What’s New in Emergencies, Trauma and Shock?

Trauma-associated Venous Thromboembolism: A Potentially Preventable Cause of Morbidity and Mortality

Trauma patients are known to be at increased risk of venous thromboembolism (VTE), which comprises deep venous thrombosis (DVT) and pulmonary embolism (PE). VTE poses significantly increased risk of morbidity and mortality following traumatic injury.

Despite the widespread use of VTE prophylaxis protocols, the incidence of DVT and PE are reported as high as 44% and 24%, respectively, during posttrauma hospitalization in high-risk patients. However, various studies have shown a lot of variation in the incidence of VTE posttrauma. These variations reflect differences in study designs (whether all patients undergo screening protocols or just the symptomatic patients; second the modalities used for screening differ across studies) and the risk and demographic profile of the study populations (e.g., all surgical patients, or only the orthopedic elective patients, or only those with spontaneous VTE).

In the index article by Strandvik et al. from Qatar published in JETS, the authors have retrospectively analyzed the medical records of all adult (>15 years) trauma patients who were diagnosed with VTE, as per the radiology information system of a leading tertiary care hospital in Qatar, over nearly 5 years. The study results carry a great significance since trauma remains a leading public health problem in the Arabian Middle East population, and particularly in Qatar, which is witnessing an exponential population growth. VTE significantly increases trauma-associated morbidity, mortality, and treatment costs.

A total of 84 patients had trauma-associated VTE, which included 56 (66.7%) DVT patients and 28 (33.3%) PE patients. The overall incidence of trauma-associated VTE was 1.9% since the total number of patients admitted under the trauma service during the study period was 4356. The authors have elaborated on the clinical characteristics, risk factors, treatment practices, and in-hospital outcomes of trauma-associated VTE patients, and they have compared patients who developed DVT with those who developed PE. Such a comparison is essential since it is speculated that posttraumatic DVT and PE are distinct clinical events whereby PE can develop de novo within the pulmonary arterial bed without an associated DVT. Interestingly, DVT was more common among outpatients, while PE was more common in inpatients. This is likely due to the fact that the hospital did not follow routine duplex screening protocol for all high-risk patients with trauma, and in many of the patients, either the patient was asymptomatic for DVT or the symptoms of DVT would have been masked by the injury itself. The present study included only those patients who had radiological evidence of VTE retrospectively. Incidence would definitely had been higher if routine duplex screening had been implemented for all high-risk patients. Recent studies have shown the benefit of such a screening protocol, especially because previous DVT is a risk factor for VTE following surgery/trauma, and informing the patient about the presence of an asymptomatic DVT that occurred during their trauma admission would be useful in providing appropriate prophylaxis. However, whether this approach is cost-effective or not, needs further evaluation.

Another important finding from this study is the significance of hereditary thrombophilia (HT), a known risk factor for provoked and unprovoked VTE, which may be a factor in posttraumatic VTE as well. Previous studies evaluating the first episode VTE in the general population have found higher incidences of HT when compared to VTE in posttrauma patients. In the present study, hyperhomocysteinemia (7.1%), deficiency of protein C (8.3%), protein S (6.0%), and antithrombin III (4.8%) were the most commonly seen HT disorders. The present study identified a significant association between protein S deficiency and the development of PE. However, whether the routine use of screening for HT in posttraumatic patients is beneficial and cost-effective remains to be seen in larger prospective studies. Nevertheless, the information on HT status of trauma patients may be helpful to decide their future care in circumstances that predispose them to a higher risk of VTE, such as repeat trauma and elective surgery.

The authors have rightly pointed out their limitation of not mentioning the severity, site, and nature of trauma as all these have serious implications on the chances of VTE development. Brakenridge et al., in their study of 1822 posttraumatic patients, have shown that the site and severity of the injury does matter. Severe thoracic trauma has shown to be significantly associated with the risk of development of PE. Similarly, pelvic and long bone fractures are associated with a heightened risk of VTE.

In the present study, patients diagnosed with PE were more likely to have a history of surgery after 24 h, (51.9% vs. 28.6%; $P = 0.03$), bedridden status (25.0% vs. 8.9%; $P = 0.04$), and a prior PE (7.4% vs. 0.0%; $P = 0.03$) as compared to those with DVT. However, no mention of duration between the infliction of trauma and onset of VTE was made. More importantly, no mention was made regarding the use of prophylactic anticoagulation in patients who ultimately developed VTE. This has an important implication since the timely initiation
of prophylactic anticoagulants has been documented to reduce the occurrence of VTE.\(^1\) It is also important while assessing the risk factors for the development of DVT and PE separately. Since treatment methods are the same for both DVT and PE, we believe that PE risk is affected by initial DVT risk in three possible ways. First, patients who are believed to be at significantly higher risk for DVT receive prophylactic anticoagulation, which eventually reduces the risk for developing PE. Second, severe trauma patients with high-risk factors are prone to manifest a DVT early and experience a lower risk of subsequent PE after receiving therapeutic anticoagulation therapy. Finally, in patients with less severe injuries, the overall VTE risk may be incorrectly estimated, and therefore a consequent delay in the use of thromboprophylaxis could result in PE. Therefore, it might be essential to consider less-injured patients for more aggressive screening and thromboprophylaxis if found positive.\(^1\)

The mortality among VTE patients was around 8% in the present study. Future large prospective studies are warranted to address the predictors of mortality in trauma-associated VTE. Identifying these risk predictors will ensure appropriate management plans to reduce mortality. Further data need to be collected regarding the risk factors of trauma-associated VTE and the risk factors of bleeding secondary to anticoagulation in these patients, to ensure their optimal management.

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