Evaluation of Venous Thromboembolism Prophylaxis in Patients with Moderate to Severe Traumatic Brain Injury

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Background

- Traumatic brain injury (TBI) is a significant risk factor for venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE)
- The incidence of DVT in patients with TBI without VTE prophylaxis is reported as high as 54%
- Pharmacological prophylaxis is often delayed over concern for intracranial hemorrhage (ICH) expansion
- Evidence-based practice guidelines do not recommend an optimal prophylaxis treatment regimen
- Some evidence suggests that early initiation of pharmacological prophylaxis (≤ 72 h post-injury) reduces VTE and is safe if ICH is stable on repeat head computed tomography (CT)
- Currently, there is no standard of practice for prescribing pharmacological prophylaxis in patients with TBI at Royal Columbian Hospital (RCH)

Objectives

- Characterize the prescribing practices of pharmacological prophylaxis in patients with TBI admitted to the intensive care unit (ICU) at RCH
- Characterize the incidence of VTE and the incidence of ICH expansion

Methods

- **Design:** Retrospective chart review at a tertiary care trauma centre
- **Population:** Convenience sample of patients with moderate to severe TBI admitted to the ICU at RCH between April 1, 2015 and May 3, 2018
- **Inclusion:**
  - > 18 years of age
  - Diagnosis of TBI with ICH on initial head CT
  - Glasgow Coma Score (GCS) ≤ 12
- **Exclusion:**
  - Death or discharge from ICU within 48 h of injury
  - VTE on admission
  - Chronic anticoagulation use prior to admission
  - ICU admission > 24 h post-injury
- **Primary Outcomes:**
  - Proportion of patients that received pharmacological prophylaxis
  - Selection and timing of initiation of pharmacological prophylaxis
- **Secondary Outcomes:**
  - Proportion of patients with VTE (DVT and PE) and ICH expansion
    - Before and after pharmacological prophylaxis initiation
    - Early (≤ 72 h post-injury) and late (> 72 h post-injury) pharmacological prophylaxis initiation
- **Statistical Analysis:** Descriptive statistics

Figure 1: Patient Screening

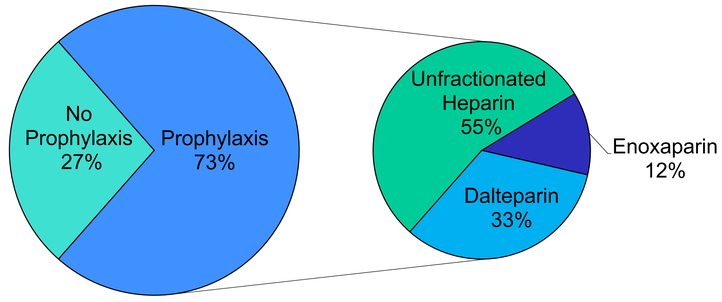
Results

Table 1: Patient Characteristics (n=125)

Male – no. (%)	92 (73.6)
Age (years) – median (range)	46 (19-90)
Hospital length of stay (days) – median (range)	23.1 (2.2-226.1)
ICU length of stay (days) – median (range)	6.9 (2-59.4)
Lowest GCS from injury to hospital – median (range)	4 (3-12)
Type of ICH on initial CT – no. (%)	
Subarachnoid hemorrhage	103 (82.4)
Subdural hematoma	83 (66.4)
Contusion	48 (38.4)
Intraventricular hemorrhage	31 (24.8)
Intracerebral hemorrhage	30 (24)
Epidural hematoma	18 (14.4)
No. of risk factors for ICH expansion* – median (range)	1 (0-4)
Patients with ≥ 1 risk factor for ICH expansion – no. (%)	105 (84)
No. of risk factors for VTE** – median (range)	2 (0-5)
Patients with ≥ 1 risk factor for VTE – no. (%)	118 (94.4)

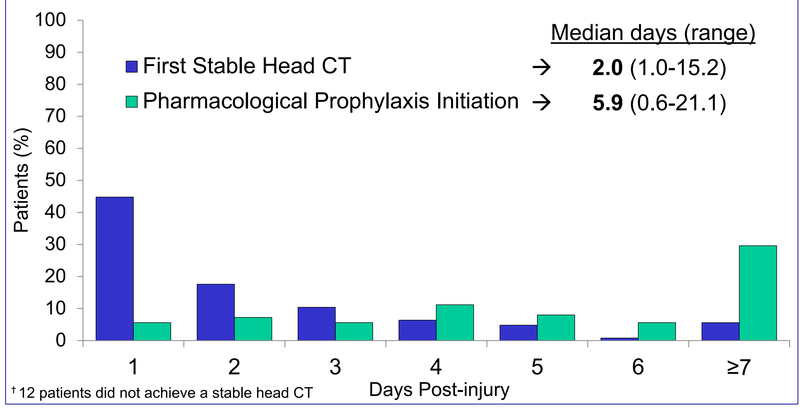
* ICH expansion risk factors: multiple sites of ICH, epidural or subdural hematoma > 8 mm, neurosurgical intervention
** VTE risk factors: age > 60 yrs, pelvic, lower extremity, or spinal fracture, GCS < 8, history of VTE, surgery, BMI >30 kg/m^2

Figure 2: Patients that Received Pharmacological Prophylaxis



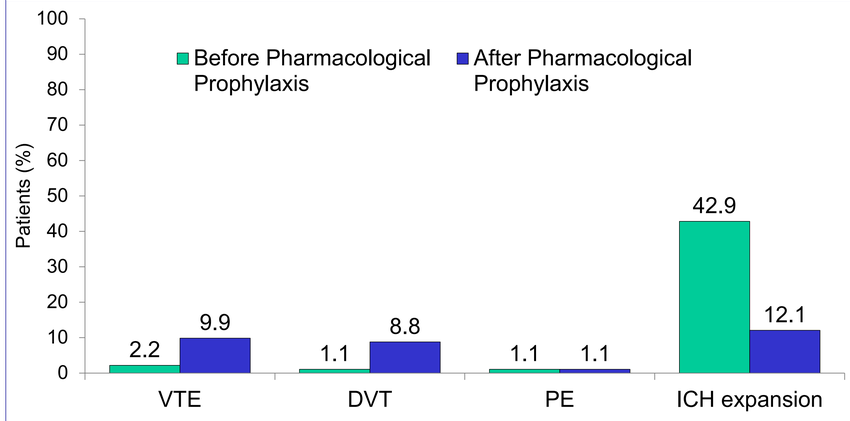
- 54% of patients had pharmacological prophylaxis initiated in the ICU
- 93% of patients received sequential compression devices

Figure 3: Timing of Pharmacological Prophylaxis Initiation (n=91) and First Stable Head CT (n=113)†



† 12 patients did not achieve a stable head CT

Figure 4: VTE and ICH Expansion in Patients that Received Prophylaxis (n=91)



Median timing of ICH expansion: 0.8 days (0.1-48.6)

Table 2: VTE and ICH Expansion by Timing of Pharmacological Prophylaxis

Outcome no. (%)	Early (≤ 72 h) (n=19)	Late (> 72 h) (n=72)	No Prophylaxis (n=34)	Total (n=125)
VTE	6 (31.6)	5 (6.9)	3 (8.8)	14 (11.2)
DVT	5 (26.3)	4 (5.6)	1 (2.9)	10 (8)
PE	1 (5.3)	1 (1.4)	2 (5.9)	4 (3.2)
ICH expansion	10 (52.6)	37 (51.4)	21 (61.8)	68 (54.4)

Limitations

- Repeat head CT and imaging for VTE ordered at discretion of treating physician
- More patients at higher risk for VTE received pharmacological prophylaxis early
- More patients at higher risk for ICH expansion received pharmacological prophylaxis late or not at all

Conclusions

- 73% of patients received pharmacological prophylaxis, with 54% initiated in ICU
- The median timing of ICH expansion, first stable head CT, and pharmacological prophylaxis initiation was 0.8, 2, and 5.9 days, respectively
- The overall incidence of VTE was 11.2% and ICH expansion was 54.4%
- Of the patients who received prophylaxis, 42.9% had ICH expansion before and 12.1% had ICH expansion after pharmacological prophylaxis initiation
- Preliminary findings suggest pharmacological prophylaxis may be safely initiated earlier than current practice
- Further research is needed to optimize pharmacological prophylaxis in this population