

JULY 2008  
QUESTION 17

Describe the respiratory changes that occur in morbid obesity

#### Morbid obesity

is defined as BMI > 35  
results in an increased basal metabolic rate  
increased oxygen demand  
increased CO<sub>2</sub> production

Changes in respiratory function are primarily due to the mechanical consequences of increased weight

#### Compliance

Chest wall compliance is reduced  
Lung compliance is also reduced due to fat infiltration although this is less significant  
Overall compliance is therefore also reduced  $1/\text{total} = 1/\text{lung} + 1/\text{chest wall}$

#### Functional residual capacity

Is reduced secondary to chest wall pressure and diaphragm splinting by abdominal contents  
If FRC > Closing capacity (which increases with age) there will be unventilated alveoli (shunt)  
Reduced FRC increases airways resistance due to the reduced calibre of the airways  
Decreased O<sub>2</sub> stores in the FRC

#### Upper airway anatomy

increased fat makes intubation more difficult  
increases the likelihood of obstruction and sleep apnoea  
increases the airways resistance

#### Work of breathing

since volume = compliance x pressure change a greater pressure change is required to attain vol  
obese patients have greater oxygen demands  
due to the airway obstruction and reduced FRC there is greater airways resistance  
the overall result is a marked increase in WOB

#### Increased O<sub>2</sub> demand

compensation as per the oxygen delivery equation =  $HR(Hb \times 1.34 \times \text{sats} + \text{dissolved O}_2)$   
increased Hb - polycythemia  
increased heart rate  
O<sub>2</sub> extraction also increases (Right shift Hb-O<sub>2</sub> curve)  
increased CO<sub>2</sub>, H<sup>+</sup> and 2,3 DPG

#### Overall result

Increased  
pCO<sub>2</sub> due to hypoventilation and obstructive sleep apnoea 'pickwickian syndrome'  
Heart rate  
Hb level  
Decreased  
paO<sub>2</sub> due to increased shunt and VQ mismatching  
physiological reserve due to increased work of breathing