Sickle Cell – Pain Crisis and Acute Chest Syndrome

Division of General Internal Medicine and Geriatrics
Hospital Medicine
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Objectives

- Understand workup of acute pain crisis
- Identify key aspects of management of acute pain crisis in sickle cell patients
- Define acute chest syndrome
- Understand management of acute chest syndrome
Sickle Cell Disease

- Autosomal recessive
- Substitution of valine for glutamic acid at 6\textsuperscript{th} AA on the beta globin chain
- Deoxygenated HbS is poorly soluble and forms polymers, distorting RBCs
- Chronic hemolysis – elevated LDH and indirect bili, elevated retic, low haptoglobin
- Recurrent vaso-occlusive crises, end organ damage
Epidemiology

- Approx 70-100,000 pts in the US
  - 65% SS
  - 25% SC
  - 8% SB\(^+\) Thal
  - 2% SB\(^0\) Thal

- Highest health care utilization is 18-30y/o
- 30% no acute care encounters in that yr
- 3% had >10 encounters (7% of 18-30y/o)
Sickle cell vaso-occlusion: multistep and multicellular paradigm
What is the average survival of a RBC in a patient with sickle cell disease?

1. 3 days
2. 15 days
3. 60 days
4. 90 days

Always check a retic count. This will affect your management.
Vaso-occlusive (pain) crisis

- Most common reason for hospitalization
- No good test for vaso-occlusion
- Frequent pain crises is an independent risk factor for early death
- Precipitants: weather, dehydration, infection, stress, pregnancy.... but majority are unknown
- Mean length of stay is 7 days
CBC, retic count are required

- Rule out acute severe anemia of splenic sequestration, aplastic crisis and hyperhemolytic crisis
- No need for Hb variants on admission for pain
- If patient has fever – look for source.
  - Consider things like strep throat, tooth abscess, PID
- If febrile, low threshold for empiric antibiotics
  - Remember functional asplenia!
- Culture central access and consider coverage for line infection
Best treated in ambulatory, day hospital type setting

Hydration
- IVF – no RCTs but experts rec D51/2 NS (+KCL)
- Don’t exceed 1.5x maintenance (total fluids po and IV) unless patient clearly is volume depleted
- Watch for signs of volume overload as pulmonary edema may be contributing factor for acute chest syndrome

Oxygen if needed to keep sats >92%

Incentive spirometer –
- 10 puffs q2hr while awake can reduce acute chest syndrome in patients hospitalized for pain crisis.

Pain control
Role of Transfusion

- The bad: Volume overload, infection, transfusion reactions
  - Allo-immunization
  - Iron overload
  - Hyper viscosity
- In a stable patient with high retic and simple pain crisis DO NOT transfuse unless sx
- There is NO DATA that transfusion shortens the duration of a pain crisis
- Hemoglobin “below baseline” is not a reason to transfuse
- Expert opinion: NIH guidelines, Red Cross guidelines recommend tx only for symptomatic anemia (usually Hb <5)
Pain Management

- Narcotics
- Synergistic agents - NSAIDs, acetaminophen
- Local measures (heat, lidocaine patch)
- Coping skills – psych consult liaison nurse
- Be aware of pseudoaddiction
Most SS patients do not abuse opioids or require daily opioid maintenance.

All opioids have side effects of pruritis, N/V, constipation, less commonly respiratory depression, myoclonus.

Bowel regimen

- Not sufficient to just give stool softener because opioids slow transit. Include a stimulant (ie give senna/colace not just colace).

Give antihistamines, anti-emetics

- No benefit to giving benadryl IV vs PO.
- Hydroxyzine (Atarax) is more potent antihistamine than diphenhydramine (Benadryl).

Tolerance and physical dependence are expected in long-term use and are not equal to addiction.
Controlling Pain

- Know your patients' home (baseline) narcotic use and their baseline pain
  - DON’T GIVE THEM LESS THAN THEY WERE TAKING AT HOME!
- DELAYS in pain relief (starting too low and not being responsive to continued pain) prolong hospitalization
  - 1st 24 hours are key to pt trust and early improvement
  - More pain may not mean more opioid – reassess patient
Pain Control Pearls

- Become familiar with opioid converter – google opioid converter (www.globalrph.com/narcoticonv.htm)
- Using short-acting and long-acting meds in the same family is easier for conversions
- Avoid morphine in CKD and ESRD
- 1.5 mg dilaudid IV = 10 mg of morphine IV!
  - Don’t overdose dilaudid or underdose morphine
- Guidelines suggest – rapid initiation, frequent titration of medication
  - See patient multiple times on the first day to adjust the short-acting pain medication
Pain Control Pearls

- Patients on narcotics at home should have basal pain med – either po or through PCA
- Consider early use of PCA
  - Give frequent demand doses (q10-15 min on PCA)
  - If poor pain control can double demand dosing
  - If relief almost adequate can increase by 50%
- When patient starts improving taper DOSE before tapering INTERVAL
Acute Chest Syndrome (ACS)

- Clinical diagnosis – new infiltrate + resp symptoms, fever, hypoxia or chest pain
- 2nd most common cause for admission
- Causes
  - Infection – mostly atypical organisms
  - Fat Embolism – much higher in adults than kids
  - Unknown (> 50% in some studies) -- pulmonary infarct, atelectasis, pulmonary edema
- Risk fx include high WBC, high Hb, low HbF
Acute Chest Syndrome

- Can rapidly lead to ARDS with 5-9% death
- Most common complication of surgery and anesthesia
- One-third to ½ of pts may have NORMAL CXR on admission and develop problems during the hospitalization
- Mean LOS 10.5 days
Treatment of Acute Chest Syndrome

- **Treatment**
  - **Transfusion** – no RCTs, but considered standard of care
    - Consider exchange transfusion in acutely ill patients with high Hb S fraction (usually >80%) or high baseline Hb (can’t transfuse to Hb >10 because of hyperviscosity)
    - Hb electrophoresis – takes several hours to run. Must call path on call resident to make this happen after hours, on weekends, or any time needed acutely
    - Requires pheresis team (nephrology) and adequate access
  - **Antibiotics** – Should include macrolide or quinolone
  - O₂ and encourage incentive spirometry use
  - IVF to prevent hypovolemia (but not excessive)
  - DVT prophylaxis

- **Outpt hydroxyurea treatment lowers ACS incidence by 50%**
Severity of ACS

- **Mild ACS** — ACS plus **ALL** of the following: Sats > 90% on RA
  - Segmental or lobar infiltrates that involve no more than one lobe
  - Responsive to simple transfusion of no more than 2 units of PRBCs

- **Moderate ACS** — ACS plus **ALL** of the following: Sats > 85% on RA
  - Segmental or lobar infiltrates that involve no more than two lobes by CXR
  - Responsive to transfusion of ≥3 units of red cells (or >20 mL/kg packed RBCs)

- **Severe ACS** — ACS plus **1 or more** of the following: Sats <85% RA or <90% on max O2
  - Respiratory failure present (PaO2 <60 mmHg or PCO2 >50 mmHg)
  - Mechanical ventilatory support required
  - Segmental or lobar infiltrates that involve three or more lobes by CXR
  - Requiring exchange transfusion of RBCs to achieve hemoglobin A levels ≥70 percent

- **Very severe ACS** — Acute respiratory distress syndrome (ARDS) present or sudden, life-threatening lung failure.
Key Messages

- Look for fever source in patients with pain crisis and have low threshold for empiric antibiotics (asplenia).
- Know what your patient has been taking for pain (not necessarily what was prescribed) and ALWAYS use opioid converters when dosing opioid medications.
- Recognize that acute chest syndrome can develop in patients hospitalized for pain crisis and consider early transfusion or exchange transfusion in patients with moderate or severe disease.
References

- **Brousseau et al.** Acute Care Utilizations and Rehospitalizations for Sickle Cell Disease. JAMA; April 7 2010
- **Desai et al.** The acute chest syndrome of sickle cell disease. Exp Opin Pharmacother. 2013 June; 303(13) 1288-94.
Revision History

05/01/12: Original Version: Ashley Duckett, MD
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