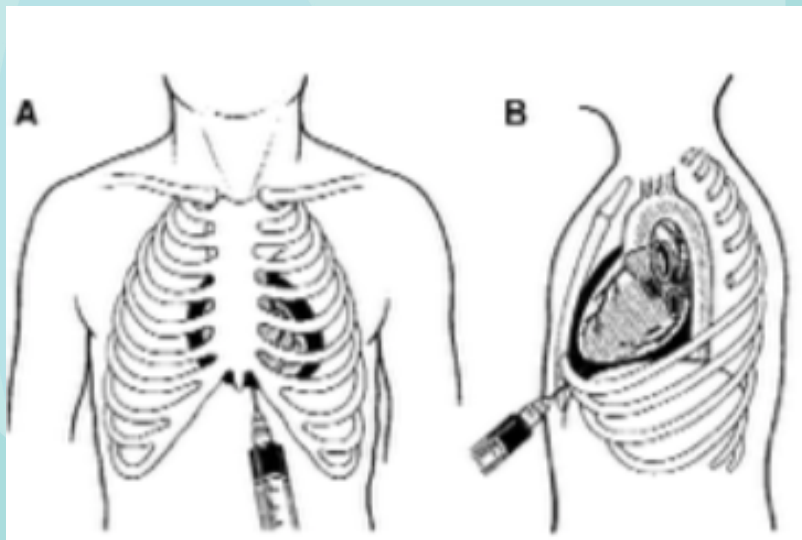
Tamponamento Cardíaco



Traumatismo Torácico

Abordagem

Tamponamento Cardíaco



Traumatismo Torácico

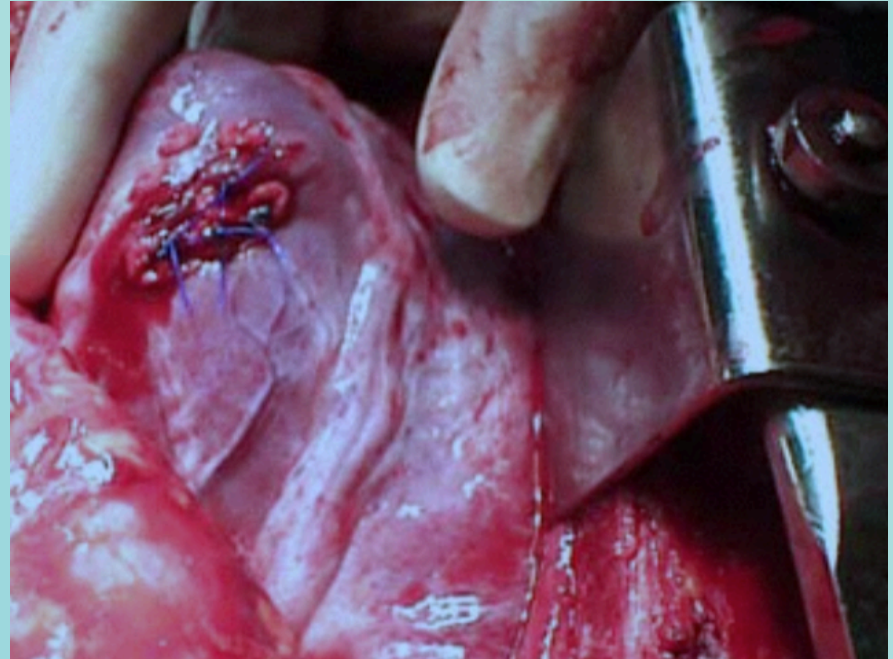
Abordagem

Tamponamento Cardíaco

- Janela Pericárdica
- Esternotomia Mediana

SE HD Instável:

- Pericardiocentese
Emergente



Traumatismo Torácico

Abordagem

Toracotomia EMERGÊNCIA



Traumatismo Cardíaco & Pulmonar

Analysis of trauma patient survival following emergency department thoracotomy

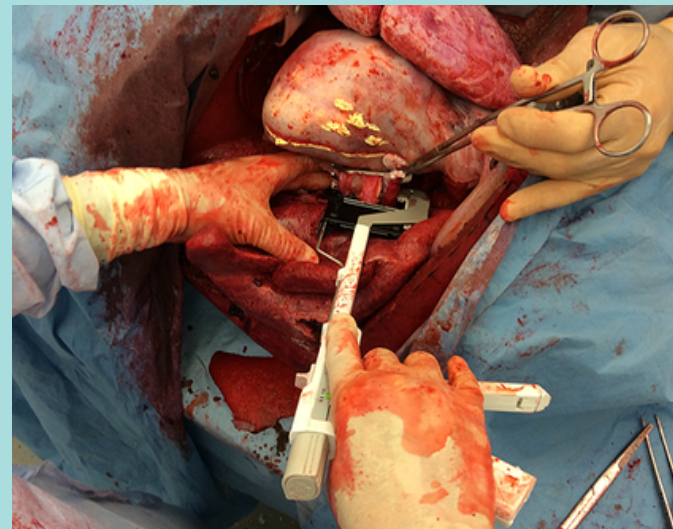
	Number of studies	Hospital survival	% (95% CI)
Injury mechanism			
Penetrating injury	64	674/6390	10.6 (9.8-11.3)
Percentage of surviving penetrating trauma patients neurologically intact post-EDT	35	282/312	90.4 (86.7-93.3)
Gun shot wounds	44	213/2966	7.2 (6.3-8.2)
Stab wounds	44	302/1907	15.8 (14.3-17.5)
Blunt injury	42	50/2172	2.3 (1.7-3.0)
Percentage of surviving blunt trauma patients neurologically intact post-EDT	8	19/32	59.4 (41.9-75.2)
Primary injury location			
Cardiac	24	250/1449	17.3 (15.4-19.3)
Thoracic	27	222/2117	10.5 (9.2-11.9)
Abdominal	22	60/856	7.0 (5.4-8.9)
Neck or extremity	8	9/128	7.0 (3.5-12.5)
Physiologic predictors			
Prehospital CPR			
Yes	9	22/425	5.2 (3.4-7.6)
No	8	41/301	13.6 (10.1-17.9)
ED signs of life			
Yes	35	290/1523	19.0 (17.1-21.1)
No	33	62/2166	2.9 (2.2-3.6)
ED cardiac rhythm			
Asystole	8	10/382	2.6 (1.4-4.6)
Pulseless electrical activity	3	17/152	11.2 (6.9-17.0)
Sinus	3	21/63	33.3 (22.6-45.6)
Other	5	4/83	4.8 (1.6-11.2)
ED vital signs			
Yes	25	241/1382	17.4 (15.5-19.5)
No	35	135/3516	3.8 (3.2-4.5)
Overall			
EDT hospital survival	71	871/10,238	8.5 (8.0-9.1)
EDT neuro intact hospital survival	47	408/6746	6.1 (5.5-6.6)
Percentage EDT survivors neurologically intact	45	466/544	85.7 (82.5-88.4)

Traumatismo Torácico

Abordagem

EMERGÊNCIA – Toracotomia - **INDICAÇÕES**

- Doente apresenta/ava **sinais de vida** na rua ou hospital (= **PCR presenciada**) E
 - respiração espontânea, pulso carotídeo palpável, PA mensurável, atividade elétrica cardíaca, resposta pupilar e movimentos das extremidades
- **Trauma torácico penetrante** HD instável (apesar da ressuscitação fluídica adequada) OU **PCR <15 min** (TT contundente PCR <10m), E
- Cirurgião torácico ou de trauma disponível <45 minutos

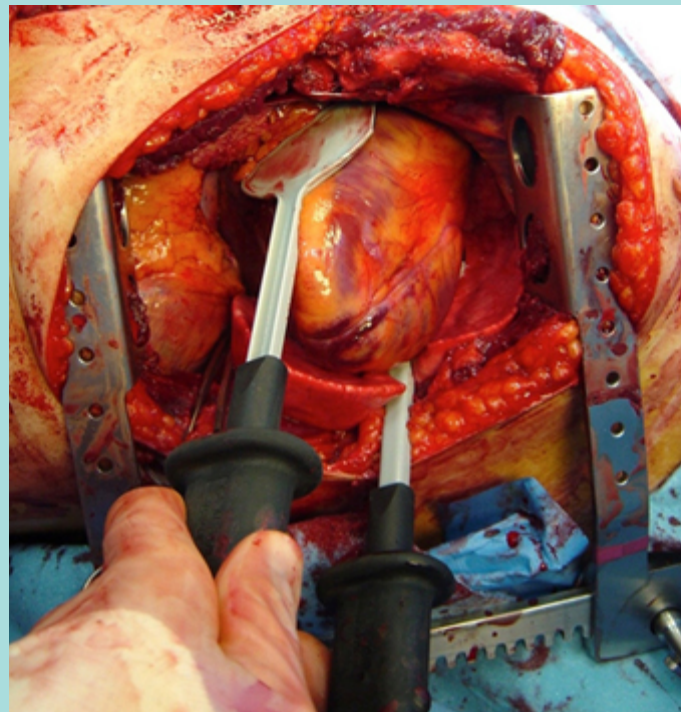


Traumatismo Torácico

Abordagem

CONTRAINDICAÇÕES/FUTIL

- Sem pulso ou TA na rua (**PCR Não presenciada**)
- **Assistolia** como ritmo de apresentação (na ausência de tamponamento pericárdico)
- **PCR prolongada (>15 minutos)** em qualquer momento
- Lesões maciças ou não compatíveis com a vida
- Sem cirurgião torácico ou de trauma em <45 minutos

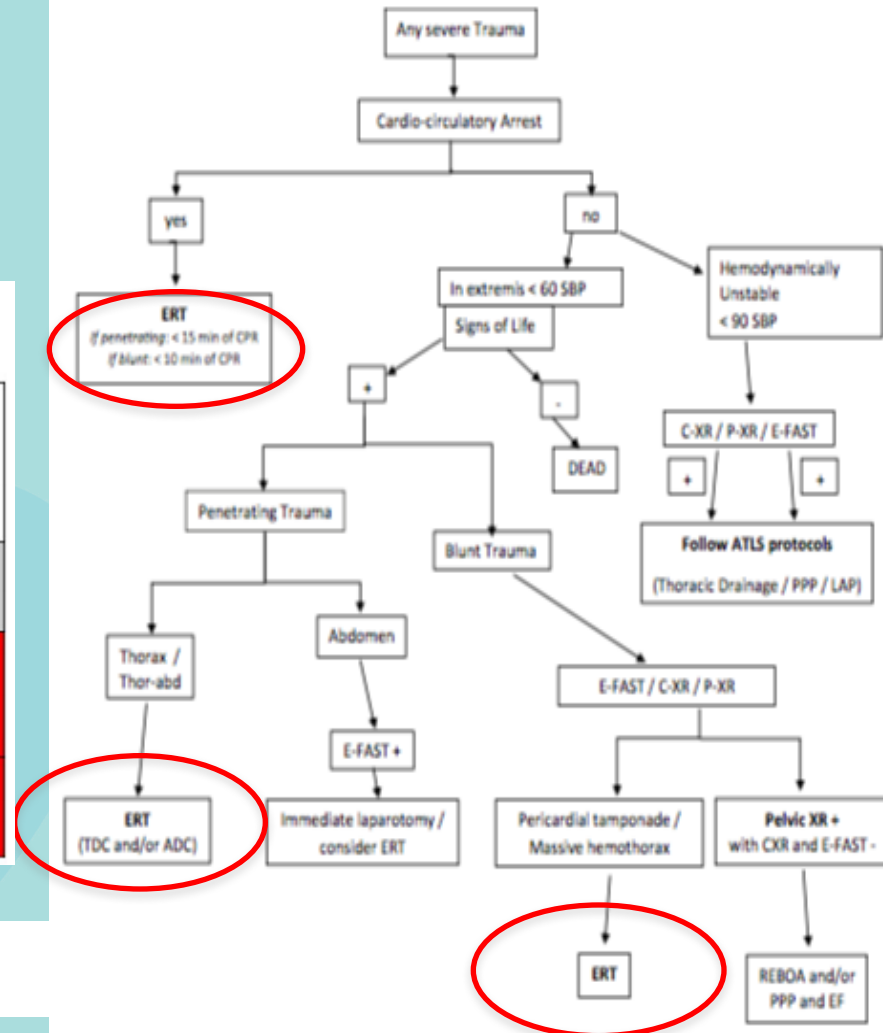


Traumatismo Torácico

Abordagem ATLS

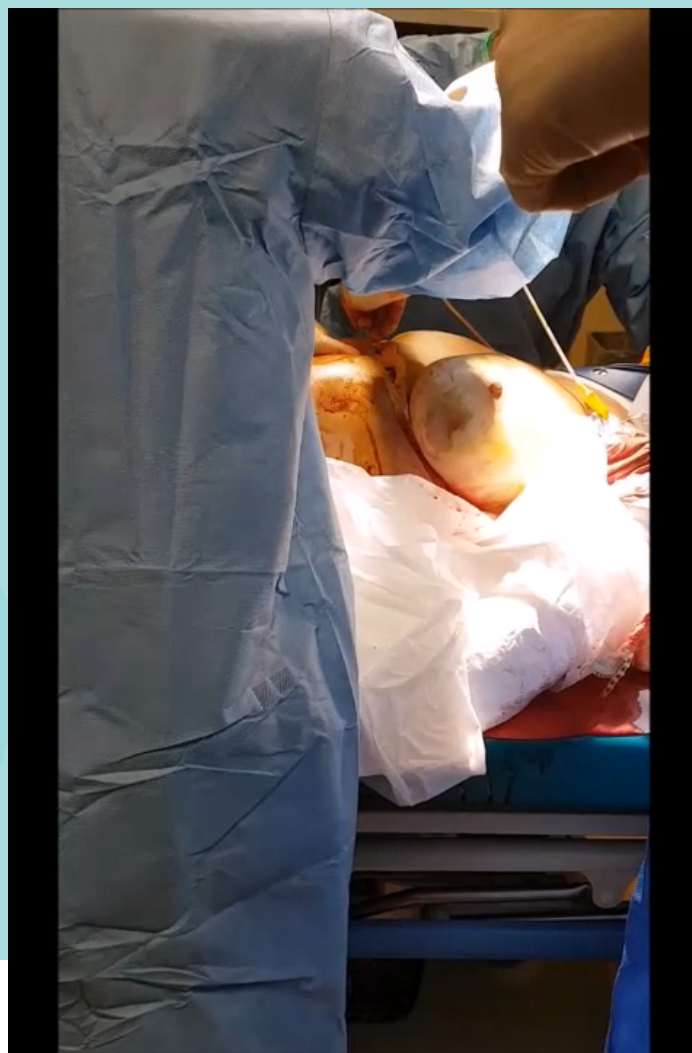
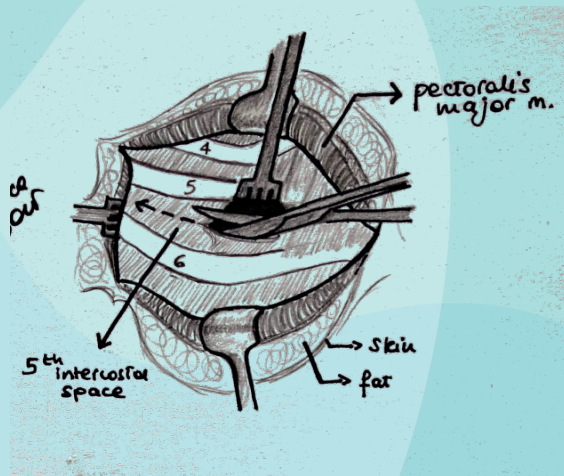
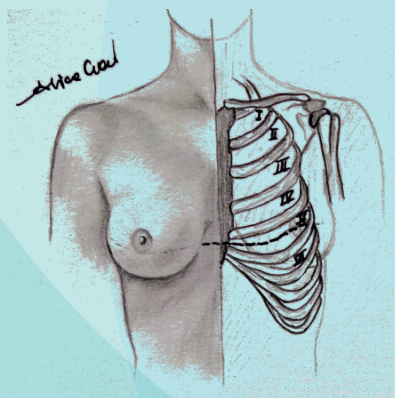
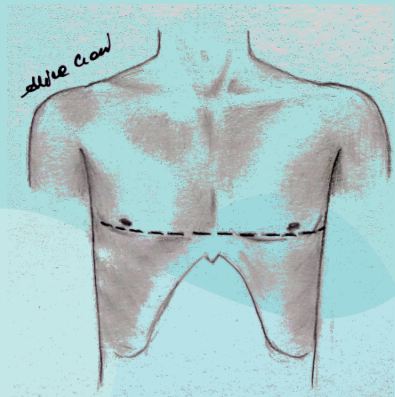
ERT indications

	SBP<60/Extremis	CA in ER during DC Resuscitation	PEA US: cardiac contraction	Asystole US: No cardiac contraction, No pericardial effusion
Penetrating Trauma	YES	YES	YES If CA <15'	Grey zone*
Blunt Trauma	Thorax → YES	YES	YES If CA <10'	NO
	Abdomen/Pelvis → first Laparotomy/REBOA			
Massive TBI Age Comorbidities	Grey zone*	Grey zone*	Grey zone*	NO





Perform the Clamshell incision in 5th space, just below the nipples





Traumatismo Torácico

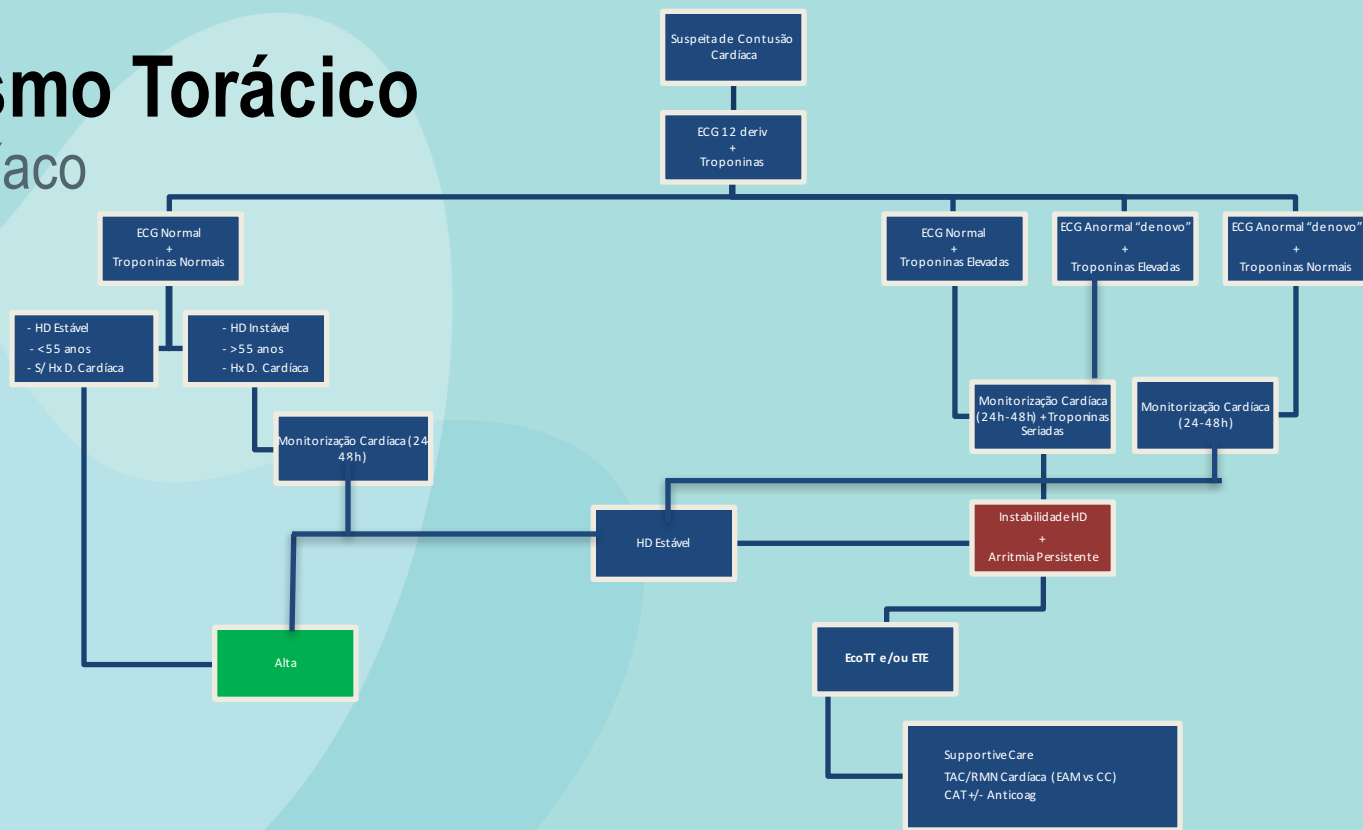
Trauma Cardíaco

Cardiac injury scale

Grade	Injury description
I	Blunt cardiac injury with minor ECG abnormality (nonspecific ST or T wave changes, premature atrial or ventricular contraction, or persistent sinus tachycardia)
	Blunt or penetrating pericardial wound without cardiac injury, cardiac tamponade, or cardiac herniation
II	Blunt cardiac injury with heart block or ischemic changes without cardiac failure
	Penetrating tangential cardiac wound up to but not extending through endocardium, without tamponade
III	Blunt cardiac injury with sustained or multifocal ventricular contractions
	Blunt or penetrating cardiac injury with septal rupture, pulmonary or tricuspid incompetence, papillary muscle dysfunction, or distal coronary artery occlusion without cardiac failure
	Blunt pericardial laceration with cardiac herniation
	Blunt cardiac injury with cardiac failure
	Penetrating tangential myocardial wound up to but not through endocardium, with tamponade
IV	Blunt or penetrating cardiac injury with septal rupture, pulmonary or tricuspid incompetence, papillary muscle dysfunction, or distal coronary artery occlusion producing cardiac failure
	Blunt or penetrating cardiac injury with aortic or mitral incompetence
	Blunt or penetrating cardiac injury of the right ventricle, right or left atrium
V	Blunt or penetrating cardiac injury with proximal coronary artery occlusion
	Blunt or penetrating left ventricular perforation
	Stellate injuries <50 percent tissue loss of the right ventricle, right or left atrium
VI	Blunt avulsion of the heart
	Penetrating wound producing >50 percent tissue loss of a chamber

Traumatismo Torácico

Trauma Cardíaco



Traumatismo Torácico

Trauma Cardíaco

Cardiac injury scale

Grade	Injury description
I	Blunt cardiac injury with minor ECG abnormality (nonspecific ST or T wave changes, premature atrial or ventricular contraction, or persistent sinus tachycardia) Blunt or penetrating pericardial wound without cardiac injury, cardiac tamponade, or cardiac herniation
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VI	Blunt avulsion of the heart Penetrating wound producing >50 percent tissue loss of a chamber

Traumatismo Torácico

Conclusões

1. Importantes no contexto de traumatismo isolado e politrauma
2. Abordagem sistematizada de acordo com etapas de gravidade – ATLS
3. Equipas de emergência devidamente treinadas e equipadas
4. A maioria dos casos são simples e resolvem-se apenas com vigilância ou procedimentos *minor* (drenagem torácica)

RESEARCH ARTICLE

Comparative Effectiveness of Emergency Resuscitative Thoracotomy versus Closed Chest Compressions among Patients with Critical Blunt Trauma: A Nationwide Cohort Study in Japan

Kodai Suzuki^{1*}, Shigeaki Inoue², Seiji Morita², Nobuo Watanabe², Ayumi Shintani³,

after ERT for blunt-trauma patients (0.0 to 0.0) compared to those of patients with penetrating trauma [14, 24–30]. In a large retrospective meta-analysis based on 25 years of published data, Rhee et al. described 24 studies that included a total of 4,620 ERT cases [16]. These data showed an overall survival rate of 7.4%, with normal neurological outcomes in 92.4% survivors. Furthermore, the survival rate was higher for patients with penetrating trauma (8.8%), particularly cardiac injuries (19.4%) and stab wounds (16.8%), than for those with blunt trauma (1.4%) [16]. The American College of Surgeons' Committee on Trauma reviewed 42 studies that included 7,035 ERT cases in its *Practice Management Guidelines for Emergency Department Thoracotomy*. These data showed an overall survival rate of 7.8% and survival rates of 11.2%