JM—Bleeding after cardiac arrest

Hospitalist conference

4 March, 2008
66 year old woman with end stage renal disease

- 12/9 Falls in kitchen—bimalleolar ankle fracture treated with closed reduction and casting
- 2 hospitalizations at ANW for dialysis logistics
- At 2nd hospitalization, she agrees to orthopedic second opinion. Cast removed, skin ulcer over medial malleolus and secondary septic arthritis of the ankle—coagulase negative staphylococcus
2nd hospitalization

- Ankle debrided twice. At second debridement, ankle looks unsalvageable. BK amputation 12/27/07
- Relatively uneventful postoperative course and discharged to nursing home in Mora January 2
- Reportedly hospitalized St. Cloud mid January for aspiration pneumonia
3rd hospitalization

- Admitted 1/30 in extremis
- Hypotensive as low as 50s, abdominal pain
- WBC 20000, CXR left lower lobe infiltrate, CT abdomen and pelvis—colonic distension
- Septic shock uncertain source treated with imipenem and vancomycin, IV flagyl
3rd hospitalization

- Fluid resuscitation, dopamine, vasopressin and stabilizes somewhat
- Flex sig on 1/31--deep ulceration sparing rectum
- Cdiff toxin negative. Colonic biopsy—cytomegalovirus colitis
- Stabilizes. Treated for Cdiff and CMV and extubated on 2/5
3rd hospitalization

- Over next 2 weeks, partial recovery—severe debility, poorly healing BK amputation, nutritional compromise. Handling secretions poorly, mild delirium

- On 2/20, BP 110/50 HR Temp 36.8 at 2300
Cardiac arrest

- Code 0045 pulseless electrical activity. ACLS protocol resuscitated and intubated.
- Code again 0240 PEA again this time due to Pneumothorax. Chest tube placed.
- 1 liter blood from chest tube and apparent hemothorax on CXR.
Post Arrest

- CBC Hgb 10.8 → 10.7 → 10.3 → 5.0
- Plt 210K → 21K
- INR 2.8
- Fibrinogen 123
- LDH 4742
- Antithrombin 46% (79-131%)
Post Arrest

- Progressive hypotension
- Pressors
- Transfused platelets, FFP, packed cells
- Vancomycin, imipenem
- Continued deterioration. Expired 0800.
- After death blood cultures positive stenotrophomonas maltophilia (and coag negative staph) Stenotrophomonas had been in sputum a week earlier and treated with cipro.
DIC 5 factors

- Exposure of blood to procoagulants
- Formation of fibrin within the circulation
- Fibrinolysis
- Depletion of clotting factors
- End organ damage
Acute DIC

- Exposure of blood to massive amounts of tissue factor with massive generation of thrombin overwhelming control mechanisms.
- Bleeding
- Ischemic tissue injury
Diagnosis

- Suggested by clinical context, thrombocytopenia, microangiopathic hemolysis

- Confirmation
  - Evidence of fibrinolysis—D-dimer less sensitive more specific than quantitative FDPs
  - Evidence of thrombin generation, decreased fibrinogen
Blood Smear (Panel A) and Kidney-Biopsy Specimen (Panel B) from a Patient with Disseminated Intravascular Coagulation
Coagulation factors

- INR II, V, VII, X
- PTT VIII, IX, XI, XII and less sensitive to components of common pathway
- Fibrinogen can be a reduction from previously elevated (acute phase reactant) level and still be in normal range
- Coagulation modulating factors AT, Protein C and Protein S can also be reduced.
Pathogenetic Pathways Involved in Disseminated Intravascular Coagulation

Differential diagnosis

- Thrombotic thrombocytopenic purpura (HUS) should not have consumption of coagulation factors
- Severe liver disease can involve impaired fibrinolysis, low levels of factors and severe thrombocytopenia and may be indistinguishable.
- Primary fibrogenolysis rare
Treatment

- First
- Treat the underlying disease!
Treatment--platelets

- Indications Platelet count < 20 K or <50K with bleeding
- Up to Date says dose is 1-2 units per 10 kg per day
- Expect less than “expected” rise in platelet count because obviously a consumptive process
Treatment--Factors

- FFP  Indication: active bleeding with elevated INR or fibrinogen < 50
- Dose according to Up to Date 15 mL/kg.
- Keep fibrinogen > 100 mg/dl
What about heparin

- Rarely useful in acute DIC
- No randomized controlled trials
- Antithrombin levels depressed
- Antithrombin should be normalized to make it effective
- Primary use in chronic DIC with primarily thrombotic manifestations and promyelocytic leukemia (though now treated with transretinoic acid)
Antithrombin?

- Placebo controlled trial showed no benefit and increased bleeding if combine with heparin.
Summary

- Consider if thrombocytopenia associated with abnormal clotting tests and microangiopathic hemolysis.
- Diagnosis requires thrombocytopenia, abnormal clotting tests and fibrinogen and some evidence of fibrinolysis, D-dimer or FDP.
Summary

- Primary treatment: treating the cause
- Platelets if < 20K or < 50K and bleeding
- FFP is primary source of fibrinogen and factors (not factor concentrates)
- No randomized controlled trials to support heparin but consider if compensated DIC with primarily thrombotic manifestations
References

- Leung, L. “Clinical features diagnosis and treatment of DIC” Up to Date v 15.3
The real lesson from this case

- Rule of thumb, “If you wouldn’t be surprised if the patient died in the next 6 months it is time to discuss palliative care”