

Reports on vascular catheter-associated thromboembolic events in a burn unit – a gap in the literature?

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Summary

Indwelling intravascular catheters are important tools in the care of critically ill patients; however, they have an inherent risk of infection or thromboembolic events. Reports on catheter associated thromboembolic events in burn units are rare, despite being well recognized that burn patients bear an increased baseline risk for thromboembolic events. We describe two catheter-associated thromboembolic complications in burn patients in a burn unit and the morbidity associated with these events. Patients with endovascular catheters in burn units may be at increased risk for severe thromboembolic events associated with intravascular catheters, but specific guidelines for prevention and management of these patients are still missing.

Key words

burn unit – endovascular catheter – arterial thrombosis – venous thrombosis

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Introduction

Endovascular catheter insertion is a common practice in intensive care units (ICU) for fluid resuscitation, drug administration, blood sampling, and hemodynamic monitoring [1]. However, endovascular manipulation associated with catheter placement has an inherent risk, amongst others, of thromboembolic events [2].

Patients admitted to burn units are no exception and may offer several challenges regarding indwelling catheter placement. Depending on the location and extent of the burn, most commonly used anatomic locations may be unavailable [3] and, more importantly, burn patients are known to have an increased risk for thromboembolic events that mirrors the severity of the burn injury [4].

There are several papers in literature that report catheter-associated thromboembolic events in cancer [5–9] and pediatric patients [2,10–12], but reports on adult patients with severe burns admitted to burn units are rare. Herein we describe two cases of catheter-associated thromboembolic events in two patients admitted to the Burn Unit in our department and discuss the management and outcomes of these patients.

Cases description

In the past 5 years, two catheter-associated thromboembolic events were reported in two patients admitted to the Burn Unit at our department. During that time-lapse, a total of 325 patients were treated in that facility, accounting for an event occurrence rate of 0.6%.

Case 1

A 38-year-old, otherwise healthy, male patient was admitted to the Burn Unit in our institution with 2nd and 3rd degree burns accounting for a total body surface area (TBSA) of 63% caused by a wildfire and associated inhalation injury. He had prolonged hospital stay during which he underwent several debridement and skin graft procedures. Of note, prophylactic enoxaparin 0.5 mg/kg/day was started upon admission.

After approximately 4 months in the burn unit, he developed unilateral cervical and facial edema, and an internal jugular vein (IJV) thrombosis was suspected. He had a history of two central venous catheter (CVC) placements in his left IJV, three- and one-month before the onset of these clinical signs. Ultrasound doppler showed an occlusive

thrombus in the left IJV extending to the left subclavian vein. Hypocoagulation with enoxaparin 1 mg/kg BID was started and the clinical signs subsided after a few days. This hypocoagulation regimen was maintained for 3 months. The patient was discharged to a rehabilitation center after 8 months and no other thromboembolic events were reported after 2 years of follow-up.

Case 2

A 43-year-old female patient was admitted to our Burn Unit with a TBSA of 42%, 3rd degree burns, caused by fire. Inhalation injury was identified as well. She had a past medical history of type II diabetes mellitus, hypertension, and being overweight. Prophylactic enoxaparin 0.5 mg/kg/day was started upon admission.

After 2 days of hospital stay, a cyanotic right foot was noticed, and the arterial catheter placed in her right femoral artery upon admission was immediately removed. Angio-CT scan showed occlusion of the right external iliac artery extending distally to the popliteal artery. Thrombolysis protocol was initiated with alteplase 1 mg followed by continuous perfusion with 0.5 mg/hr in a 1 mg/10 mL dilution with normal saline. Unfractionated heparin perfusion through the arterial sheath was initiated at a rate of 500 U/hr. However, the patient progressed to irreversible ischemia and a mid-thigh amputation was performed. Hypocoagulation with unfractionated heparin was initiated for a target partial thromboplastin time of 60 sec. After this event, the patient underwent serial debridement and skin grafting procedures for burn management; however, after 2 months, she developed multiorgan failure due to generalized sepsis resulting in her death.

Discussion

Catheter-associated thromboembolic events in burn patients are sparsely described in literature, though they can

bear a significant comorbid burden to these patients. In a study from Barrett et al. [13], complications of the hypercoagulable state in burn patients were analyzed. He found a 20% mortality rate in burn patients who had a thrombotic event compared to an overall mortality rate of 0.06%, and these events were responsible for 3.4% of all deaths. Thrombotic events in burn patients might have prognostic value; however, there are no available data if this stands true when only catheter-associated thromboembolic events are considered.

Regarding venous thromboembolism, incidence of CVC-associated thromboembolic events ranges from 5% for symptomatic events [14] to 14–18% when all events are considered [15]. Nonetheless, it is yet to be determined if this incidence is affected in the context of extensive burns, as well as the relative risk for a given percentage of TBSA. Al Harbi et al. recently described a case of recurrent pulmonary embolism in a burn patient despite standard chemoprophylaxis [16]. In his paper, the thromboembolic events were spontaneous without apparent correlation with endovascular catheter placement.

Relative to arterial catheter-associated occlusive events, percutaneous femoral artery cannulation has been generally considered to be a safe procedure, with few serious complications [17]. In 1996, Riker et al. reported 976 femoral cannulations in burn unit patients leading to three events of permanent ischemic damage [18]. Interestingly, this is the only study in adults reporting irreversible limb ischemic events associated with arterial cannulation.

It is well recognized that extensive burns lead to systemic inflammatory response syndrome and to an immunosuppression status designated counter inflammatory response syndrome [13]. These phenomena predispose the patient to a thrombogenic, and hypercoagulable state seen in burn patients. Nevertheless, it remains largely unknown

to what extent these disorders interact with the catheter-tip microenvironment in patients with extensive burns. In other words, how many catheter-associated thromboembolic events could be attributable to the post-burn status contribution. Knowledge in this field would be of interest in defining therapeutic targets for both CVC and arterial catheter thrombotic event prevention.

Patients with endovascular catheters in burn units may represent a special population for severe and treatment-refractory thromboembolic events associated with intravascular catheters. Unfortunately, there are no specific guidelines for prophylaxis in burn patients [16].

However, it would be useful to have a prospective study to identify if catheter-associated thromboembolic events in burn unit patients have increased incidence or severity, compared with paired non-burned patients in other ICUs. This knowledge would be important to help stratify risk and eventually modify preventive protocols in higher risk burn patients.

Role of authors

All authors have been actively involved in the planning, preparation, analysis and interpretation of the findings, and enactment and processing of the article with the same contribution.

Conflicts of interest and source of funding:

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