Thalassemia

Hereditary defect with increased incidence in patients of Mediterranean, Asian and African decent; normal globin structures but because of gene deletion, synthesis rate of α and ß-chains of hemoglobin (α and ß thalassemia respectively) decreases causing an imbalance of globin chain synthesis resulting in precipitation of unpaired chains and premature RBC destruction which leads to anemia; other concerns include difficult airway d/t facial deformity

ANESTHETIC CONSIDERATIONS:

- Anemia
- Facial deformity - potential difficult intubation in beta thalassemia major
- Transfusion side-effects:
  - Potential for iron toxicity (esp. if transfusion dependent) → hepatic fibrosis, cardiomyopathy, coagulopathy, diabetes, arrhythmias
  - Alloimmunization → difficult to x-match blood
- 4 types:
  - ß-Thalassemia (major) or Cooleys
    - Potential difficult A/W 2° to maxillary overgrowth (from BM stimulation)
    - Other locations of BM overgrowth – rib cage, pelvis, face
    - Hemochromatosis – deposition of hemosiderin (Fe) into cardiac muscle → dilated cardiomyopathy, CHF, conduction delays
    - Jaundice 2° to hemolysis
    - Hemolytic Anemia
    - Thinning of cortical bone → potentially difficult regional 2° to vertebral destruction
    - Positioning
  - ß-Thalassemia (minor) – mild haemolytic anemia and iron deficiency.
  - α-Thalassemia (major) – incompatible with life
  - α-Thalassemia (minor) – mild anemia

ANESTHETIC GOALS:

- Ensure patient not anemic for surgery (usual goal is Hb > 100)
  - Cross-match early d/t potential of alloimmunization and difficult cross-match
- Anticipate difficult airway in beta-thalassemia major and manage appropriately

HISTORY

- AMPLE
  - Type and severity
  - Transfusions, splenectomy, bone marrow transplant
- Resp – dyspnea
- CVS – poor exercise tolerance / fatigue; CHF (orthopnea, PND, edema); palpitations; angina; pericarditis (chest pain)
- Endocrine – DM (polyuria, polydipsia); hypoparathyroid
- GI – liver dysfunction (cirrhosis); jaundice
- Heme – coagulopathy; bruising
- MSK – fracture of long bones; acute pain

PHYSICAL

- **VITALS** – including temperature and SaO_2
- **HEENT** – careful a/w exam; prominent maxilla and malar eminences; frontal bossing
- **RESP** – restrictive defects; crackles
- **CVS** – CHF (edema, incr JVP, S3); arrhythmias; pericarditis (rub); volume status
- **GI** – jaundice; increased liver / spleen size, other signs of liver disease
- **HEME** – coagulopathy; bruising
- **MSK** – cortical thinning; fracture of long bones; incr rib cage and pelvis (marrow hyperplasia)

INVESTIGATIONS

- **Labs**
  - CBC / differential / smear – look for signs of anemia (microcytosis), hemolysis
  - Group and screen: often multiple transfusions in the past → at risk for transfusion related complications (alloimmunized)
  - Lytes (glucose, Ca)
  - Hb electrophoresis
  - LFTs
  - Renal profile – assess renal function
- **Imaging**
  - EKG – LVH / rhythm
  - CXR – CHF
  - Abdominal U/S – (liver / spleen size)
  - ECHO – cardiomyopathy

OPTIMIZATION

- Hematology consult
- Aim for perioperative Hb around 100
  - Transfusion pRBCs +/- FFP and PLT (dictated by functional status and surgery)
- Pneumovax (prevent infection from encapsulated organisms) in splenectomised

ANESTHETIC OPTIONS

- Regional & GA both acceptable
- Regional contraindicated if coagulopathy; may be more difficult if vertebral destruction
  - Ensure normal coagulation profile prior to regional

ANESTHETIC SETUP

- **Drugs**

- Standard
- **Equipment**
  - CAS monitors
  - Temperature
  - +/- art line, CVP, PAC depending on underlying heart function

MANAGEMENT OF ANESTHESIA

- **Induction**
  - Consider awake FOB if distorted anatomy d/t extramedullary hematopoiesis
  - If cardiomyopathy – caution with myocardial depressants
- **Maintenance**
  - Position carefully as bones easily fracture
- **Emergence**
  - None

DISPOSITION & MONITORING

- Dependent on surgery

PATHOPHYSIOLOGY

- Hereditary defect; increased incidence in Mediterranean, Asian and African decent
  - Normal globin structures but because of gene deletion, synthesis rate of α and ß-chains of hemoglobin (α and ß thalassemia respectively) decreases
  - Imbalance of globin chain synthesis results in precipitation of unpaired chains and premature RBC destruction
- Normal adult = 95% Hb-A (2 alpha, 2 beta); 3.5% Hb-A2 (2 alpha, 2 delta); < 1% Hb-F (2 alpha, 2 gamma)
- **Alpha thalassemia**
  - 4 alpha genes encode normal alpha chains
  - One gene deletion - silent carrier
  - Two gene deletions - alpha thalassemia minor or trait (mild-moderate microcytic anemia)
  - Three gene deletions - alpha thalassemia major (Hb-H disease [tetramers of beta chains], severe hemolytic anemia, increased bilirubin, increased spleen, marrow hyperplasia)
  - Four gene deletions - hydrops fetalis (incompatible with life)
- **Beta thalassemia**
  - Point mutations in beta gene
    - Heterozygote - beta thalassemia minor (asymptomatic to mild microcytic anemia, increased Hb-A2 levels)
    - Homozygote - beta thalassemia major (absent beta chain synthesis, severe hemolytic anemia, all Hb-F, increased liver / spleen, jaundice, bone changes d/t marrow hyperplasia)
- Treatment
  - Simple transfusion for anemia / blood loss
    - Mild – supportive transfusions; folate (iron resistant anemia)
    - Major – chronic transfusion to keep HCT > 30%; iron chelation therapy w/ desferoxamine (slow development of hemosiderosis); splenectomy (decreased transfusion requirements); bone marrow transplant

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