Author(s): Alison Haddock, MD, 2011

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CASE OF THE WEEK

Alison Haddock, PGY4
OBJECTIVES

- Discuss two critical care cases
- Challenges in management and diagnosis
- Review emergent management of a common ED presentation
- Focused exploration of a less common disease process
- Discussion of how the health care system can contribute to individual patient morbidity and mortality
CRITICAL PATIENT IN RESUS
BRAVO

- Obese elderly Asian female
- Pale, breathing heavily
- Accompanied by son
ABCS

○ A
  • Speaking single words

○ B
  • RR 30
  • SpO2 unable to obtain

○ C
  • HR 50
  • BP unable to obtain
PULSES AND BPS

- Old ATLS teaching
  - SBP > 80 mmHg if palpable radial
  - SBP > 70 mmHg if palpable femoral
  - SBP > 60 mmHg if palpable carotid
- Not scientifically validated
- Did confirm that loss of pulses occurs in order...
  - radial
  - femoral
  - carotid

NEXT STEPS

- **IV**
  - Multiple techs attempting

- **O2**
  - Supplemental O2 via NRB

- **Monitor**
  - Slow HR
  - No BP
NEXT STEPS

Right External Jugular Vein

robswatski, "Right external jugular vein", flickr
NEXT STEPS

- **IV**
  - 16 gauge in R EJ

- **O2**
  - Supplemental O2 via NRB

- **Monitor**
  - Slow HR (ranging 40s-50s)
  - No BP (estimate 60-70 SBP)
WHAT NOW?

Brief History

Brief Exam

Further Interventions

More Clinical Data
BRIEF HISTORY

- POD #10 from lap-to-open cholecystectomy
- Prolonged post-operative hospitalization due to “heart problems”
- Discharged home three days ago
- Increasingly weak today
- C/O severe fatigue, “chills”
- Denies measured temps, denies pain
- Taking all medications including coumadin and blood pressure pills
BRIEF EXAM

- Pale, increased WOB
- PERRRL, dry MM
- Shallow clear breath sounds
- Slow irregular heartbeat
- Obese/distended and firm abdomen
  - No focal tenderness
- Cool extremities
  - No palpable radial pulse
  - Thready femoral pulse
FURTHER INTERVENTION

- IVF bolus
  - 1L wide open
  - Attempting to obtain additional access
- Pacer pads
WHAT CLINICAL DATA?

- Labs?
- XR?
- CT Scan?
- US?
- Phone-a-friend?
RESUS SHORCUTS

VBG
EKG
CXR
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DIAGNOSIS?

Shock.
LACTATE & MORTALITY

TYPES OF SHOCK

- Hypovolemic
- Obstructive
- Distributive
- Cardiogenic
DIFFERENTIAL DIAGNOSIS

- Hypovolemic
  - Hemorrhagic

- Obstructive
  - No apparent evidence of PE, PTX or tamponade...

- Distributive
  - Sepsis from recent hospitalization/surgery

- Cardiogenic
  - Hx of recent cardiac problems
  - Medication toxicity?
**REASSESSMENT**

- Ongoing bradycardia 40s-50s
- **Treatment?**
  - For HR <50bpm with evidence of hypoperfusion
  - Or if high risk of progression to complete block
  - Options: atropine vs pacing
- **Atropine**
  - 0.5 – 1mg IVP adult dose
  - Anticholinergic positive chronotropic effect
  - Pt has increased HR to 50s-60s without BP improvement
REASSESSMENT

- Respirations increasingly labored
- Abdomen still distended
- Now poorly responsive to son’s questioning

- Back to the ABCs!

PhillippN, "Endotracheal tube colored", Wikimedia Commons
RESSESSMENT

- Airway now secure
- Still unable to obtain BP
- Access: single EJ
- Additional 14g placed by tech in Right AC
- Second Liter warmed Normal Saline started
- Pt started on pressors
### PRESSORS (OVER)SIMPLIFIED

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<tr>
<td></td>
<td>dopamine</td>
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REASSESSMENT

- How can we distinguish between types of shock?
RAPID ULTRASOUND IN SHOCK (RUSH)

PUMP
- Cardiac contractility
- Camponade
- Pneumothorax
- RV strain
RAPID ULTRASOUND IN SHOCK (RUSH)

TANK
- IVC – size & resp change
- FAST
RAPID ULTRASOUND IN SHOCK (RUSH)

PIPES
- Aorta
- DVT
ULTRASOUND

Liver

Peri-renal fascia

Kidney
REASSESSMENT

- Abdomen increasingly distended and firm
- Surgery contacted

- Treatment initiated for hemorrhagic shock
  - O+ pRBCs placed on rapid transfuser
    - Massive transfusion anticipated
    - Given calcium chloride
REVERSAL OF ANTICOAGULATION: FIRST STEPS

- **FFP**
  - Typical adult pt requires 3-4 units to reverse
  - Contains all vitamin K dependent factors
  - Does not fully reverse
    - Ex: factor IX does not rise >20% of normal post FFP (not reflected in INR)
  - Requires thawing
  - Risks volume overload

- **Vitamin K**
  - 10mg slow IV
  - Starts to work in 4hrs
REVERSAL OF ANTICOAGULATION: NEXT STEPS

- Recombinant Activated Factor VII
  - Expensive, limited literature
  - UofM: “serious bleed associated with prolonged INR after significant clotting factor replacement”
  - 1200mcg x one dose

- Prothrombin Complex Concentrate
  - Plasma-derived product, no matching required
  - Virally inactivated and 20x less volume than FFP
  - Contains II, IX, and X (+ VII in UK)
  - Currently infrequently used in US
  - Expensive
  - Potentially thrombogenic
REASSESSMENT

- Rapid transfusion of 3U FFP, 4U pRBCs
- Surgery at bedside

- Still no BP on max dose dopamine (20mcg/kg/min)
- Pulse check = no carotid or femoral
- PEA
  - Compressions initiated
  - Single dose of 1mg epinephrine
  - Return of strong pulse
**REASSESSMENT**

- **ABCs**
  - Airway secured with ETT
  - Ongoing hypotension despite pressors

- **Volume**
  - Cordis inserted into R groin + 14G PIV + 16G PIV
  - Femoral arterial line
  - Rapid infuser for pRBCs, FFP

- **Pressors**
  - Max dose dopamine
  - Epinephrine and norepinephrine initiated post-arrest
LABS

Hematology:

CBCP:

10.1
26.2 >------< 375
31.3

Cardiac Enzymes (18:00):

Troponin: 0.11; CPK: 102; CKMB: 2.3;

Liver Panel:

Prot: 5.7; Alb: 3.1;
AST: 54; ALT: 23;
TBILI: 1.7;
ALK: 156;

Coags:

INR: 1.8 (PT: 18.1); PTT: 24.8;

Diff (Automatic):

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<tr>
<th>NEUT</th>
<th>LYMPH</th>
<th>MONO</th>
<th>EOS</th>
<th>BASO</th>
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<td>8.3</td>
<td>8.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>#: 21.9</td>
<td>2.2</td>
<td>2.1</td>
<td>0.0</td>
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</table>

Chemistry:

142c | 102 | 24 | Cal: 9.32c | AnGap: 17
----------------< 190 | BUN/Cr: 16
4.6 | 22 | 1.5 | CalcOsm: 301
REASSESSMENT

- Mismatch between BPs
  - Femoral arterial line = SBPs in 60s
  - Cuff pressure = SBPs in 100s
- Overall poor responsiveness to pressors and fluids

- Additional diagnosis made:
ABDOMINAL COMPARTMENT SYNDROME
ABDOMINAL COMPARTMENT SYNDROME

- **Definition**
  - Sustained intraabdominal pressure of >20 mmHg associated with new organ dysfunction or failure

- **Measurement of Intra-Abdominal Pressure**
  - Challenging clinical diagnosis
  - Direct peritoneal cannulation, rectal, gastric, IVC
  - Most popular = bladder
  - Routinely tracked in ICU settings

- **Relatively high incidence**
  - One study found ACS in 14% of high-risk trauma pts
  - Another found 50% of ICU pts had IAH (>12 mmHg)
ABDOMINAL COMPARTMENT SYNDROME

- **Primary ACS: injury/disease in abdomen**
  - Abdominal trauma
  - Abdominal hemorrhage
  - Bowel obstruction
  - Intraperitoneal sepsis
  - Ruptured AAA
  - Acute pancreatitis
  - Less acute: morbid obesity, pregnancy, massive ascites

- **Secondary ACS: third-spacing in abdomen**
  - Severe sepsis, burns
  - Any shock requiring massive fluid resuscitation
Box 1: Emergency department patients at risk of developing intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS)

Patients who should be considered at higher risk of developing IAH and ACS:

- Patients with open or blunt abdominal trauma
- Patients requiring large volume fluid resuscitation (especially in the context of an underlying capillary leak problem)—for example:
  - pancreatitis
  - septic shock
  - trauma
  - severe burns
- Patients with increased intra-luminal contents
  - gastroparesis
  - ileus
- Patients with increased abdominal contents
  - haemoperitoneum or pneumoperitoneum
  - ascites or liver dysfunction

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<th>Parameter</th>
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<th>Decreased</th>
<th>No change</th>
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<td>Mean blood pressure</td>
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</tr>
<tr>
<td>Heart rate</td>
<td>×</td>
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<tr>
<td>Peak airway pressure</td>
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<tr>
<td>Thoracic/pleural pressure</td>
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<tr>
<td>Central venous pressure</td>
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<tr>
<td>Pulmonary capillary wedge pressure</td>
<td>×</td>
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<tr>
<td>Inferior vena cava pressure</td>
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<tr>
<td>Renal vein pressure</td>
<td>×</td>
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<tr>
<td>Systemic vascular resistance</td>
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<tr>
<td>Cardiac output</td>
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<tr>
<td>Venous return</td>
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<td>×</td>
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<tr>
<td>Visceral blood flow</td>
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<td>×</td>
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<tr>
<td>Gastric mucosal pH</td>
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<td>Renal blood flow</td>
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<td>Glomerular filtration rate</td>
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<td>Cerebrospinal fluid pressure</td>
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<tr>
<td>Abdominal wall compliance</td>
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Fig. 40.1. The abdominal compartment syndrome
ABDOMINAL COMPARTMENT SYNDROME

- Definitive management: surgical decompression
Box 2: Conservative measures for treatment of abdominal compartment syndrome

- Paracentesis
- Gastric and rectal suctioning
- Prokinetic agents (metoclopramide, domperidone, erythromycin, prostigmine)
- Diuretic therapy
- Continuous veno-venous haemofiltration with aggressive ultrafiltration
- Sedation and paralysis
- Body positioning

ABDOMINAL COMPARTMENT SYNDROME

- Definitive management: surgical decompression

- In ED, pt difficult to ventilate
  - Given doses of versed and vecuronium
  - Anesthesia arrived to assist

- Covered with piperacillin/tazobactam

- OG Tube placed before transport to OR
INDICATIONS FOR THE PROCEDURE: Mrs. PG is an elderly woman who underwent a laparoscopic converted to open cholecystectomy 10 days ago. She presented to the ER with complaints of feeling weak and light-headed. Shortly after admission to the ER, she became hypotensive and had a PEA arrest. She was resuscitated and a FAST scan showed a large amount of fluid in her abdomen; her abdomen was also quite tense on examination. She is anti-coagulated with coumadin and her INR at that time was 1.8. She was presumed to have an intra-abdominal bleed and was therefore taken emergently to the OR. She was requiring significant amounts of fluid resuscitation, including 4 units of PRBC's as well as pharmacologic pressure support. She was intubated in the ER.

PROCEDURE: Time out was performed, confirming correct patient. Anesthesia was induced with general endotracheal anesthesia. The patient was positioned in the supine position on the table and was prepped and draped in the usual aseptic fashion. Her abdomen was then entered through a midline incision extending from xiphoid to just above the pubis. Dissection was carried down through the subcutaneous tissues and the fascia was opened in the midline. Upon entering the peritoneal cavity, a large amount of blood and clot was encountered and evacuated. Approximately 1,500 cc's of clot and old blood was evacuated, the majority of the clot was encountered inferior to the liver. This was evacuated and there was obvious bleeding from the gallbladder fossa. We elected to leave her abdomen open and place an abdominal VAC.

we elected to leave her abdomen open and place an abdominal VAC.

Upon entering the peritoneal cavity, a large amount of blood and clot was encountered and evacuated. Approximately 1,500 cc's of clot and old blood was evacuated, the majority of the clot was encountered inferior to the liver. This was evacuated and there was obvious bleeding from the gallbladder fossa.

Sponge and needle counts were correct at the conclusion of the case. The patient was taken to the SICU in critical condition.
HOSPITAL COURSE

- Extensive ICU course
  - ARF with anuria, on CRRT
  - Resp failure requiring tracheostomy
  - Febrile with +BAL (stenotrophomonas), MDR UTI, infected rectus sheath hematoma (both E coli)
  - Intermittent A-fib with RVR
  - Multiple pulmonary emboli

- Transferred SICU to BICU to CCMU

- Discharged home two months later with PEA as primary diagnosis
52yo M with a hx of “liver and kidney problems”
CC: SOB

Arrives in Resus A in acute distress
Gasping for breath, saying single words
Pale, diaphoretic
Bradycardic with palpable radial pulse
Unable to measure BP or SpO2
PIV placed by EDT
SPEED CASE

- Becomes unresponsive <60sec after arrival
- BVM applied
- Given atropine 1mg IV w/o change in status
- Loses pulses
- CPR initiated
- 2 rounds epinephrine/atropine
- Intubated w/o meds
SPEED CASE

- Empirically medicated given “kidney” history
  - Calcium gluconate
  - Sodium bicarbonate
- VBG returns with K of 8.0
  - Started insulin and glucose
  - Albuterol via ETT
- ROSC after <10 minutes (3 rounds)
- Spontaneous movements observed
Gradual onset of hypotension after ROSC
- Started on dopamine
- Empiric sepsis coverage
  - Piperacillin/tazobactam
  - Vancomycin
- Accepted for admission by CCMU
- Sedated with propofol

Cooling?
SPEED CASE

- 2 week admission to CCMU requiring dialysis
- Normal neurologic status post-extubation
- Discharged home with outpt dialysis, otherwise doing well
THANK YOU!


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Slide 20, Image 1: Source Unknown.


Slide 30, Image 1: Source Unknown.

Slide 31, Image 1: Source Unknown.

Slide 32, Image 1: Source Unknown.

Slide 33, Image 1: Source Unknown.


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