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CORRESPONDENCE

Renal function in the ICU: always look both ways before initiating venous thromboprophylaxis

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In a recent issue of Intensive Care Medicine, Helms et al. [1] highlighted the high risk of thrombotic events in critically ill patients, the importance of pharmacological thromboprophylaxis at the time of admission to the intensive care unit (ICU) and the superior efficacy of low-molecular-weight heparin (LMWH) when compared to unfractionated heparin (UFH). Accordingly, European guidelines recommend pharmacological prophylaxis with LMWH over UFH. For patients with renal failure, it is recommended the use of UFH, dalteparin or reduced doses of enoxaparin complemented by monitoring anti-X_a activity [2].

While the authors recognize the importance of adjusting pharmacological thromboprophylaxis dosing to patient's renal function, they address only severely reduced function. Clinicians are used to looking at renal function only through two dimensions: normal or decreased performance. However, there is a full spectrum of renal function that needs to be addressed and seen as a continuum (Fig. 1). Of note, a significant number of critically ill patients exhibit augmented renal clearance (> 130 mL/min/1.73 m^2—ARC). Robust data worldwide showed this condition is ubiquitous in critical care setting and the prevalence of ARC in mixed ICU can rise up to 65% [3]. Despite not being a pathologic condition, ARC has far-reaching consequences on the kinetics of renal elimination of hydrophilic drugs, such as enoxaparin [4], consequently increasing the risk of underdosing.

Helms et al. also debated the thromboprophylaxis regimen in critically ill patients with coronavirus disease 2019 (COVID-19). Patients with COVID-19 (and other acute severe infections) appear to present a hypercoagulable state with prothrombotic tendency, particularly those requiring critical care. In addition, this population shows a prevalence of ARC between 25% and 72% [5], similarly to other critically ill patients. This association between a prothrombotic state and the high prevalence of ARC in critically ill patients with COVID-19 may lead to an additional risk of thrombotic complications even while under "standard" pharmacological thromboprophylaxis, given the expected increased renal clearance of enoxaparin. It is possible that COVID-19 patients showing ARC constitute the group that most benefits from an increased dose of anticoagulation. To identify the potentially increased venous thromboembolism risk, these patients require adequate evaluation of renal function, and daily measurement of urinary creatinine clearance appears to be the best method for identifying ARC.

Although it remains unclear how best to adapt prophylactic anticoagulation in the critically ill, adequate levels of anti-X_a activity are probably the best surrogate marker to evaluate adequacy of thromboprophylaxis. The dynamics of renal function calls for personalization of dosage; therefore, frequent evaluation of anti-X_a activity needs to be considered when monitoring critically ill patients with significant altered renal clearance. Further studies are needed regarding the influence of ARC in anti-X_a levels in critically ill patients under enoxaparin prophylactic dose, with analysis of mortality and adverse events.

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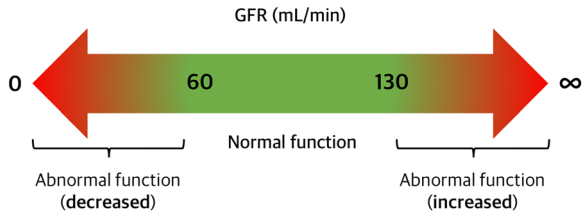

Fig. 1 Schematic full spectrum of renal function in the critically ill patient

While it is true that several non-controlled variables contribute to the uncertainty of the effect of LMWH in critically ill patients, there is no excuse to ignore one of the few we can monitor daily: the presence of ARC—which, incidentally, can be very easily measured.

"If you cannot measure it, you cannot improve it."
Lord Kelvin (1824–1907).

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Declarations

Conflicts of interest
On behalf of all authors, the corresponding author states that there are no competing interests.

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References

1. Helms J, Middeldorp S, Spyropoulos AC (2023) Thromboprophylaxis in critical care. Intensive Care Med 49:75–78. https://doi.org/10.1007/s00134-022-06850-7
2. Duranteau J, Taccone FS, Verhamme P, Ageno W, Force EVGT (2018) European guidelines on perioperative venous thromboembolism prophylaxis: intensive care. Eur J Anaesthesiol 35:142–146
3. Udy AA, Baptista JP, Lim NL, Joynt GM, Jarrett P, Wockner L, Boots RJ, Lipman J (2014) Augmented renal clearance in the ICU: results of a multicenter observational study of renal function in critically ill patients with normal plasma creatinine concentrations. Crit Care Med 42(3):520–527
4. Abdel El Naeem HEM, Abdelhamid MHE, Atteya DM (2017) Impact of augmented renal clearance on enoxaparin therapy in critically ill patients. Egypt J Anaesth 33(1):113–117
5. Denise HR, Ashley BB, Nicholas RN (2022) Augmented renal clearance: an under-recognized phenomenon associated with COVID-19. Crit Care Explor 4(2):0617