Challenging Trauma Cases

David Thompson, MD, MPH

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

• Negative imaging – OK to discharge home?

INR 2.7

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)?
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

28 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

Jan Franko, MD, Phil, Karen J. Schi, MD, Brendan G. O’Connell, MD, Sujana Subramanian, MD, and James V. Twardek, MD, PACS


- 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 Twicker, MD, Heiko Kollin, MD, Philipp Monauer, MS, Wolfgang Hirtl, MD, and Harald Rauch, 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*

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


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


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- 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.

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

James Li, MD

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. Isacca, MD, Greg A. Howells, MD, Frederick S. Jane, MD, Holly A. Bair, MSN, Phillip J. Bensick, PhD, and Randy J. Junczyk, MD

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

**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?
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

Serum lactate and base deficit as predictors of mortality and morbidity
Parah A. Hussain, M.D.*, Matthew J. Martin, M.D., Philip S. Malinin, M.D., Scott R. Steele, M.D., David C. Elliott, M.D.
Department of Surgery, Shriners Hospitals for Children, Portland, OR 97239, USA

"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.

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

Kevin M. Schueter, Kimberly A. Darias, Felix Y. Lau, Linda L. Maerz, and Lewis J. Kaplen

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


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


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

Table 2
Pre-determined blood product administration in massive transfusion in trauma victims. A sample protocol

<table>
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<th>Package no.</th>
<th>RBC units</th>
<th>FFP units</th>
<th>Platelets</th>
<th>Cryoprecipitate</th>
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</tr>
<tr>
<td>7</td>
<td>6</td>
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<td>10 units</td>
</tr>
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</table>

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
CXR and Abd XR: radiopaque FB in R abdomen

Surgeon driving in, OR activated

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

What is the goal BP for this patient while waiting for surgery?

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)

Rationale

- Thrombus dislodgement
- Coagulopathy
- Hypothermia
- Acidosis

Caution:

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

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 Morrisey, MD, MPE, Matthew M. Carrick, MD, Michael A. Gorman, MD, Bradford G. Scott, MD, Francis D. Wink, MD, Peter Tipt, MD, Kathleen E. Olive, MD, Matthew J. Wolfe, Jr., MD, and Kenneth L. Motto, 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


• 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?