Ultrasound in Trauma: Past, Present and Future

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Objectives

• How is bedside US is used to evaluate trauma patients?
• What are the advantages and limitations of bedside US in trauma care?
• What is new in US for trauma care?

The Past . . .
Case 1: Big City, USA

- 26 year old male
  - Restrained driver HRMVA

- Obtunded at scene w/prolonged extrication
  - HR: 118 BP: 88/67 RR: 6

- EMS: 2 large IVs and intubation

Case 1: Big City, USA

- Primary Survey
  - HR: 121 BP: 85/53 RR: 12 (bagged)
  - 8.0 ETT
  - Bilateral BS
  - Weak femoral pulses/stable pelvis
  - Pupils 3→2 bilaterally, MAE

Case 1: Big City, USA

- Secondary Survey
  - Abdominal tenderness diffusely
  - Ecchymosis on the chest, abdomen and pelvis
  - Gross deformity of left leg
the FAST

Primary Indications
- Identify intraperitoneal hemorrhage
- Identify pericardial effusion
- Identify hemothorax

Main Views
- Hepatorenal
- Splenorenal
- Suprapubic
- Subxiphoid
Hepatorenal Space

Hepatorenal

- Identify:
  - Diaphragm
  - Liver
  - Kidney
Splenorenal Space

- Identify:
  - Diaphragm
  - Spleen
  - Kidney
Suprapubic
Suprapubic

- Identify:
  - Bladder
  - Uterus (+/-)
Advantages

- Sensitive
- Rapid
- Bedside Test
- Noninvasive
- Non-ionizing
- Repeatable

Limitations

- Retroperitoneum
- Solid Organs
- Hollow viscous
- <500mL fluid
- Subacute hemorrhage
The Present . . .

Case 2: Small Town, USA

- 26 year old male
  - Stab wound to the anterior chest

- Awake and alert at scene
  - HR: 118  BP: 88/67  RR: 20

- EMS: 2 large bore IVs

Case 2: Small Town, USA

- Primary Survey:
  - HR: 118  BP: 88/67  RR: 20
  - Patent airway
  - Bilateral BS
  - Weak radial pulse
  - MAE to command
Case 2: Small Town, USA

- 2cm laceration to chest
- Faint heart sounds
- Radial pulse diminishes with inspiration
- Prominent neck veins and upper torso plethora

... the E-FAST

The Extended FAST

- Emphasis on identifying pericardial hemorrhage
- Identify pneumothorax
Subxiphoid

- Below costal margin
- Scan through the liver

Subxiphoid

- Identify:
  - Pericardium
  - Right ventricle
  - Left ventricle
Thoracic Views

Hemothorax

- Begin at mid-axillary line, below rib margin
- Slide superiorly – above level of diaphragm
Pneumothorax

- Midclavicular line, 2nd or 3rd intercostal space

Normal Lung: pleural slide and comet tail artifacts
Pneumothorax: loss of pleural slide

The Future . . .

Case 3: Remote Village, Far Away Nation

- 26 year old male
  - Kicked in the abdomen by a horse

- Family arranged for a cart to transport the patient
  - It's taken them 5 days to get over the mountain range
Case 3: Remote Village

- **Primary Survey**
  - HR: 118  BP: 88/67  RR: 24
  - Patent airway
  - Bilateral BS
  - Weak radial pulse/stable pelvis
  - Lethargic, but neuro intact

Case 3: Remote Village

- **Secondary Survey**
  - Abdominal tenderness diffusely
  - Rebound and guarding
  - Ecchymosis around the umbilicus

... the iFAST?
Cost-Effective Remote iPhone-Teathered Telementored Trauma Telesonography

Paul B. McBeth, MD, Trevor Hamilton, MD, and Andrew W. Kirkpatrick, MD, FRCSC, FACS

J Trauma, 2010
Resuscitative US

Early Prediction of Massive Transfusion in Trauma: Simple as ABC (Assessment of Blood Consumption)?

J Trauma, 2009

Findings of a randomized controlled trial using limited transthoracic echocardiogram (LTTE) as a hemodynamic monitoring tool in the trauma bay

J Trauma Acute Care Surg, 2014

Summary

- FAST
- E-FAST
- i-FAST

References


Daniel K. Does This Adult Patient Have a Blunt Intra-abdominal Injury? JAMA. 2012


