Challenging Trauma Cases

David Thompson, MD, MPH

High Risk + Hawaii

Topics

• Head injury in the anticoagulated patient
• Shock recognition
• Transfusion ratios
• Hypotensive resuscitation

Case 1: Head injury

HPI: 57 yo male w/ PMH atrial fibrillation, on Coumadin – slipped and fell in the shower. Hit his head, No LOC
PE: 130/45, P 63, R 16, 99% RA, T 36.0
General: NAD
HEENT: Abrasion to L temple, perrl, no dental trauma,
Neck: in cervical collar
Neuro: GCS 15, MAE x 4
Extremities: Atraumatic

INR 2.7

• Negative imaging – OK to discharge home?

Question:
What is the risk of delayed intracranial hemorrhage in patients taking oral anticoagulants with minor head injury?
- He’s on aspirin, not Coumadin, does he need a second CTH?
- Second CTH for Clopidogrel (Plavix)?
- Ticagrelor (Brilinta)?
- Prasugrel (Effient)?
- Second CTH for rivaroxiban (Xarelto)?
- Dabigatran (pradaxa)?

*Traumatic Brain Injury in Anticoagulated Patients*
David B. Cohen, MD; Charles Reider, MD, FACS; and Jack E. Wilberger, MD, FACS

• Retrospective review of prospectively collected head injury database and a trauma registry
• 77 patients taking warfarin w/ GCS 13-15
• Avg age 68
• Avg INR 4.4
• 64% had CTH performed
• 12.5% abnormal

• 20 Patients DC’ed from the ED
• 10 (35%) had a normal CTH performed
• 18 returned to the ED, Dx’ed w/ significant ICH
• 2 died at home of SDH found on autopsy
• Among these 20 patients, mortality 88%

• 45 patients admitted for observation
• 4 had abnormalities on CTH
• Within 18 hours, 80% of these patients had a decline in GCS to <10
• Mortality 84%

• Overall mortality in these 77 anticoagulated patients with minor head injury 80.6%
Advanced Age and Preinjury Warfarin Anticoagulation Increase the Risk of Mortality After Head Trauma

Jon Fratila, MD, PhD, Koren J. Kish, MD, Brendan G. O’Connell, MD, Sajeev Subramanian, MD, and James V. Yasko, MD, FACS


• Retrospective analysis of 1493 blunt head injury patients
• 159 on warfarin
“warfarin anticoagulation is an independent predictor of mortality after blunt TBI. Warfarin anticoagulation carries a six-fold increase in TBI mortality.”

• Higher INR → higher risk for ICH and death
Secondary Intracranial Hemorrhage After Mild Head Injury in Patients With Low-Dose Acetylsalicylate Acid Prophylaxis

Mark Tauber, MD, Helko Koller, MD, Philipp Moroder, MD, Wolfgang Hitzl, PhD, and Herbert Ronch, MD

Level 1 trauma center
100 consecutive trauma patients > 65 on low dose ASA
4 cases of delayed hemorrhage on CT #2
1 fatal outcome, 1 required neurosurgery
Recommended 12-24 hour routine repeat CTH vs. 48 hr. observation admission

J Trauma. 2009 Sep;67(3):521-5

Immediate and Delayed Traumatic Intracranial Hemorrhage in Patients With Head Trauma and Preinjury Warfarin or Clopidogrel Use

Daniel H. Nachcone, MD, MSc, Steven R. Schmeer, MD, Donald W. Ballard, MD, David P. Veenstra, MD, back, MD, MPH, Adrian E. Beilke, MD, MPH, Karen E. Reid, PhD, MPH, James F. Holmes, MD, MPH, for the Clinical Research in Emergency Services and Treatment (CREST) Network

2 trauma centers, 4 community hospitals
1064 patients enrolled, 1000 CT'ed
Delayed hemorrhage in 4/687 warfarin patients, 2 died
Zero cases of delayed hemorrhage in 243 clopidigrel patients


- Patients on clopidigrel more likely to have immediate hemorrhage (12%) than those on warfarin (5%)
- Delayed hemorrhages on warfarin identified on days 1, 3, 3, and 7.

Admit All Anticoagulated Head-Injured Patients? A Million Dollars Versus Your Dime. You Make the Call

From U.S. dollars for hospital, Cochrane, etc.

Step 3. Cost of 2 CT scans=24h admission=224 admissions needed to save 1 patient
United States
1,018,980
Spain
197,915
Canada
105,280
Other US-based interventions by cost per year of life saved, adjusted for 2011 dollars
Data inflamed in parenthesis also? Inverso ambidextro: N
Rheumoxicostal vascularization in patients >65 y of age
3,454
Iionide therapy for patients with positive tubercular skin test results
26,850
Outpatient dialysis treatment
111,470
Coloroscopic screening in patients >40 y of age
141,300
Annual mammogram in patients aged 40-49 y
298,200

Question

• What is the optimal management of traumatic intracranial hemorrhage in patients taking warfarin?

Rapid Warfarin Reversal in Anticoagulated Patients with Traumatic Intracranial Hemorrhage Reduces Hemorrhage Progression and Mortality

Felicia A. Ivanou, MD, Greg A. Howell, MD, Frederick S. Jana, MD, Holly A. Bair, MSN, Phillip J. Bendick, PhD, and Randy J. Janczyk, MD

Trauma. 2005 Nov;59
Results

• Small study
• Enrolled 82 patients on Coumadin with head trauma
• 19 had intracranial bleeding
• 10% (2) died
• Compare to pre-protocol mortality 48%

Conclusion

• Rapid confirmation of ICH with CT scan and reversal of coagulopathy decreases progression of ICH and reduces mortality.

Warfarin Reversal

• FFP (4-6 units)
• Vitamin K (PO vs. IV)
• Prothrombin Complex Concentrate (PCC)
  - Bebulin – Factors 2, 7, 9, 10
  - Kcentra – Factors 2, 7, 9, 10, Proteins C & S

LMWH & Heparin

• Administer protamine
Dabigatran & Rivaroxaban
- Prothrombin Complex Concentrate (evidence for Rivaroxaban)
- Dialysis
- Charcoal
- Time

Take Home Pearls
- On Warfarin - Negative CTH, INR ~3+, Observe and repeat CTH
- On ASA, Plavix – Negative CTH -> DC
- On Dabigatran, Rivaroxiban – negative CTH, admit for observation

Take Home Pearls
- On ASA/Plavix + ICH – give platelets

- On Warfarin + ICH – give PCC, or FFP + Vitamin K

- Head Injury + AMS – initiate reversal agents on ED arrival

Take Home Pearls
- On Dabigatran + TBI – discuss w/ trauma surgeon/neurosurgeon, give PCC, discuss dialysis

- Be prepared!
Case 2: Crush

- 48 year old female BIBA after being crushed between 2 trucks. The paramedics note she had significant ecchymosis and abrasions to her abdomen. Vitals are BP 110/50, HR 110, RR 28, sat 95% on RA. Medics placed an 18g and a 20g IV in the field.

- Initial ED VS: BP 80/40, P 130
- Patient received 500mL NS
- Repeat VS: BP 110/50, P 105
- Patient speaking, c/o abd pain, pain improved after 50mcg Fentanyl
- No ultrasound available

Do you want to transfuse the patient?

What tests do you want?

What’s going on with the patient?

Fig. 2. Intermittent hypotension in the setting of ongoing hemorrhage and recurrent volume resuscitation. Despite the intermittent return of normal systolic BP, the patient remains in a prolonged shock state, which if not definitively corrected results in the patient's demise.
Pitfalls in shock recognition

- Compensation
- Volume Responders
- Mental status – attribute to head injury
- Elderly – relative hypotension

Lab testing

- Base Deficit
- Lactate
- PT/INR
- Hematocrit
- Thromboelastography

“Elevated initial and 24-hour lactate levels are significantly correlated with mortality and appear to be superior to corresponding base deficit levels.”

“Initial base deficit is a poor predictor of mortality and did not correlate with lactate levels except in trauma nonsurvivors.”

Case 3: Stab Wound

- 30 yo intoxicated M BIBA s/p stab wound to the right flank
- HR 145, BP 76/38, RR 22, sat 99% RA

PE:
- Gen: intoxicated, repetitive, no head trauma
- Abd: tense, guarding
- Back: 2 cm linear wound to right flank
- Neuro: moving all extremities
• Would you transfuse this patient?
• How much blood would you order?

What’s a massive transfusion protocol?

Hemorrhagic Shock Resuscitation

• What is the optimal ratio of blood products to transfuse?

• 246 patients, combat support hospital who received >10 units PRBCS
• Retrospective
• 3 groups: (RBC:FFP ratio) -> mortality
  • (1:8) -> 65%
  • (1:2.5) -> 34%
  • (1:1.5) -> 19%

• Conclusion: recommended 1:1 ratio of RBC:FFP in massive transfusion protocols.

Retrospective
133 civilian patients received >10 units PRBC's
56% of patients died
Factors associated with death: higher RBC transfusions, INR>1.5 at 6 hrs., hypothermia, age >55
Higher FFP:RBC ratios led to decreased coagulopathy, but no decrease in mortality

J Trauma. 2008 Aug;65(2):261-70

• Conclusion: More study is necessary before 1:1 ratio can be recommended.

The status of massive transfusion protocols in United States trauma centers: massive transfusion or massive confusion?

Kevin M. Schuster, Kimberly A. Davis, Felix Y. Lui, Linda L. Maerz, and Levio J. Kaplan

Web Survey of 186 Surgeons, 59 center directors
85% of centers had MTP
62% of first batches contained FFP
All 3rd boxes contained FFP
Overall, 50% of MTPs have a 1:1 FFP:RBC ratio

Putting It Together

Table 2

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<th>FFP units</th>
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Take Home Point

- Be prepared for massive transfusion!

Case 4: Gunshot wound

- Level 2 Trauma center
- 22 yo m w/ GSW X 1 to abdomen
- P 135, BP 80/40, RR 28, 02 93% NRB
- Gen: Pale, cool, Diaphoretic
- Chest: CTA B/L
- Abd: L periumbilical puncture wound, diffuse TTP
- Extr: Faint Pulses
What is the goal BP for this patient while waiting for surgery?

CXR and Abd XR: radiopaque FB in R abdomen

Surgeon driving in, OR activated

(2) 14G IV’s, beginning RBC transfusion

Prospective, 598 penetrating torso trauma patients with EMS SBP<90
Standard EMS ATLS IV hydration resuscitation
Vs. no IVF until OR
Even vs. Odd days
70% (restrictive) vs. 62% (liberal) survival
23% (restrictive) vs. 30% (liberal) complications (ARDS, sepsis, renal failure, wound infection, PNA)

Hypotensive Resuscitation Strategy Reduces Transfusion Requirements and Severe Postoperative Coagulopathy in Trauma Patients With Hemorrhagic Shock: Preliminary Results of a Randomized Controlled Trial

C. Anne Morrow, MD, MPH; Matthew M. Carrick, MD; Michael A. Norman, MD; Bradford G. Scott, MD; Francis J. Walsh, MD; Peter Tsai, MD; Kathleen R. Zwiren, MD; Matthew J. Wall, Jr., MD, and Kenneth J. Matte, MD

90 patients, prospective, randomized
Arrived in hemorrhagic shock, req. emergent surgery
Standard care by EMS and ED
MAP goal 50 vs. 65
No difference in 30 day mortality
Less blood products used in hypotensive group
Conclusion: Hypotensive resuscitation is safe


Rationale

• Thrombus dislodgement
• Coagulopathy
• Hypothermia
• Acidosis

Caution:

• Traumatic Brain Injury
• Elderly
• Baseline Hypertension
• Coronary Disease

• Hypotensive resuscitation is safe and may be beneficial for patients with hemorrhagic shock due to trauma.
In Summary...

Topics

• Head injury in the anticoagulated patient
• Shock recognition
• Transfusion Ratios
• Hypotensive resuscitation

Thank You!

Any questions?