Medical Issues in Trauma Patients

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Goals

- Trauma Clearance
- Medical Clearance
- Anesthesia – Regional vs general
- VTE
Trauma Patient

- Can happen at any age
- Spectrum of health
- Treatments options may vary
Trauma Clearance

- Multiple injured patient (APC 3 pelvis, c-spine injury, femur fx and open tibia)
  - Are they “Cleared for Surgery”? 
- ATLS 
- What next? 
  - Damage Control Orthopedics (DCO) 
  - Early Total Care (ETC)
## Why DCO vs ETC

<table>
<thead>
<tr>
<th>DCO</th>
<th>ETC</th>
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<td>- Prolonged surgery may worsen inflammatory response and lead to ARDS or MOF</td>
<td>- Patients mobilize faster</td>
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<td>- “Second hit”</td>
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FIGURE 2. Treatment protocol for major fractures in poly-trauma.⁴⁰
# Parameter Guidelines

<table>
<thead>
<tr>
<th>TABLE 3. Assessment of Four Different Clinical Grades and Ranges of Clinical Parameters Determining These Grades</th>
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<tr>
<td><strong>Parameter</strong></td>
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<td>Shock</td>
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<td>Surgical strategy (Fig. 2)</td>
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Risk of mortality is 50% less if treated > 12 hours. Except the 24-48 hr group. Abdominal injury patients benefit more than other groups with delayed treatment.
Louisville Group

- “at risk” patient
  - DCO indicated if:
    - pH < 7.24
    - Temp 32 – 35
    - Operative procedure > 90 minutes
    - Platelets < 90,000
    - Received > 10 units of PRBC’s
Head Injury

- Injured Brain is highly susceptible to ischemic injury
- Highest risk is 24 to 48 hours
- Patients with GCS<9 operated on < 2 hrs had 8 x risk of hypotension (Townsend et al.)
- Neurosurgical consultation
Chest Injury

- Lung contusion closely associated with ARDS
- Likely that chest injury itself is responsible for pulmonary complications not treatment
- Some controversy
Geriatric Population

- Multiple co-morbidities before injury
- Injury can range from hip fracture to polytrauma
- Medical “clearance” is actually “risk assessment”
- Surgery is typically indicated and “urgent” or “emergent”
- Hospitalist consult?
Patient with ACC should get evaluated

- Active Cardiac Conditions (ACC)
  - Unstable angina
  - MI within 6 weeks
  - Decompensated heart failure
  - Significant arrhythmia
  - AV block (Mobitz II or Complete)
  - Symptomatic Ventricular arrhythmias
  - Symptomatic Bradycardia
  - SVT >100 bpm
  - V-Tach
  - Severe valvular lesion
  - Severe aortic stenosis
  - Symptomatic mitral stenosis
Sedentary patient with 3 or more risk factors should be evaluated

- **Clinical Risk factors**
  - Heart failure
  - Cerebral vascular disease
  - DM
  - CKD
Perioperative betablocker

- If already take beta blocker continue
- If have a cardiac risk factor should have pre-op beta blocker
PROTOCOL
Emergency Department

- Patient with suspected hip fracture gets appropriate x-rays of hip, pelvis
- CXR
- EKG
- Labs: CBC, CMP, Coags, UA with reflex culture
- IV hydration

- NPO
- Foley catheter placed
- Pain assessment/medication as indicated
- Orthopedic surgery consult
- Hospitalist/medicine consult for medically complex patients, ie, DM1, CHF, CAD, CRF, O2 dependent COPD
PROTOCOL

Pre-Operative Management

- Patient admitted to orthopedic unit unless otherwise indicated
- Bedrest
- IV hydration
- NPO with I&O’s recorded
- Pain assessed every 2-3 hours while awake with pain medication as indicated/ordered
- Delirium prevention: avoidance of certain medications, ie, hypnotics, benzodiazepenes, diphenhydramine
- Antiemetic regimen PRN
- Assess previous mobility and functional status
- Assess social circumstances for whether or not patient has care giver or DPOA
- Thorough skin assessment for presence/high risk of pressure sores
- Sequential compression devices unless contraindicated
- Vital signs per protocol, nurse care protocols initiated
- Hospitalist/medicine assessment/optimization if indicated for surgical clearance
PROTOCOL
Day of Surgery

- NPO except sips for am meds
- Preoperative beta blocker
- Preoperative antibiotics
- Repeat labs if indicated, ie, INR, blood glucose reading, lytes
- IV hydration

- Surgical consent/site marked
- Return to floor postoperatively: clear liquid diet, continue IV hydration, continue foley catheter, overhead trapeze, neurovascular checks, pain assessment/medications, incentive spirometry hourly while awake, mobilization with therapy if feasible,

- Bowel regimen initiated
- Restart preoperative medications – include antidepressants, antipsychotics, dementia agents, seizure medications
PROTOCOL
Postoperative day #1

- Prophylactic antibiotics for 24 hours postoperatively
- D/C foley catheter
- Transition to PO pain medication
- IV heparin lock if tolerating diet
- D/C drains if output less than 50cc/8 hrs
- Start thromboembolic chemoprophylaxis 12 hours after surgery
- Check CBC/electrolytes, and if indicated check INR

- Restart anticoagulation
- Mobilize with therapy – PT consult for up to chair BID
- CM/social work consult for discharge planning
- Advance diet as tolerated
- Postoperative films if indicated
- Bowel regimen continued to include stool softeners and laxatives as needed
- Continue Delirium prevention: avoidance of certain medications, ie, hypnotics, benzodiazepenes, diphenhydramine
PROTOCOL
Postoperative Day #2 and Beyond

- D/C foley and drains if present and indicated
- Dressing change POD #2
- Check CBC, lytes and if indicated coagulation
- Continue mobilization with therapy
- Continue thromboembolic chemoprophylaxis
- Continue discharge planning with CM/SW
- Continue anticoagulation if indicated
PROTOCOL
Discharge

- Afebrile, hemodynamically stable
- Tolerating regular diet
- Medically optimized with near-baseline presentation
- Wound clean, dry, intact
- Pain well controlled by oral pain medications
- Cleared by PT for discharge to next level of care
- Arrangements made for SNF, Rehab, or HHC per CM/SW
- Discharge instructions to include WB status, new medications, follow up visits, wound care, activity restrictions, contact information, narcotic refill policy
VTE

- DVT and PE
- Affect estimated 900,000 people in US/yr
Post-Operative Anticoagulation

- DVT is the second most common complication in hip fx surgery

- Without prophylaxis:
  - DVT incidence 40-60%
  - Fatal PE 0.7-7%

- ACCP: Hip fracture surgery highest risk for VTE
  - With prophylaxis 1.3-8.2%
    - Chest 2004;126:338S
What happens to develop VTE

- Virchow’s triad
  - Venous stasis
    - immobile
  - Vascular intimal injury
    - Direct endothelial injury from injury and surgery
  - Hypercoagulability
    - Injury activates clotting factor; decrease ATIII levels; increase platelet activity
    - Bone release thromboplastins when operated on
    - Clotting cascade is stimulated during instrumentation of medullary canal

- 85% of symptomatic DVTs ≤ 5 weeks of surgery

Injury 1999;30:
Risk Factors for thromboembolism

- Advanced age
- Malignancy
- Previous VTE
- Obesity
- Heart failure
- Paralysis
- Presence of an inhibitor deficiency state
- Surgical delay
- Prolonged surgery
Comprehensive DVT Prophylaxis

- Not just meds!
- Prompt surgery
- Sequential Compression Device
- Early weight bearing
- Eliminate restraints
- Delirium prevention
- Pain management
Risk Assessment profile (RAP)

- **Underlying condition**
  - Obesity – 2
  - Malignancy – 2
  - Abnormal Coag – 2
  - Hx of VTE – 3

- **Iatrogenic Factor**
  - Central line > 24 hr – 2
  - Transfusion >4U in 24 hr – 2
  - Surgery > 2 hr – 2
  - Repair or ligate major vessel - 3

- **Injury Related factor**
  - Chest AIS >2 – 2
  - Abdomen AIS >2 – 2
  - Head AIS > 2 – 2
  - Spinal fx – 3
  - GCS < 8 for > 4 hr – 3
  - Complex lower ext fx – 4
  - Pelvic fx – 4
  - Spinal cord injury – 4

- **Age**
  - 40 to <60 – 2
  - 60 to<75 - 3
  - >75 - 4

Greenfield et al 1997
RAP

- < 5 low risk
  - No surveillance or prophylaxis

- 5 or greater
  - Prophylaxis and surveillance

Gearhart et al. 2000
RAP

- 5 or less – 4% incidence
- 5-14 – 17% incidence
- > 14 – 42% incidence

- 2281 patients
  - DVT 11%
  - PE 2%
  - 5 patients (<1%) died from PE

Hegsted et al 2013
Cochran Data Base 2013
Trauma patient

- No prophylaxis group
  - DVT (dx by duplex) : 8.7% (37/424)
  - PE (dx by VQ scan, angio, autopsy) : 3.3%

- Thromboprophylaxis
  - Did not reduce mortality or PE
  - However did reduce DVT

- Pharmacologic > mechanical

- LMWH > UH

- Some evidence that minor bleeding occur with pharmacologic
Prophylaxis

- Low dose Heparin (5000 U 3 times / day)
  - Not adequate for patient with ISS >10 (Ganzer et al.)
  - LDH vs 30mg bid of enoxaparin show comparable rate of DVT (Arnold et al.)

- LMWH

- Mechanical
  - Graduated compression stockings
  - Sequential pneumatic compression devices
  - A-V foot pumps

- Vena Cava Filter
ACCP Recommendations

- LMWH and possibly mechanical
- If LMWH contraindicated PCD or with GCS
- Major trauma thromboprophylaxis until DC
- Recommend against VCF
EAST Recommendations

- LDH level III evidence to use if high risk that bleeding can worsen
- LMWH level II evidence to use in Pelvis, complex lower extremity, spinal cord
  - Level III patient with ISS>9
- AV foot pump level III may replace PCD
- PCD level III may have benefit in head injury patients
- VCF level III consider in very high risk trauma patient who cant have anticoagulation because of increased bleeding
Aging effects on Warfarin

- Age-related decline in metabolism
- Warfarin is 99% protein bound
  - Age-reduction in albumin
    - Lower with poor nutrition

Am J Health-Sys Pharm 2005;62:1062-6
Warfarin dosing with age

- Recommend load ≤ 5mg/d
- Less if liver failure, CHF, malnutrition
- 5mg/d excessive in:
  - 82% of women
  - 65% of men

Chest 2005;127:2049-56
Anticoagulation in renal failure

- Enoxaparin is only anticoagulant certified by the FDA for VTE prophylaxis in renal failure
- 30 mg SQ daily for CRCL < 30
- LMWH vs UFH in GFR < 60
  - Risk of major bleed was increased with worse function for both
  - Risk of minor bleed higher for LMWH than UFH
- Heparin for ESRD and Dialysis patients
Vena caval filters potential indications

- Can’t anticoagulate
- GI bleeder
- Multiple clots in past
- Protein deficiency patients
Duration of Prophlaxsis

- Optimal duration unknown
- Most recommend 2-5 weeks or until mobile

\(^1\)Arch Int Med 2003; 163:1337
### AAOS guidelines for THA

<table>
<thead>
<tr>
<th>Risk of PE</th>
<th>Risk of Bleed</th>
<th>Agent</th>
<th>Level</th>
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<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>ASA LMWH Fundaparinux Warfarin</td>
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<tr>
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All patients should be assessed pre-operatively for elevated risk of PE and major bleed.
Recommendations

- American College of Chest Physicians
  - Recommend against the use of aspirin alone (Grade 1A)
  - Routine prophylaxis with
    - Fondaparinux (grade 1A)
    - LMWH (grade 1B)
    - Warfarin (INR target 2-3; grade 1B)
    - UH (grade 1B)
  - Continue prophylaxis >10 days up to 35 days
Geriatric Population

Hip fractures

Regional vs General

- Theory regional would decrease pulmonary morbidities
  - Therefore decrease LOS, ICU stay, cost
  - Continuous neuroaxial anesthesia allow for less opioid use
  - Also decrease intra operative hypotension
- Regional anesthesia did not lower pulmonary morbidities

Le-Wendling et al. 2012
Cochrane review 2004
- RA show borderline improvement short term mortality and postoperative delirium but not long term
- No difference for: Pneumonia, MI, CVA, CHF, Renal failure, urine retention, post op vomiting,

Luger et al. 2010
- Spinal associated with less early mortality
  - Less DVT
  - Less post op confusion
  - Tendency toward fewer MI, less pneumonia, less fatal PE, less post operative hypoxia
- General associated with less hypotension
  - Tendency toward less CVA
Conclusion

- Start with ATLS
- Every patient has different needs
- VTE prophylaxis decrease DVT but does not reduce mortality
- Obtain medical consult if indicated
  - Pre-morbid conditions
  - Hemodynamic instability
- Regional anesthesia has some benefits but somewhat limited