OXYGEN DELIVERY IN SEVERE ANEMIA

-5g/dL and euvolemia well tolerated in healthy at rest
Degree of anemia associated with shock—depends on age, Cardiopulmonary function
Below 3g/dL see 50% mortality

-To mitigate anemia, see increase cardiac output by increasing heart rate, decrease in vascular resistance due to decrease in blood viscosity, and decrease in nitric oxide scavenging by rbcs

What we can do:
High $Fi0_2$
Normovolemia
Mild Hypothermia
Dee sedation

PHYSIOLOGY

Amount of oxygen delivered to tissues is about 4times more than needed [ratio of $D0_2$ to $V0_2$ is 4:1]

When $D0_2$ / $V0_2$ ratio is less than 2:1, see anaerobic metabolism and shock

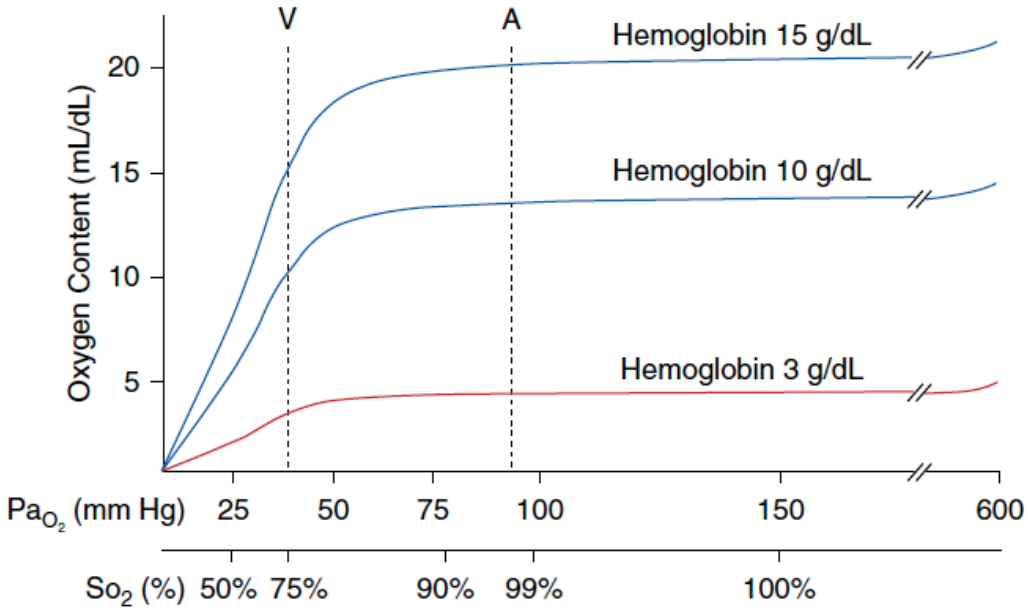
$D0_2$ ML 0_2/MIN = CA_{02} mL/0_2 BLOOD X CO L/MIN X 10dL/L

Remember dissolved oxygen is less than 1% of the total arterial oxygen content[without hemoglobin, resting cardiac output would need to be 300L/min to maintain adequate delivery of oxygen]

$Ca0_2$ =([Hgb] X Sa_{02} /100 X 1.34 mL 0_2/gHgb) + ($Pa0_2$ X .003mL/mmHg/dL)

$Ca0_2$ = 20 is normal

Normal



Use of hyperbaric oxygen increases dissolved oxygen 20 fold—up to 1500-2000mmHg—arterial content of 10mL/dL

Hemoglobin based oxygen carriers

Use high-dose erythropoietin and iv iron

HBOCs-purified acellular hemoglobin molecules modified through cross-linking, conjugation and polymerization

Meta-analysis in 2008 found increased relative risk of myocardial infarction and mortality with use of Hgb substitutes

Each 30g unit of HBOC-201 raises plasma hgb by 0.63g/dL—1/2 life of 19h—Adverse effects of methemoglobinemia and hypertension—avidly scavenges NO—no consistent clinical benefit