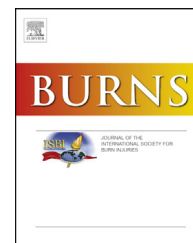


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Venous thromboembolism in burn patients is not prevented by chemoprophylaxis

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ABSTRACT

Background: Venous thromboembolisms (VTE) including deep venous thrombosis and pulmonary embolism are serious complications following burn trauma. There are inconsistencies in the literature regarding thromboembolic prevention strategies and data suggests that complications occur despite chemoprophylaxis.

Objective: To determine the prevalence of deep venous thromboembolism and pulmonary embolism in burn patients who are actively being treated with VTE prophylaxis and to determine factors that help predict which anti-coagulated patients are at risk for VTE and may benefit from further treatment.

Materials and methods: Retrospective analysis of burn data registry and patient Charts 1980–2012.

Results: Out of 1549 burn patients in the registry fifty patients (3.2%) had a VTE but charts were only available for 26 of these for further analysis. Of these, 12 patients (46%) had a VTE while on chemoprophylaxis and 14 (54%) without chemoprophylaxis. There were no differences between groups, but 90% of DVT complications occurred to Caucasian patients and none to Asians. The VTE group had significantly higher rate of inhalation injury, higher TBSA, longer hospital stay and ICU stay than matched controls.

Conclusions: Chemoprophylaxis does not prevent VTEs. Burn severity predisposes to venous thromboembolic complications.

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1. Background and rationale

Prevention of venous thromboembolism (VTE), including deep venous thrombosis (DVT) and pulmonary embolism (PE), has been increasingly studied in burn patients over the last five years. According to the American College of Chest Physicians (ACCP), burn patients are placed in the highest-risk category for VTE, along with major trauma, due to the presence of a profound systemic hypercoagulable state, prolonged bed rest, performance of repeated surgical procedures, femoral venous catheter insertion and recurrent bouts of sepsis [1]. A recent systematic review of the economic burden of VTE found an annual median total healthcare cost for patients with an isolated DVT or PE in the US to be \$15,843 [2].

Overall reported incidence of thrombotic complications in burn patients ranges from 0.25% to 7.0% in retrospective

studies [1,3]. When undertaking universal diagnostic ultrasound to screen burn patients the risk is reported as high as 23% [1,4]. The incidence of VTE in US burn patients is reported as 0.6%. This incidence increases to 1.2% when patients undergo management in the intensive care unit (ICU) or have a total body surface area (TBSA) burn greater than 10%. TBSA burns reaching 50% or greater had the highest incidence of VTE at 2.4% [5]. According to a study using the American Burn Association's National Burn Repository, independent risk factors for VTE in burn patients included TBSA burned, number of days spent in ICU, number of operations, central venous access, increased age, obesity, burn wound infection, and transfusion of more than 4 units of packed red blood cells [6]. These complications result in significant morbidity and mortality for burn patients with the majority of PE deaths occurring within hours of diagnosis; many as a result of

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unrecognized DVT [6]. Despite the availability and use of preventative agents, many patients continue to acquire these complications.

In addition to exhibiting all components of Virchow agents, many patients continue to acquire these complications. The occurring central venous catheters further aggravating endothelial damage, and activation of both fibrinolytic and thrombotic pathways [7]. The ACCP determined the following summarized list of potential risk factors for VTE in burn patients taking into account both burn and physical trauma associated with burn patients: advanced age, morbid obesity, extensive or lower extremity burns, concomitant lower extremity trauma, use of CVCs, presence of wound infections and prolonged immobility [1].

There has been some recommendation for screening asymptomatic high-risk patients for DVT using diagnostic ultrasound (DUS) after prospective studies found a DVT rate of 6-27% [1]. Unfortunately, the low sensitivity of DUS for detecting asymptomatic DVT as well as its unlikely prevention of PE have made it impractical. Additionally, at least 25% of trauma patients have suboptimal scans due to local injuries, dressings, casts, pain and poor patient cooperation. Other diagnostic modalities such as CT and MRI have high false-positive rates for DVT [1]. Lastly, preventive inferior vena cava filter (IVCF) insertion is extremely expensive and PEE to local injuries, dressings shown to occur despite them; thus these continue to be recommended only in patients with proven proximal DVT and either an absolute contraindication to full-dose anticoagulation therapy or planned major surgery [1].

DVT prophylaxis in trauma patients was first recommended 60 years ago but few randomized controlled trials have been executed and none specifically for burn trauma [1].

A systematic review of heparin to treat burn found only 9 studies with appropriate data to be included, and of these, many of the studies were of poor methodological quality (inadequate definitions of treatment and outcomes and no control for confounding factors) [8]. A survey done Canada showed no consistent prophylaxis or treatment algorithm between burn centers [7]. Also, approximately half of burn centers routinely administered either UH or LMWH for thromboprophylaxis to all admitted burn patients regardless of their risk factors. These medications are then continued until discharge [7]. Some centers administered VTE prophylaxis only if additional risk factors existed and only until patients began mobilizing [7].

In addition to limited research on effectiveness, there is also limited research on complications from these medications. The most commonly used anticoagulants are unfractionated (UH) and low molecular weight heparin (LMWH). Among a prospective trial of 625 burn patients treated with heparin, the incidence of Heparin-Induced Thrombocytopenia (HIT) was 2.3% [4].

Multiple risk assessment tools, including the Well's multiple risk assessment tools, including the Well's risk factors existed which patients received prophylaxis and by which method [10]. Unfortunately, their applicability in burn care is unknown, and specific recommendations as to what type of prophylaxis is beneficial is lacking.

There are currently no universal guidelines for VTE prophylaxis in burn patients and limited research on the complications of medications given. Additionally, despite VTE

chemoprophylaxis it has been noted that some burn patients continue to acquire a DVT or PE. A literature search using Meshed headings and keywords about the incidence and factors associated with VTE in patients being actively treated with thromboprophylaxis revealed no results. The number of burn patients who are being actively treated with VTE prophylaxis and acquire a VTE may be significant. Thus, this retrospective study will help to find which patients are at risk of VTE despite prophylaxis and what additional measures may be of benefit to prevent these complications.

1.1. Objectives

1. Determine the prevalence of DVT and PE in burn patients who are actively being treated with VTE prophylaxis in a Provincial Burn Center.
2. Determine factors that help predict which anti-coagulated patients are at risk for VTE and may benefit from further treatment.

2. Methods

Patients with VTE complications were drawn from the Provincial Burn Registry between 1980-2012. Fifty patients were identified but only 26 charts were available for analysis due to hospital records policy on destruction of old chart. These charts were separated into groups based on the presence of chemoprophylaxis at the time of VTE. A control group of patients on chemoprophylaxis without VTE complications was drawn randomly from the registry. Thirty-three patients were selected from this group, matched for age, gender and comorbidities.

Analysis involved 2 groups. First, patients who had a VTE while on prophylaxis were compared to those who had a VTE without prophylaxis (Part I). Secondly, those who had a VTE while on prophylaxis were compared to the control group of patients who were on prophylaxis and did not acquire a VTE (Part II).

Data collected included demographics, burn etiology, burn surface area, presence of inhalation injury, length of hospitalization including ICU days and number of operative procedures, other risk factors such as smoking, alcohol use and drug use, type of VTE, type of prophylaxis, and treatment response.

Statistical analysis is quantitative with basic statistics used where appropriate (e.g. mean, standard deviation and confidence intervals).

3. Results

Most VTE complications occurred in men (>70%). For patients who had a VTE occurrence while not on prophylaxis, 5 had inhalational injuries, and 13 had infection (including 5 wound infections, 3 pneumonias, and 4 urinary tract infections). The group on prophylaxis had similar factors including 6 patients with inhalational injuries and 14 patients contracting infections (6 wound infections, 3 pneumonias, 2 urinary tract infections, and 3 with sepsis unspecified).

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