Trauma Challenges in the Obese Population

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Admin Support

Sophia Quesada  
Research Associate

- Coming soon
**Outline**

- Physiologic changes associated with obesity
- Specific trauma situations:
  - Airway
  - Invasive Procedures
  - Penetrating abdominal trauma
  - Rhabdomyolysis

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![BMI Chart](image-url)
The Obesity Epidemic Over Time

Effects of social distancing caused by the COVID-19 pandemic on physical activity level, sitting time, and binge eating: a comparison between overweight/obese and normal-weight adults

Caroline Pereira Garcês¹D · Luciana Oliveira e Silva¹D · Sara Menezes Nunes²D · Nadia Carla Cheik²D

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Critical care of the bariatric patient

Fredric M. Pieracci, MD; Philip S. Barie, MD, MBA, FCCM; Alfons Pomp, MD

- Adipose tissue is highly metabolically active
  - pro inflammatory
  - hypercoagulable

- Altered pharmokinetics
  - ABW vs. IBW

- Excess adipose tissue impairs procedures

- Increased overall weight
  - Equipment limitations
  - Pressure induced pathology
    - Rhabdomyolysis
    - Compartment syndrome

<table>
<thead>
<tr>
<th>Organ System</th>
<th>Pathology</th>
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<tbody>
<tr>
<td>Respiratory</td>
<td>↓ FRC, TLC, VC, IC, ERV</td>
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<tr>
<td></td>
<td>↑ FEV₁/FVC</td>
</tr>
<tr>
<td></td>
<td>Obstructive sleep apnea syndrome</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>↑ Blood volume</td>
</tr>
<tr>
<td></td>
<td>↑ Vascular tone</td>
</tr>
<tr>
<td></td>
<td>↓ Ventricular contractility</td>
</tr>
<tr>
<td>Renal</td>
<td>↑ Clearance of renally excreted drugs</td>
</tr>
<tr>
<td></td>
<td>Hypertensive and diabetic nephropathy</td>
</tr>
<tr>
<td>Hematologic</td>
<td>↑ Fibrinogen</td>
</tr>
<tr>
<td></td>
<td>↑ PAI-1</td>
</tr>
<tr>
<td></td>
<td>↓ AT-III</td>
</tr>
<tr>
<td></td>
<td>Venous stasis</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Hiatal hernia</td>
</tr>
<tr>
<td></td>
<td>↑ Gastric secretion volume</td>
</tr>
<tr>
<td></td>
<td>↓ Gastric pH</td>
</tr>
<tr>
<td>Metabolic/Endocrine</td>
<td>↑ Resting energy expenditure</td>
</tr>
<tr>
<td></td>
<td>Insulin resistance</td>
</tr>
<tr>
<td></td>
<td>↑ Proteolysis</td>
</tr>
<tr>
<td>Immunologic</td>
<td>↑ TNF-α</td>
</tr>
<tr>
<td></td>
<td>↑ IL-6</td>
</tr>
<tr>
<td></td>
<td>Impaired neutrophil function</td>
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</table>
Airway Considerations

**Issues**
- Obstructive sleep apnea (OSA)
- Difficult mask ventilation (may need three people)
- Reduced FRC
- Increased susceptibility to respiratory depressant effect of anesthetic drugs

**Strategies**
- Pre-oxygenation (high flow nasal cannula during RSI)
- Positioning (ramp)

**Adjuncts**
- Video laryngoscopy
- Fiberoptic bronchoscopy
- Percutaenous tracheostomy
Invasive Procedures

- Central Venous Cannulation
  - Ultrasound guidance mandatory
  - Internal jugular position preferred
  - Cutdown may be necessary
  - Ensure adequate equipment length

- Tracheostomy
  - Percutaneous preferred over open

- Chest tube
  - Percutaneous preferred over surgical
  - Make bigger incision for surgical
  - Lower threshold for VATS

Original Research Article
Beyond the tube: Can we reduce chest tube complications in trauma patients?
Carson Platnick a,*, Cordelia E. Witt a,*, Fredric M. Pieracci a, Caitlin K. Robinson a, Ryan Lawless a, Clay Cothren Burlew a, Ernest E. Moore a, Mitchell Cohen a, K. Barry Platnick a

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Multivariable logistic regression.

<table>
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<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>p</th>
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<tr>
<td>BMI &gt;30 kg/m²</td>
<td>2.57</td>
<td>1.43 - 4.61</td>
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<td>Time from admission to TT</td>
<td>0.99</td>
<td>0.97 - 1.00</td>
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<td>Overnight placement</td>
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<td>Inserted in ED</td>
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<td>1.29 - 3.67</td>
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<td>Inserted by EM operator</td>
<td>2.42</td>
<td>1.37 - 4.27</td>
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<tr>
<td>Inserted by resident</td>
<td>0.74</td>
<td>0.39 - 1.40</td>
<td>0.35</td>
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</table>
Chest Tube Misadventures
Bedside VATS-assisted tube thoracostomy
Pleural insufflation

- Entry via Opti-view technique
- Insufflation pressure 8-12 mm Hg
- Hypercarbia possible; usually inconsequential
- Avoid tunneling into sub-Q space
Penetrating Trauma

- Increased adipose tissue external to body cavities decreases the likelihood of injury requiring surgical management.

- This lends itself to more liberal use of non-operative strategies.

- However, peritonitis is masked in the obese patient population.
Anterior Abdominal Stab Wounds

Anatomic Regions

1. ANTERIOR ABDOMEN
2. LEFT THORACOABDOMEN
3. RIGHT THORACOABDOMEN
4. FLANK/BACK
Management Pathways
penetrating abdominal injuries

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>ANTERIOR ABDOMEN</th>
<th>L THORACO-ABDOMEN</th>
<th>R THORACO-ABDOMEN</th>
<th>BACK/FLANK</th>
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</thead>
<tbody>
<tr>
<td><strong>BMI &lt; 40 kg/m²</strong></td>
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<tr>
<td>GSW</td>
<td>Laparotomy</td>
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<td>Observe</td>
<td>CT</td>
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<tr>
<td>STAB WOUND</td>
<td>Local wound</td>
<td>Local wound</td>
<td>Local wound</td>
<td>CT</td>
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<td></td>
<td>exploration -</td>
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<tr>
<td></td>
<td>observe</td>
<td>laparoscopy</td>
<td>observe</td>
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<td><strong>BMI ≥ 40 kg/m²</strong></td>
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<tr>
<td>GSW</td>
<td>CT</td>
<td>Laparoscopy</td>
<td>Observe</td>
<td>CT</td>
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<tr>
<td>STAB WOUND</td>
<td>Observe</td>
<td>Laparoscopy</td>
<td>Observe</td>
<td>CT</td>
</tr>
</tbody>
</table>
A New Field of Trauma Surgical Endoscopy

- In stable patients with source control (percutaneous and/or surgical), endoscopic control of perforations has become increasingly popular.

- This is particularly advantageous in severely obese patients.

- Endoscopic vs. operative should be a carefully considered, individualized decision, based upon patient physiology and leak location/size.
Pressure-induced Rhabdomyolysis

- **Setting:**
  - Prolonged immobility
  - Intra-operative time/positioning

- **Risks factors:**
  - Male
  - BMI > 50 kg/m²,

- Presents with myalgias, oliguria, myoglobinuria, elevated serum CPK

- **Treatment:**
  - Hydration
  - Dialysis
Summary

- Set yourself up for success by having appropriately sized equipment – think of obesity as a unique subset like pediatrics.

- Prioritize staff safety by always having extra people around.

- Incorporate the severely obese patient into your checklists, drills, simulations, quality initiatives, and research.
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