

ECHO assessment of the trauma patient

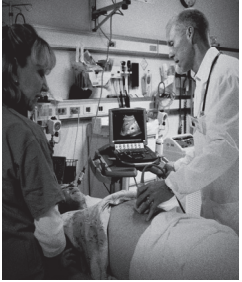
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- ### Critical points in the multiple trauma patient
- Early diagnosis in the E.D – FAST
 - Lung evaluation
 - Pneumothorax
 - Pleural effusion
 - Cardiovascular evaluation
 - Fluid responsiveness
 - Heart trauma
 - Aortic evaluation

- ### Perioperative ECHO
- E.D
 - O.R
 - Recovery Room
 - ICU
 - Non-invasive
 - Accurate
 - Inexpensive, rapid
 - Easily repeated
 - No contraindications


How is Emergency Ultrasound Different?

- Designed to answer a simple clinical question at the bedside
- Highly focused
- Limited exam
- Goal directed exam
- Critically time dependent




Why Ultrasound in Trauma?

TIME CRITICAL!
In a disease in which there is a golden hour, every minute counts!



FAST Exam Focused Assessment Sonography in Trauma

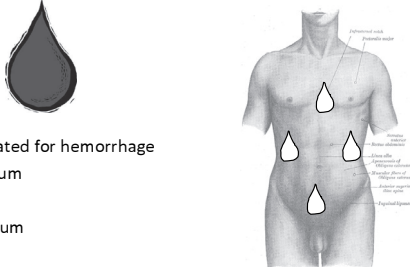
- Exam is focused/targeted
 - not performing a complete survey
 - goal is to diagnose hemorrhage
 - not sensitive for identification of organ injuries



"Average examination time 2.5 minutes."

Goal of FAST Exam

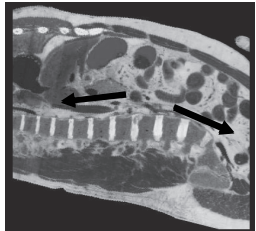
- Detection of free intraperitoneal and pericardial fluid in trauma



- Areas evaluated for hemorrhage
 - Peritoneum
 - Pleura
 - Pericardium

Hemorrhage

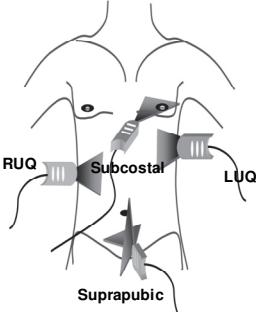
- In most trauma patients
 - if hemorrhage is above the bony pelvis, it will flow superior (cephalad)
 - if below, it will flow inferior (caudad)



When is it Performed? Primary Views

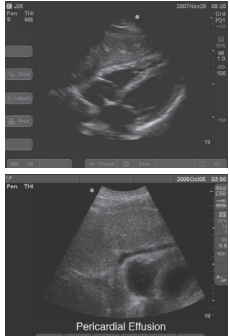
Life-threatening Emergencies

- Blunt abdominal trauma
- Penetrating torso trauma
- Abdominal pain of unclear etiology
- Trauma in pregnancy
- Unexplained hypotension

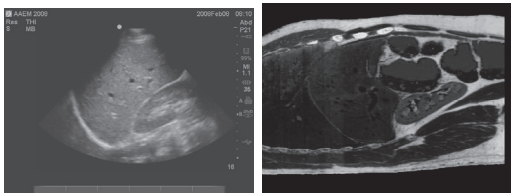


FAST Exam – Subcostal View

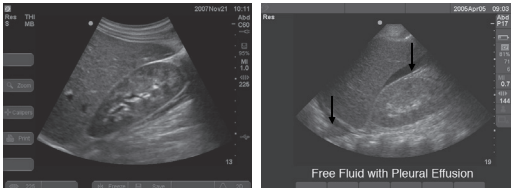
- Detection of cardiac activity
- Asses global function
- Evaluate for pericardial effusion or tamponade

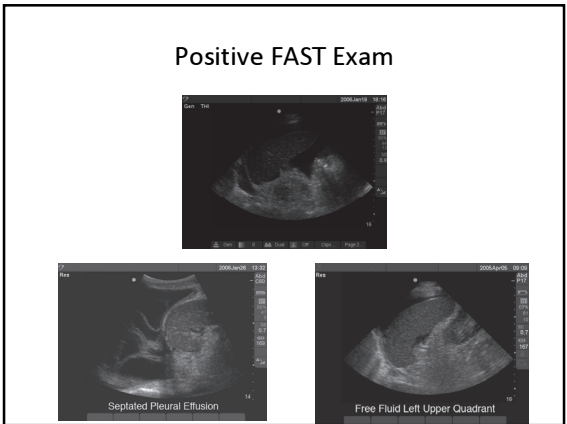
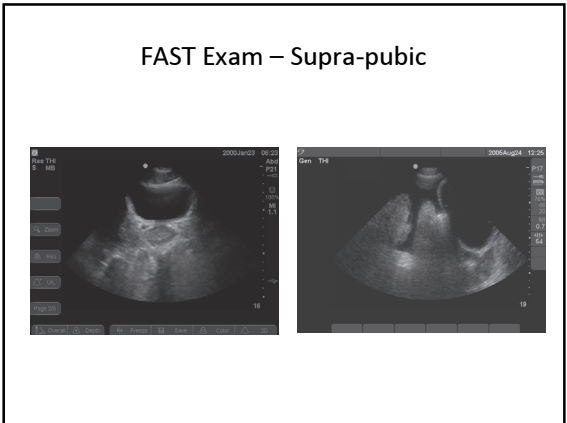
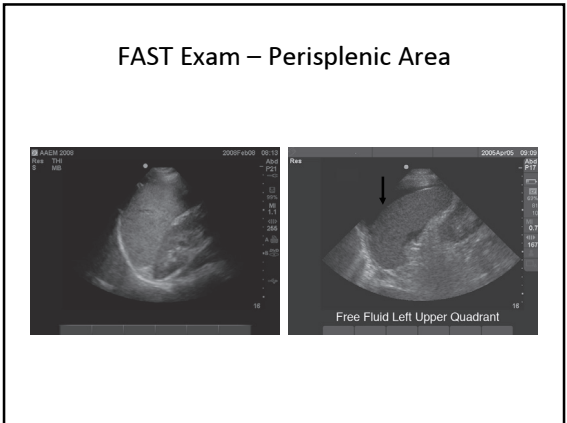


FAST Exam – Morrison's Pouch



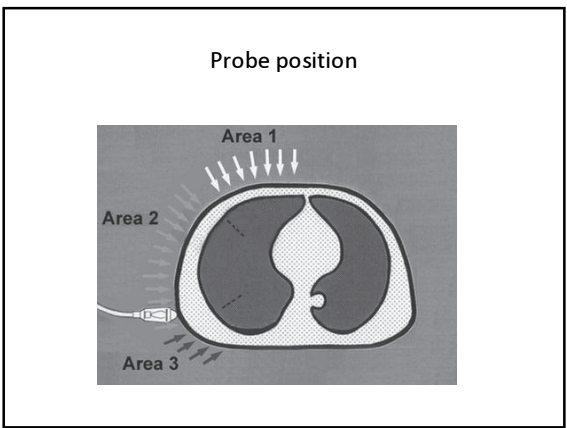
FAST Exam – Morrison's Pouch

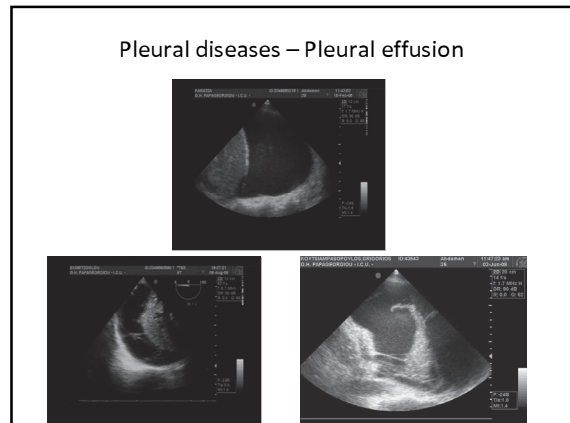
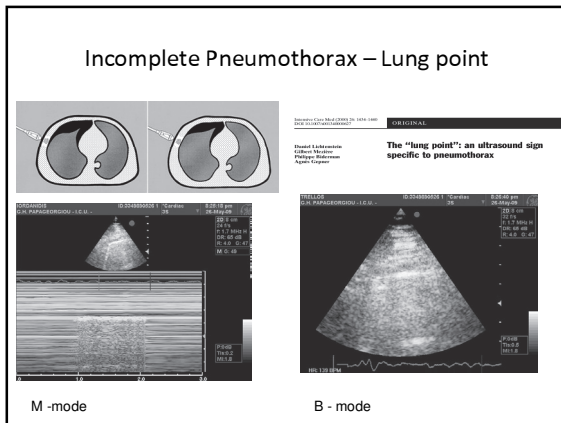
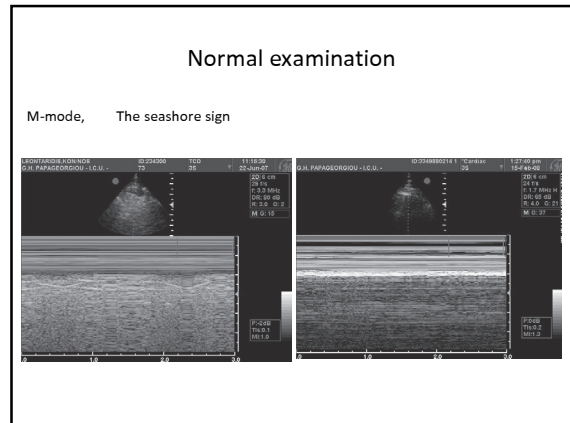
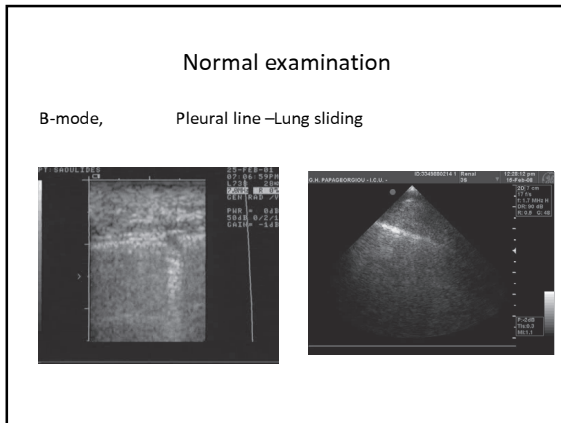




- ### Lung and Pleural ECHO Examination
- Ultrasound waves are not transmitted through anatomical structures filled with air
 - Ultrasound waves are transmitted to intra-thoracic structures only if lung aeration is absent as in
 - Lung consolidation
 - Atelectasis
 - Pleural effusion
 - However, we can use what we see with echo (b-mode or M-mode) or we don't see or the presence of artifacts to conclude on the presence of absence of pleural and lung pathology.

CLINICAL INVESTIGATIONS	
<small>Resuscitation 2011; 18(1): 1-11 © 2011 American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.</small>	
Comparative Diagnostic Performances of Auscultation, Chest Radiography, and Lung Ultrasonography in Acute Respiratory Distress Syndrome	
<small>Daniel Lichtenstein, M.D.,¹ Ivan Goldstein, M.D.,¹ Eric Mourgeon, M.D.,¹ Philippe Cluzel, M.D., Ph.D.,¹ Philippe Grenier, M.D.,² Jean-Jacques Rosdy, M.D., Ph.D.¹</small>	
• Auscultation	61% Pleural effusion 36% Pulmonary consolidation
• Chest X-ray	47% Pleural effusion 75% Pulmonary consolidation
• Lung ECHO	93% Pleural effusion 97% Pulmonary consolidation
• CT: gold standard	





Evaluation of the cardiovascular system

- Evaluation of preload – fluid responsiveness
- Heart trauma
- Evaluation of the thoracic aorta

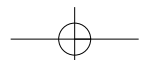
Methods of preload assessment

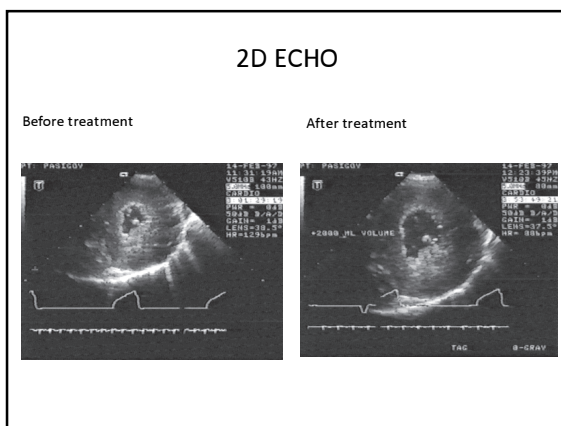
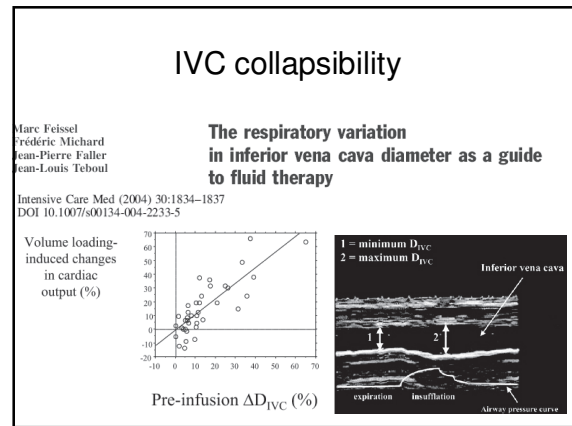
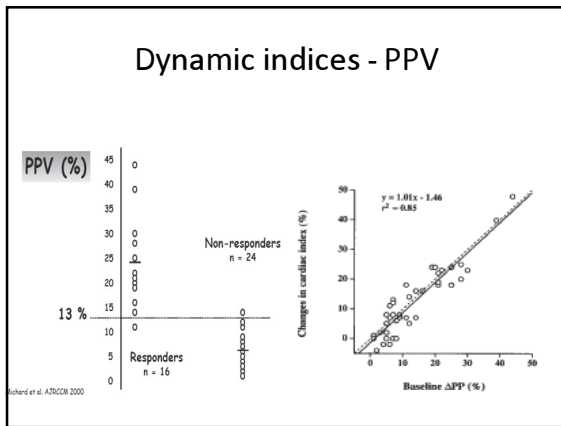
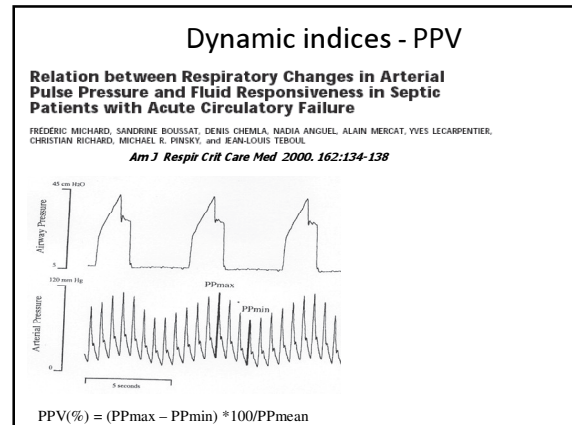
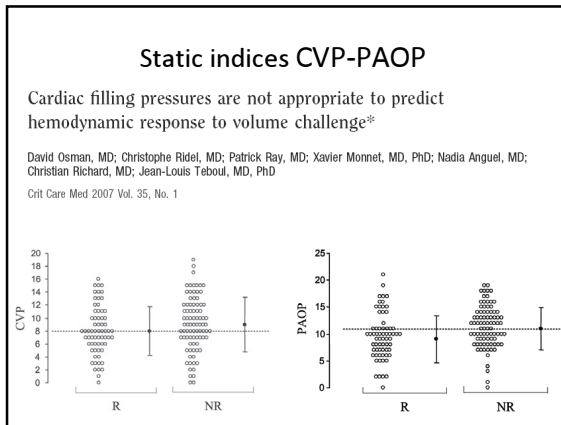
Static indices

- CVP
- PAOP

Dynamic indices

- Pulse Pressure Variation (PPV), or Stroke Volume Variation (SVV)
- IVC collapsibility
- 2D ECHO of the heart chambers



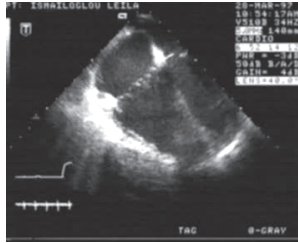


- ### Heart Trauma
- Heart contusion
 - Penetrating Heart trauma
 - Tamponade

Heart contusion

Rapid diagnosis

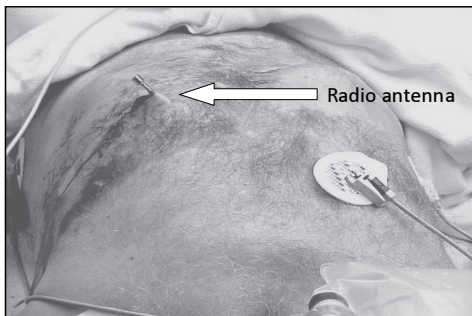
- Hypokinesia
- IVS rupture or hematoma
- Valve destruction
- Hemopericardium
- Tamponade



Penetrating heart trauma - Statistics

- Trauma is the third cause of death in the US (150,000 lives/year)
- Cardiothoracic injury represents 25% of deaths following trauma due to cardiac or great vessel injury
- 25-30,000 deaths from gunshot or stab wound
- 10% of these deaths are the result of penetrating cardiac trauma
- Iatrogenic cardiac injuries (Pacemaker, CV catheters, cardiac catheters)

Stupid accidents



Etiology of cardiac penetration



- The frequency of involvement of the heart chambers in penetrating injuries is proportional to the area of the anterior chest wall that they cover
- RV 43 %, LV 33%, RA 14%, LA 5%
- The coronary arteries are involved in 3-4,4 % of the cases, the LAD is injured in 87% of the cases

Clinical manifestations

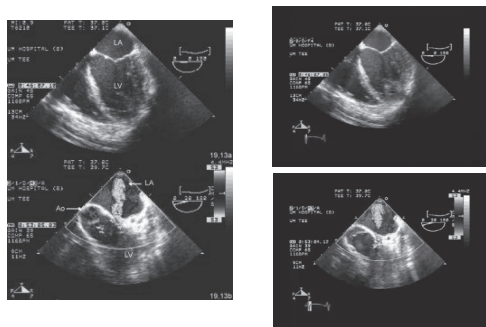
- Gunshot cardiac injuries are more frequent and more lethal than stab wound injuries, with only 11% of the victims arriving alive at the trauma center compared to 40% of cardiac stab wound.
- The two most common clinical manifestations are
 - Hemorrhage hemorrhagic shock
 - Pericardiac tamponade

Diagnosis

- 70% of the Patients with cardiac penetration injury arriving at the trauma center do not exhibit symptoms suggesting cardiac injury
- Chest X ray unreliable very little diagnostic yield
- EKG is also unreliable
- Cardiac catheterization and angiography is time consuming, not appropriate for the initial evaluation (Information on valve destruction, coronary vessels, intracardiac shunts)
- Serial ECHO 90% sensitive and 97% specific for the diagnosis of cardiac penetration



Stub wound of the Heart



Gunshot of the Heart

