

LETTER

# Algorithm-based management of bleeding in patients with extracorporeal membrane oxygenation

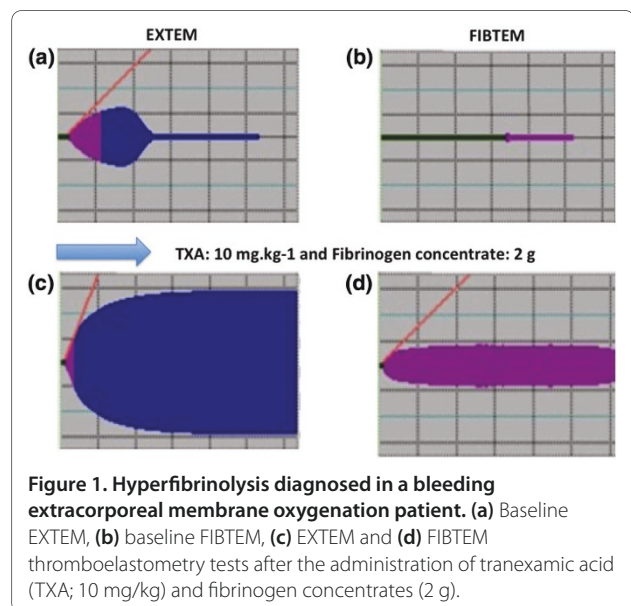
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See related research by Repressé *et al.*, <http://ccforum.com/content/17/2/R55>

We read with interest the paper published by Repressé and colleagues [1]. Coagulation management is a challenge during extracorporeal membrane oxygenation (ECMO) due to complex hemostatic and inflammatory responses associated with the underlying conditions that include infection, sepsis, surgery, and/or traumatic injury [2]. Repressé and colleagues present the first algorithm-based approach to bleeding in ECMO patients. However, additional perspectives are important to consider.

First, activated partial thromboplastin time or anti-activated factor X monitoring are routinely used to monitor heparin therapy in ECMO patients, despite intra-individual and inter-individual variability [3]. Rotational thromboelastometry (ROTEM<sup>®</sup>; TEM<sup>®</sup> International GmbH, Munich, Germany) is also increasingly used in the ICU to rapidly assess the coagulation status, including clotting factors, fibrinogen levels, and whole blood clotting [4]. Moreover, this test also facilitates fibrinolytic pathway evaluation, which cannot be easily explored by routine laboratory tests. We believe ROTEM<sup>®</sup> could be used to design an algorithm-based approach to bleeding in ECMO patients and follow fibrinogen consumption associated with hyperfibrinolysis, an important cause of bleeding. For this reason, anti-fibrinolytic agents should be considered in the multimodal approach (Figure 1), an important point the authors omitted in their algorithm.

Second, adverse events including 32% venous thrombosis and a 2.5% incidence of fatal pulmonary embolism have already been reported in ECMO patients [5]. In another series, Combes and colleagues reported a 10% incidence of femoral vein and 7% incidence vena cava thrombosis [6]. Recombinant activated factor VII is associated with thromboembolic events [7] and should



**Figure 1. Hyperfibrinolysis diagnosed in a bleeding extracorporeal membrane oxygenation patient. (a)** Baseline EXTEM, **(b)** baseline FIBTEM, **(c)** EXTEM and **(d)** FIBTEM thromboelastometry tests after the administration of tranexamic acid (TXA; 10 mg/kg) and fibrinogen concentrates (2 g).

be used with caution until additional data help us evaluate the benefit-to-risk administration in bleeding ECMO patients.

#### Abbreviations

ECMO, extracorporeal membrane oxygenation; ROTEM, rotational thromboelastometry.

#### Competing interests

The authors declare that they have no competing interests.

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Published: 8 May 2013

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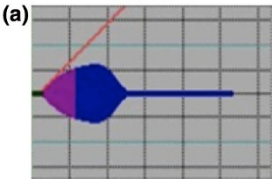
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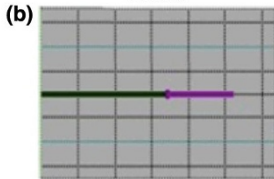
doi:10.1186/cc12682

**Cite this article as:** Faraoni D, Levy JH: **Algorithm-based management of bleeding in patients with extracorporeal membrane oxygenation.** *Critical Care* 2013, **17**:432.

EXTEM



FIBTEM



TXA: 10 mg.kg<sup>-1</sup> and Fibrinogen concentrate: 2 g

