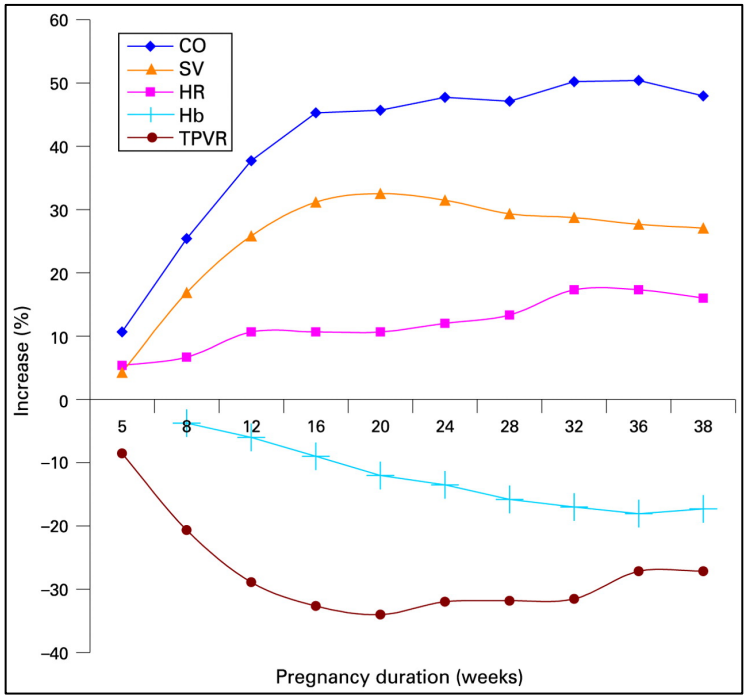
Cardiovascular & Respiratory Changes of Pregnancy

Anesthetic Pearls: Anesthetic Implications of Cardiovascular & Respiratory Changes in the Parturient

Cardiovascular Changes:

Maternal blood volume increases by approximately 40% in normal pregnancy and plasma volume increases greater than red cell volume resulting in a physiologic anemia. However, hemoglobin should still be greater than 11 g/dl. Anemia beyond physiologic is usually caused by FeS04 (iron) deficiency. Blood volume returns to pre-pregnancy levels within 1-2 weeks post-partum. Cardiac output increases 30-50% during normal pregnancy as a result of increased stroke volume and heart rate. MAP actually decreases during pregnancy mostly during the 2nd trimester. Vena cava (IVC) compression can reduce CO leading to 10-15% of term patients experiencing symptomatic hypotension in the supine position. Because of this caval compression, it is recommended that parturients after 20 weeks gestation sleep in the lateral position. CO also increases during labor with maximal increase of 80% over pre-labor CO occurring immediately after delivery. At this maximal point of cardiac exertion, patients with cardiovascular disease can decompensate acutely.



Respiratory Changes:

Minute ventilation (MV) increases 50% during normal pregnancy secondary to increased tidal volume (TV). $Pa0_2$ increases by 5-10 mmHg and $PaC0_2$ decreases to 32 mmHg. Oxygen consumption increases secondary to increased metabolic requirements and work of breathing. Also, oxygen supply is increased secondary to an increased minute ventilation (MV), increased CO, and a shift of the oxyhemoglobin dissociation curve to the right. There is also a 15-20% decrease in functional residual capacity (FRC) at term that is caused by increased tidal volume and decreased diaphragmatic excursion. The decreased FRC can result in airway closure even during normal tidal ventilation. The combination of increased oxygen consumption, decreased FRC, and increased alveolar-arterial (A-a) oxygen gradient contribute to the rapid development of hypoxia during apnea. It is critical to pre-oxygenate pregnant women with 100% oxygen for several minutes prior to induction of general anesthesia. Edema of the respiratory tract also makes airway instrumentation more difficult and dangerous. A cuffed 6.5 ETT is usually quite adequte for intubation in pregnant patients.