EM CASES SUMMARY

Episode 69 – Managing Obesity in the ED

With Andrew Sloas, Rich Levitan & David Barbic

Prepared by Dr. Michael Kilian, edited by Dr. Anton Helman, Sept 2015

Current estimates of the prevalence of obesity are that a quarter of adult Canadians and one third of Americans are considered obese with approximately 3% being morbidly obese. With the proportion of patients with a BMI>30 growing every year, you're likely to manage at least one obese patient on every ED shift. Obese patients are at high risk of developing a host of medical complications including diabetes, hypertension, coronary artery disease, peripheral vascular disease, biliary disease, sleep apnea, and depression, and are less likely compared to non-obese adults to receive timely care in the ED.

In addition to their risk factors, the obese patient's cardiopulmonary physiology is significantly different and they absorb drugs differently. This can make their acute management much more challenging and dangerous. We will cover a number of important differences as well as practical approaches to the obese patient in the ED.

Obese patients are not just large adults!

Vital Signs in Managing Obesity

Blood pressure readings can be falsely reassuring in obese patients as the cuff often overestimates BP. For these reasons, a "borderline" BP could represent a "shock" state in an obese adult. If you recognize that a blood pressure within the normal range does not rule out shock in an obese patient who appears unwell, you are more likely to begin early resuscitation and initiate appropriate treatment. In order to obtain a more accurate reading, *consider placing an early arterial line* to obtain and trend accurate readings over time.

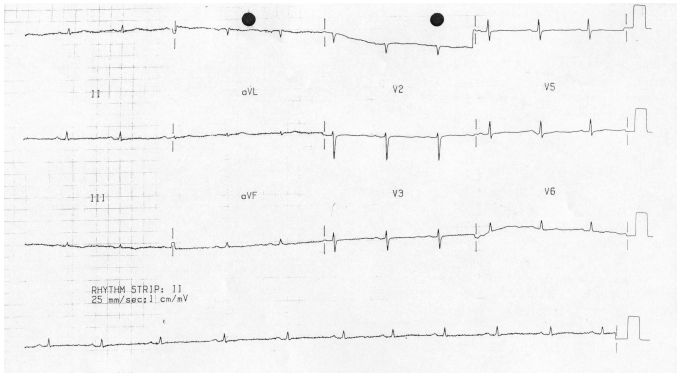
The ***Shock Index*** can be a helpful tool in making a diagnosis of occult shock. The calculation is based on heart rate and blood pressure but requires accurate readings for prognostication.

Shock Index = HR/SBP
Any number > 1 suggests occult shock

Shock index calculator: http://www.mdcalc.com/shock-index/

ECG Alterations in Managing Obesity

The ECG in obese patients also differs from the average adult. Due to the size of their chest wall, they are more likely to have 1. ***Low voltages*** on their ECG. For this reason it's important to rule out a pericardial effusion each time, before attributing these findings to adipose tissue. On the ECG, obese patients also have physiologically 2. ***Longer QT intervals*** at baseline. Lastly, they are more likely to develop and show 3. ***Signs of LVH*** over time.



Low Voltage ECG. *Courtesy of Lifeinthefastlane.com*

Pathophysiologic Differences in Managing Obesity in the ED:

1. ***Decreased respiratory reserve*** is secondary to diminished total lung capacity and functional residual capacity. The decreased reserve compromises an obese patient's ability to tolerate respiratory insults such as pneumonia
2. ***Increased airway pressures*** are a result of increased airway resistance (heavier chest walls, increased abdominal girth, atelactatic lung bases). The increased pressures lead to:
    a. Smaller O2 reserves at baseline
    b. Increased work of breathing
    c. Shorter time to desaturation during induction and a *shorter Safe Apnea Time*
3. Higher incidence of hypoxemia and hypercapnia at baseline
4. Higher risk of aspiration pneumonitis
5. More difficult to ventilate with BMV.

Dr. Levitan created a helpful mnemonic for all of the factors that need to be considered in planning and executing a safe and successful intubation for critically ill obese patients:

V.A.P.O.R.S

V: Ventilation
A: Acidosis
P: Pressures (BP, peak pressures, plateau pressures etc)
O: Oxygenation
R: Regurgitation
S: Shock Index (see above)

For more information on Dr. Levitan's VAPORS approach visit:

http://emblog.mayo.edu/discussion/the-vapors-and-the-resuscitation-sequence-of-intubation-richard-levitan/

Ventilation and Induction in Managing Obesity

Applying what we know about the pathophysiological differences about an obese patient's airway and ability to tolerate acute insults, the following mnemonic outlines a practical approach to the obese airway:

B.I.G.R.A.M.P

B: BUY TIME: Given the decreased respiratory reserve and higher degrees of hypoxemia, increase the FiO2 and recruit as much lung space as possible.

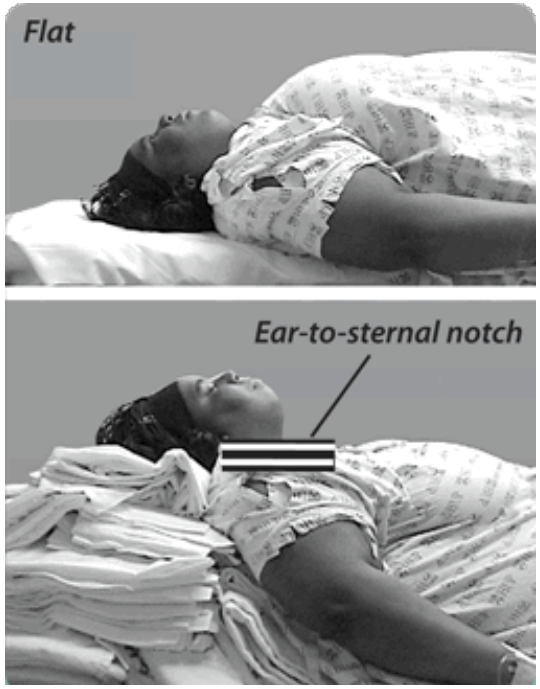
a. Provide 100% FiO2
b. Insert nasal trumpets or oral airway
c. Use non-invasive positive pressure ventilation to recruit alveoli
d. Provide a two handed bilateral jaw thrust
e. Optimize medical therapy: *Resuscitate before you intubate!* This may require large, rapid fluid boluses or initiation of vasopressors before induction via a peripheral IV
f. If all else fails, a supraglottic airway can provide a useful bridge to a definitive airway

Two- Handed Bilateral Jaw thrust and chin lift

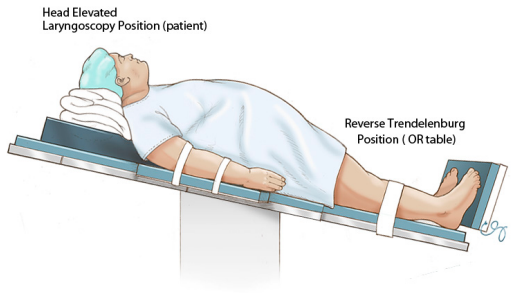
I: INDICATION FOR INTUBATION: Consider whether you really need to intubate and if you have time to optimize the patient first.

G: GET HELP: The obese patient presents an anticipated challenging airway. Therefore, the most experienced physician should be the first to attempt intubation. Consider calling your colleagues from anaesthesia, ICU or ENT.

R: RAMP: Build a big ramp behind the patient's head and torso to achieve an *ear-to-sternal-notch* configuration. Then position the patient in *reverse Trendelenburg* to take the weight of the panus off the chest.



Ramped Position



Reverse Trendelenburg in ramped position

For more on positioning the obese patient for airway management visit Airway eLearning:

http://www.airwayelearning.com/awel/articles/articles-1.aspx?Action=1&NewsId=1944&PID=71655

A: APNOEIC OXYGENATION: Use nasal cannulas at 15L underneath the facemask or BVM to maintain passive diffusion of oxygen help blow open the oropharynx

M: MINIMAL DRUGS: Consulting with a pharmacist will help you dose medications appropriately based on their pharmacodynamics. Lipophilic drugs (eg. Propofol) need to be dosed based on *total body weight*. Therefore these doses will be much higher than in average adults. Hydrophilic drugs (eg. Ketamine) are dosed based on *ideal body weight*.
Antibiotics also have different dosing profiles based on their class. Vancomycin loading doses are 25-30mg/kg of *total body weight*. Beta-lactams (eg. Pipiracillin-tazobactam) doses are based on *ideal body weight* with an additional conversion factor that your pharmacist can help you with.

P: PRE-OXYGENATE WITH NIV: This will help improve *Safe Apnea Time* in patients with decreased respiratory reserve

P: PARALYSIS – Dr. Levitan recommends ***against*** paralysis in most critically ill obese patients. Once paralyzed you may encounter a "can't oxygenate, can't ventilate" situation.

P: PLAN FOR FAILURE:

Make sure to have at least two functioning intravenous access ports before initiating induction. This may require the use of ultrasound to place a large bore IV or placement of an IO. For intra-osseous access, use the largest bore needle (Yellow 45mm needle in EasyIO kits) for obese patients and consider humeral or sternal IO placement if IV access cannot be readily obtained and you encounter too much adipose tissue at the pre-tibial location. A *femoral* central line can be quickly placed with the patient in frog-legged position and an assistant displacing the patient's panus. Our experts recommend *against* placing neck central lines in massively obese patients because of the ill effects of placing obese patients in Trendelenburg position and because of the theoretical increased risk of complications.

For cricothyrotomy Dr. Levitan recommends first identifying the midline using the *laryngeal handshake* technique and cutting a large vertical skin incision rather than first attempting to identify the cricothyroid membrane through the adipose tissue.

P: POST INTUBATION CARE: The ventilator settings will need to provide high PEEP and plateau pressures. A ramped and reverse Trendelenburg position can help decrease the pressures required.

Trauma & Managing Obesity in the ED

Obese patients have a higher risk for sustaining severe trauma and compared to the average-sized adults with a similar injury severity score (ISS), and have higher rates of morbidity and mortality. Studies have shown that obese patients are less likely to wear their seat belts and are more likely to sustain chest injuries.

When an obese patient arrives in your trauma bay, you should be aware of important limitations in your assessment and workup of these patients. Firstly, your blood pressure cuff will be unreliable as mentioned earlier. Therefore you are more likely to miss shock or under-resuscitate your obese trauma patient. Your imaging modalities will also be less reliable. The FAST scan may be indeterminate or falsely negative given the depth of penetration required to visualize Morrison's pouch. The chest x-ray will be underpenetrated. Finally, the CT images will be more difficult for the radiologist to interpret and as a result, injuries are more often missed.

Unfortunately, some patients may be too heavy to have a CT scan performed. Different CT scanners have varying weight cut-offs but most have a weight limit in the range of 350-450lbs. In order to image heavier patients, a bariatric CT scanner is required. Speak to your radiologists to develop a protocol for transferring massively obese patients to the closest bariatric CT scanner.
To hear Dr. Claire Atzema tell her Best Case Ever involving the management of an obese patient in atrial fibrillation visit:

http://emergencymedicinecases.com/best-case-ever-7-atrial-fibrillation/

Key References

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