

Commentary

Venous thromboembolism deserves your attention

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Abstract

The survey of how Canadian intensive care units (ICUs) prevent and diagnose venous thromboembolism (VTE) presented in this issue of *Critical Care* illustrates considerable variability. Lack of optimal patient care reflects how VTE is rated in ICUs. The discussion should no longer focus on the incidence of thrombosis, but rather on its prevention. Unfractionated heparin remains the most commonly used agent to prevent VTE, despite the recognized efficacy and safety of low-molecular-weight heparins (LMWHs) in the ICU setting. In addition, too few ICU directors consider the use of mechanical prophylactic measures, such as graded elastic stockings and venous foot pump. The present situation calls for large randomized controlled trials in either medical or surgical ICU patients, and for new education programmes in order to modify the care of ICU patients with regard to VTE.

Keywords compression, intensive care unit, low-molecular-weight heparin, thromboembolism

Deep vein thrombosis (DVT) remains an underestimated problem in ICU patients, despite the findings of many randomized controlled trials performed in the field of DVT prophylaxis after surgery during the past few decades [1,2]. Several consensus statements have been reported [3–5] that summarize the conclusions of those studies. The Canadian survey reported in the present issue of *Critical Care* (page 336) provides a useful snapshot of daily clinical practice in Canada with regard to DVT prophylaxis [6]. It strongly suggests that studies dedicated to DVT prophylaxis in ICU patients should be performed in order to develop useful recommendations. Furthermore, a great effort would have to be made to educate physicians regarding both DVT screening and pharmacological aspects.

A difficult diagnosis

Clinicians should be aware that DVT in ICU patients has unusual characteristics that make its clinical diagnosis difficult. Physical examination is rarely helpful because DVT is generally asymptomatic. This was demonstrated in the study of Geerts *et al.* [7], in which the clinical signs of DVT (e.g. oedema, pain and flushing) occurred in less than 1.5% of patients. As a result, physicians are often lulled into an

inappropriate sense of security. Moreover, the diagnosis is not always easy to confirm. The insensitivity of Doppler ultrasound and the major difficulty in performing venography in ICU patients generally lead to blind anticoagulant prophylaxis. Even when a pulmonary embolism leads to death, diagnosis is often difficult to confirm in a patient who has already been treated and ventilated for a pulmonary condition because autopsies are rarely conducted in trauma victims. As stated at the most recent American College of Chest Physicians Consensus Conference [5], however, trauma patients represent a group that is at very high risk for DVT. The discussion should therefore no longer focus on the incidence of thrombosis, but rather on the different methods of prevention that could be used.

Traditional and advanced compression techniques

Graded elastic stockings do not provide adequate prophylaxis in high-risk patients [5,8,9]. Most of the Canadian respondents in the survey appear to be aware of this, which would explain why up to 34% of ICU directors do not consider mechanical prophylaxis at all. It has been strongly suggested, however, that elastic stockings should be

combined with LMWH [3–5]. Combining noninvasive with pharmacological prophylaxis has been shown to be beneficial [3], and should therefore be encouraged. It is also cost-effective and easy to use.

In order to improve the benefit from such combinations of mechanical and pharmacological measures, new mechanical devices for DVT prophylaxis are being developed. Classic intermittent pneumatic compression devices applied directly to the entire leg are often difficult to use because of fractures, immobilization with plaster casts, or external fixation instruments. With a venous foot pump these difficulties are eliminated. The foot pump is designed to overcome the venous stasis that is associated with surgery. It flattens the metatarsal arch, emptying the venous plexus (30 ml blood) and thus reproducing the effect of normal weight-bearing. The efficacy of the foot pump has already been demonstrated in level II and III studies.

A recent large, prospective, randomized study conducted in 274 patients with total hip replacement [10] compared the safety and effectiveness of the foot pump with those of LMWH prophylaxis. That study showed no significant difference between the two methods; DVT was detected in 24 (18%) patients randomized to foot pump prophylaxis as compared with 18 patients (13%) randomized to receive the LMWH enoxaparin. There was no difference in the transfusion requirements or intraoperative blood losses between the two groups. This new method could be helpful in trauma, neurological, or neurosurgical patients when anticoagulants are contraindicated.

In summary, mechanical prophylaxis should systematically be used alone or in combination with pharmacological prophylaxis in ICU patients.

Unfractionated versus low-molecular-weight heparin

Although unfractionated heparin (5000 IU administered subcutaneously two or three times per day) is used extensively in the Canadian centres, there is considerable evidence [2–5,11,12] that these small doses of heparin are relatively ineffective in comparison with doses used in orthopaedic surgery. In the literature, selection of unfractionated heparin was supported by DVT detection methods, such as echography and Duplex scanning. These methods are unacceptable because of their low sensitivity in asymptomatic patients, especially in the ICU. Administration of LMWH has been shown to result in significantly better results.

In 1996, Geerts *et al.* [13] showed that 30 mg enoxaparin given twice daily exhibited superior antithrombotic efficacy as compared with subcutaneous heparin 5000 IU twice daily. The overall venographic DVT rate was reduced from 44 to 31%, and the proximal DVT rate from 15 to 6% in patients receiving heparin and enoxaparin, respectively. Since then,

only one relevant study has been reported, which compared LMWH with placebo in ICU patients [14]. In that study, nadroparin was able to decrease the DVT rate significantly, but no direct comparison between LMWH and unfractionated heparin was undertaken.

Although there is still insufficient data in the ICU setting, the large amount of data gathered by surgical trials should allow extrapolation. LMWH appears to be effective and safe postoperatively, and hence should probably be recommended in ICU patients except when renal function is impaired and in very old patients [15,16]. The optimal duration of treatment has not been defined, but it appears reasonable to suggest that prophylaxis with LMWH should be continued for as long as risk factors are present, such as inflammation, sepsis and immobilization.

New compounds such as recombinant hirudin [17] and pentasaccharide [18] should be evaluated in these very high risk patients because those agents have exhibited high efficacy in preventing DVT after total hip replacement surgery. They may be particularly useful in those settings in which thrombotic risk rapidly exceeds haemorrhagic risk. Oral anticoagulants cannot be recommended in trauma patients because some have to undergo multiple surgical procedures. In addition, interactions between vitamin K antagonists and other drugs used in this setting may be hazardous.

Conclusion

Thrombotic complications (DVT, pulmonary emboli) are a major concern in ICU patients and still occur in a significant number of patients. Antithrombotic agents, and LMWH in particular, should be considered in a systematic manner, except for those cases in which they are contraindicated. The optimal dosage for prophylaxis with LMWH is not well defined. Pharmacological prophylaxis should always be combined with mechanical prophylaxis. Large randomized controlled trials are needed to confirm these recommendations. Finally, educational programmes should be implemented that include epidemiological and therapeutic aspects of VTE prevention.

Competing interests

None declared.

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