

Prevalence of Venous Thromboembolism in Trauma Patients in a Private Tertiary Care Hospital

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Abstract

OBJECTIVES: To study the prevalence of venous thromboembolism (VTE) in trauma patients receiving inpatient care at Bangkok Hospital Headquarters (BHQ).

MATERIAL AND METHODS: A retrospective observational study in adult trauma patients (age ≥ 15 years) admitted at BHQ from 2016 to 2018. The collected data were diagnosis of VTE, gender, age, ethnicity, VTE risk score, Injury Severity Score (ISS), the onset of VTE, and patient care modalities including operative or non-operative management, need for intensive care and need for ventilator support.

RESULT: A total of 2,548 trauma patients were admitted at BHQ from January 1, 2016 to December 31, 2018. Thirty-one patients developed VTE (1.22%), 29 cases had deep vein thrombosis (DVT) and 2 cases had DVT with pulmonary embolism (PE). There were twenty-one male patients and ten female patients in the VTE group. Fifteen patients in the VTE group were older than 65 years (48%). The prevalence of VTE was 0.54% in Thai patients, and 2.43% in non-Thai patients. Twenty-nine patients in the VTE group had high VTE risk. Four patients had diagnosis of VTE prior to admission at BHQ and 13 cases had been diagnosed within 48 hours of admission. The patients with higher severity of injury (higher ISS) had higher risk for VTE ($p < 0.001$). Twenty-four cases in the VTE group needed surgical management. Seventeen cases required intensive care and 7 cases needed ventilator support, not related to the presence of PE. Six patients developed VTE despite prevention.

CONCLUSION: The prevalence of VTE in adult trauma patients in BHQ is 1.22%. A significant association between VTE and the severity of injury suggests that we should pay attention to this specific groups of patients for early VTE prophylaxis and detection.

Keywords: trauma, venous thromboembolism, deep vein thrombosis, pulmonary embolism

Venous thromboembolism (VTE) is not uncommon in trauma patients, as a population-based research study reported that the mechanism of trauma increased the odds of VTE 12.6 fold.¹ More recent studies showed a significantly lowered incidence of VTE. The National Trauma Data Bank (NTDB) between 2008-2014 reported that 1.0% of trauma patients in the USA were diagnosed with VTE, and the German Society for Trauma Surgery reported a 1.8% overall incidence rate of clinically apparent VTE during post-traumatic hospitalization in 2010.^{2,3} In Thailand, a Level 1 Trauma Center reported the 28.9% adherence to the current VTE prophylaxis guideline with 2.8% occurrence of VTE.⁴ This study aimed to survey the prevalence of VTE in trauma patients in a private tertiary care hospital in Thailand to provide basic information for patient safety and performance improvement.

Material and Methods

This is a retrospective observational study from 2016 to 2018 in Bangkok Hospital Headquarters (BHQ), a private tertiary care hospital receiving an average of 700-1,000 trauma admissions per year, of these, 15% or 100-150 cases were major trauma. The data of adult trauma patients (age ≥ 15 years) in trauma registry of BHQ was reviewed for diagnosis of VTE during hospitalization, gender, age, ethnicity, VTE risk score, Injury Severity Score (ISS), the onset of VTE, and patient care modality including operative or non-operative management, need for intensive care and ventilator support.

All patients in VTE group received standard treatment for VTE. Trauma patients were followed up until discharge from the hospital or death.

Definition / Protocol

Screening and diagnosis of DVT were confirmed by duplex ultrasonography examined by radiologist. Diagnosis of PE was confirmed by the computerized tomography of pulmonary artery (CTPA) interpreted by radiologist.

VTE risk score was calculated, using the Caprini risk assessment model.⁵ Physicians and nurses taking care of trauma patients used the checklist to assess and calculate the score. High VTE risk was identified by a score of 3 points or more, and the low risk group was scored 0-2 points. Patients in the high VTE risk group were eligible to receive VTE prophylaxis.

Injury severity score (ISS) is a trauma scoring system to assess trauma severity. It correlates with mortality, morbidity and hospitalization time. The higher the ISS, the higher mortality and morbidity. Calculation of ISS is based on the severity code of the Abbreviated Injury Scale (AIS), an anatomically based severity scoring system. The ISS scores range from 3 to 75. Major trauma is defined as the ISS being greater than 15.⁶ Onset of VTE was counted from the day of admission to the day of VTE diagnosis.

End points

The primary endpoint is the prevalence of VTE in adult trauma patients treated as inpatient at BHQ. The secondary endpoint is the correlation between VTE, patient demography and severity of injury.

Results

There were 2,548 adult trauma patients in the 3-year period. The VTE events occurred in 31 patients. 29 cases had deep vein thrombosis (DVT) and 2 cases had DVT with pulmonary embolism (PE). The overall prevalence of VTE was 1.22%. 21 were male and 10 were female. Fifteen patients older than 65 had VTE (48%). Four patients had been diagnosed for VTE prior to admission, 27 patients had been diagnosed with VTE after admission at BHQ. 13 patients were diagnosed within 48 hours after admission. 29 patients had high VTE risk by Caprini score. Fourteen patients were major and severe trauma (ISS \geq 15). Twenty-nine patients had extremities injury, and 16 patients had multiple injuries. Twenty-four patients required operative treatment. Seventeen patients needed intensive care. There were seven patients who need ventilator support, none of the respiratory problems were related to VTE. From 27 patients for whom VTE had been diagnosed after admission, 6 patients in this group received VTE prevention by intermittent pneumatic compression or pharmacoprophylaxis by low molecular weight heparin.

Table 1 : Demographics (n = 2548)

Data	Total cases (n = 2,548) ; n (%)	VTE cases (n = 31) ; n (%)
Gender		
Male	1,357 (53.26)	21 (67.7)
Female	1,191 (46.74)	10 (32.3)
Ethnicity		
Thai	1,733 (68)	10 (32.3)
Non-Thai	815 (31.98)	21 (67.7)
Age group		
15 - 64	1,668 (65.46)	16 (51.6)
\geq 65	880 (34.54)	15 (48.4)
Injury Severity Score (ISS)		
1 - 8	1,559	6 (0.38)
9 - 15	789	11 (1.39)
16 - 24	193	7 (3.62)
> 24	167	7 (4.19)

Discussion

Blood clot formation in the deep venous system of legs or deep vein thrombosis (DVT) is the common form of VTE. Blood clot in the pulmonary artery or pulmonary embolism (PE) is a rare but more serious form of VTE. Massive PE can be fatal as it blocks blood flow to the lungs, resulting in poor gas exchange and hemodynamic instability. In an earlier report by Geert WH et al in 1992, trauma patients have a 58% risk of distal DVT (below the knee) and an 18% risk of proximal DVT (above the knee).⁷ Half of the patients who present with a proximal DVT will develop PE, and of those, 2%–3% will die as a consequence of the PE.^{8,9} The long term consequence of DVT is post-thrombotic syndrome (PTS). The affected patients suffer from disability caused by chronic leg swelling and chronic venous leg ulcers developed in 20 to 50% of patients with DVT.¹⁰ The guidelines for VTE prevention in trauma patients have been developed and widely implemented to reduce VTE, its related mortality, and long-term disability.¹¹ The prevalence and prevention of VTE are important quality indicators in trauma care.

This is the first study of VTE in trauma patients in a private tertiary care hospital in Thailand, which provides an insight into the actual risk and need for proper management of this preventable complication.

The prevalence of VTE in all trauma patients at BHQ was 1.22%, which was comparable to the international reports, 1% from the NTDB and 1.8% from the German Society for Trauma Surgery.

VTE prevalence had a statistically significant relation with the injury severity score ($p < 0.001$). The prevalence of VTE in less severe trauma patients (ISS $<$ 15) was 0.72%, while the prevalence of VTE in major trauma patients (ISS $>$ 15) increased more than fivefold to 3.9%.

Other factors were reported to affect VTE risk, such as gender, age, ethnicity, and region of injury.¹²⁻¹⁷ A higher prevalence of VTE was also observed in certain groups of patients in this study which were male, age > 65 years, non-Thai ethnicity, high VTE risk, extremities injury and those who required operative management. Special attention for VTE surveillance and prevention should be considered in these groups and especially patients with high ISS.

More than half of all VTE had been diagnosed within 48 hours after admission. This evidence indicates that VTE surveillance and prophylaxis measures should be started early within this period.

The occurrence of VTE in 6 patients who received VTE prevention should alert all caretakers that the high VTE risk group receiving VTE prophylaxis is not without risk.¹⁸ A high

index of suspicion should be maintained with regular reassessment for early detection of VTE, even after preventive measures have been started.

Limitations in this observational study include the small number of patients in VTE group, subject to inherent biases including unmeasured confounding, selection, and ascertainment bias.

Conclusion

The prevalence of VTE in adult trauma patients in BHQ is 1.22%, comparable to the recent international reports. A significant association between VTE and the severity of injury suggests that we should pay attention to these specific groups of patients for early VTE prophylaxis and detection.

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