DVT Prophylaxis in Head and Solid Organ Injury

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Disclosure

• I have nothing to disclose

DVT Prophylaxis

• Multisystem trauma is a significant risk factor for development of DVT
  – Prolonged immobilization (Stasis)
  – Direct trauma (Endothelial damage)
  – Abnormalities to the clotting system (hypercoagulable)
    • Initial coagulopathy
    • Followed by increase in platelets and procoagulant proteins ~4 days after injury

DVT Prophylaxis

• True incidence of DVT difficult to know
• After trauma, the reported mortality rate of PE ranges from 0.4% to 50%
• Prevention
  – Unfractionated Heparin
  – Sequential compression devices
  – Advent of Low Molecular Weight Heparin
Low Molecular Weight Heparin

  - Knudson MM, Morabito D, Paiement GD, Shackleford S.
- LMWH effective in DVT prophylaxis as soon as resuscitation is completed and the bleeding risk is acceptable

DVT Prophylaxis

- Ideal timing for DVT prophylaxis in patients with solid organ injuries and traumatic brain injuries has been controversial
- Risk of failure of non-operative management
- Risk of morbidity and mortality

A Potentially Expanded Role for Enoxaparin in Preventing Venous Thromboembolism in High Risk Blunt Trauma Patients

- 118 patients – seriously injured blunt trauma
- Closed head injuries and nonoperatively treated solid abdominal organ injuries
  - Excluded – Spinal cord injuries, ongoing coagulopathy, ongoing hemorrhage, or opinion of extremely high risk for further bleeding
DVT Prophylaxis

• 41 patients initially excluded because of bleeding concerns
• 118 patients started on enoxaparin on admission or at 24 hours if TBI
  – 55 had TBI, 8 required craniotomy
  • NO bleeding complications in this group
  – 10 had liver injuries (Grade I-III) – No NOM failure
  – 12 had splenic injuries (Grade I-IV)
    • 2 failed NOM (Grade III and IV)

• Duplex US obtained at discharge
• 2 patients found to have DVT
  – Common femoral vein
  – Peroneal vein
  – Both were asymptomatic and started on systemic anticoagulation
  – NO episodes of PE
• Conclusions: Safe for early use in blunt trauma
  • 24 hours for liver, 72 hours for spleen

Solid Organ Injury

• 565 patients from 2005-2008
  – Excluded 49 who died within 24 hours and 27 with no data
  – 177 patients with operative management
  – 312 patients with non-operative management
    • 154 splenic injuries
    • 144 liver injuries
    • 65 kidney injuries
  – Early group, Late group, NO LMWH group
    • ICH, perispinal hematoma, ongoing hemorrhage, coagulopathy

• 312 patients with solid organ injuries undergoing non-operative management
• Compared Early vs Late DVT prophylaxis with LMWH
  – Early = < 3 days
  – Late = > 3 days
Solid Organ Injury

- 111 pts (35.6%) received LMWH
  - 41 Early LMWH
  - 70 Late LMWH
- Early LMWH
  - Less severely injured – ISS 21.9 +/- 10 vs 24.6 +/- 10, p<0.001) GCS < 8 12.5% vs 20.0%
  - No difference in incidence of high grade injuries or the presence of risk factors for failure
- Late LMWH
  - Received more pRBCs than either Early or NO LMWH
  - NO difference in mortality

Solid Organ Injury

- Splenic Injuries
  - 22 received early, 35 late LMWH
  - 12 failed NOM – NO difference between groups, even with high grade injuries
- Liver Injuries
  - 18 received early, 36 late LMWH
  - 3 failed NOM – NONE received LMWH prior to failure
- Kidney Injuries
  - 6 received early, 17 late
  - 2 failed NOM – NONE received LMWH prior to failure

Solid Organ Injury

- Thromboembolic complications
  - 2 pts with DVT
  - 2 pts with PE
  - All were treated with therapeutic LMWH
  - None died

Solid Organ Injury

- It does not appear that early administration of LMWH will increase the failure rate of NOM of solid organ injury
- Administration within 36 hours as long as no evidence of ongoing hemorrhage or coagulopathy
- If they do bleed, better to bleed in hospital
- Risk of PE is too great not to prophylax
Evaluated 525 patients with isolated head trauma

- Enoxaparin 30mg SQ q 12 after 24 hour repeat head CT
- Excluded: Continued coagulopathy, blunt solid organ injury, spinal cord injury/severe fracture, TBI with AIS <2 admitted for <48 hours, surgeon concern (24.4%), ICH >2 cm in diameter, multiple smaller contusions within one region of the brain, SDH or EDH >8mm in thickness, persistent ICP >20 mmHg, increase in size of lesion on 24 hour follow up CT

Head Injury

- Time from admission to until first dose – 36.2 +/- 12.7 hours (median 25.5)
- 6 pts (1.14%) had U/S diagnosed DVT
- 0 pts had PE

Head Injury

- 8.3% (n=44) – Progression of hemorrhage on CT BEFORE enoxaparin
- 3.4% (n=18) - Progression of hemorrhage on CT following enoxaparin
- No difference between the groups
  - 12 considered clinically insignificant
  - 1.1% (n=6) clinically significant to warrant change in therapy
  - 1 patient where enoxaparin may have contributed to mortality
Head Injury

- Protocol violations occurred in 10 out 18 patients with progression of bleed
- 5 out 6 clinically significant progressions had protocol violations
- If excluded all protocol violations
  - CT progression rate would be 1.8% (vs 3.4%)

Head Injury

- Authors concluded that
  - Enoxaparin can be safely administered to many patients with TBI
  - Risk of clinically significant intracranial bleed progression (1.14%) is less than that of DVT (18%) and PE (4.8%) in patients without prophylaxis

Safety and Efficacy of Prophylactic Anticoagulation in Patients with Traumatic Brain Injury

Travis Scudder, BA, Karen Read, MD, MPH, FACS, Travis Webb, MD, FACS, Pamela Dodder, MD, FACS, Lewis Steenborg, MD, FACS, John Wege, MD, FACS, David Hermann, FACS, William Popadic, PhD.

- Retrospective analysis of patients with TBI over 2 year period after institutional DVT prophylaxis protocol was instituted

Head Injury

- Protocol: Standard administration of chemical prophylaxis (Heparin or Enoxaparin) to all patients with a 24 hour follow-up CT that showed no progression of initial injury
- Prophylaxis starts 24-48 hours after second CT or 48-72 hours after initial injury
- Patients with progression or who undergo craniotomy are not eligible
Head Injury

• 812 patients in study
  – 410 received NO prophylaxis
  – 402 received prophylaxis

• Group receiving prophylaxis
  – Older
  – More severely injured
  – Lower GCS
  – Started on average at 94 +/- 4 hours

Head Injury

• Group receiving prophylaxis
  – Lower incidence of VTE 1% vs 3% p=0.019
  – No significant progression of bleed 3% vs 6% p=0.055
    • Indicates appropriate non-prophylaxis in the no treatment group

• Only had 55% compliance with protocol during study period
  – Attributed to different admitting teams

Head Injury

• While these studies cannot offer Level I evidence, the do suggest that:
  – Chemical prophylaxis can be administered to select patients with TBI
  – Patients with no progression seen on 24 hour follow up head CT
  – Multi-disciplinary protocols should be in place with quality control evaluations