## Life-threatening hyperkalaemia after succinylcholine

We read with interest the Clinical Picture by Anne-Flore Plane and colleagues<sup>1</sup> describing life-threatening hyperkalaemia after succinylcholine use to facilitate endotracheal intubation in a patient who was critically ill. The authors note that this complication is well known but imply that such a profound response was unexpected. We wish to make two observations regarding this case.

First, the authors report that the patient had been on mechanical ventilation for 31 days before an unsuccessful extubation. Duration of mechanical ventilation is independently associated with critical illness myopathy and polyneuropathy,<sup>2</sup> complications that contribute to unsuccessful weaning off of a ventilator-as seen in this patient-and that underly the electrophysiological abnormalities that predispose a patient to hyperkalaemia induced by succinylcholine.<sup>3</sup> In fact, duration of intensive care unit stay per se is a predictor of the magnitude of the increase in serum potassium concentration when succinylcholine is administered.4

Second, this drawback of succinylcholine, along with other properties of the drug that render it undesirable for emergent intensive care unit airway management, have led to UK practice increasingly moving away from its use. Joint guidance<sup>5</sup> from the Difficult Airway Society, Intensive Care Society, Faculty of Intensive Care Medicine and Royal College of Anaesthetists recommends rocuronium as a more rational choice in this setting because it produces similar intubating conditions without the numerous side-effects of succinylcholine, including the sideeffect highlighted by this case.

Plane and colleagues are to be commended for reporting this case. We would be interested to learn how their experiences with this patient have affected their choice of neuromuscular blocking drug for endotracheal intubation in the intensive care unit.

We declare no competing interests.

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## Jamie Strachan, \*Matthew Frise matthew.frise@dpag.ox.ac.uk

Department of Critical Care, Milton Keynes University Hospital NHS Foundation Trust, Milton Keynes, UK (JS); Intensive Care Unit, Royal Berkshire NHS Foundation Trust, Reading, UK (MF); and Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, OX1 3PT, UK (MF)

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## Authors' reply

We thank Jamie Strachan and Matthew Frise for their interest and comments on our Clinical Picture<sup>1</sup> showing electrocardiogram modifications related to life-threatening hyperkalaemia induced by succinylcholine in a patient who was critically ill.

The pathophysiology of hyperkalaemia induced by succinylcholine involves dysregulation of the nicotinic acetylcholine receptor on the neuromuscular junction that occurs in cases of muscle denervation or injury.1 Critical illnesses and intensive care unit treatments such as mechanical ventilation can lead to critical illness polyneuropathy and myopathy (also called intensive care unit-acquired weakness) that predisposes to succinylcholineinduced hyperkalaemia. A Medical Research Council score of less than 48 defines intensive care unit-acquired weakness. Blanié and colleagues<sup>2</sup> reported that the length of stay in an intensive care unit is independently associated with an increase in serum potassium concentration after use of succinylcholine. However, their study was done in a surgical intensive care unit and did not report intensive care unit-acquired weakness, but did report motor deficit related to neurological injury or polytraumatism. Consequently, Blanié and colleagues' study does not answer the question about the safety of succinylcholine in patients with extended stay in an intensive care unit without intensive care unit-acquired weakness. Our case highlights that critical illness polyneuropathy and myopathy can expose a patient to life-threatening hyperkalaemia after use of succinylcholine even if they do not have intensive care unit-acquired weakness with an MRC score over 48.

Rocuronium is an alternative to succinylcholine as a neuromuscular blocking agent (NMBA) in rapid sequence induction for endotracheal intubation. However, succinylcholine has been reported to be superior to rocuronium for achieving excellent or clinically acceptable intubating conditions.<sup>3</sup> This difference was no longer statistically significant when rocuronium was used at a dose of more than 0.9 mg/kg. Moreover, most studies that have used rocuronium were done in the operating room and few have been done in an emergency setting or in an intensive care unit. Without a large randomised controlled trial comparing succinylcholine with rocuronium in an intensive care unit, the treatment guidelines will continue to differ across countries. UK quidelines recommend rocuronium as a rational choice because of the sideeffects of succinylcholine, whereas French guidelines recommend succinylcholine as the first-line NMBA for tracheal intubation in patients who are critically ill.4.5

So, how do you choose which NMBA to use for endotracheal intubation? Perhaps two different situations can be distinguished. Contraindications to succinvlcholine are easily identifiable at admission to an intensive care unit and succinvlcholine is still our first-line NMBA in this situation because of appropriate intubating conditions. However, side-effects of succinylcholine are less predictable after an extended stay in the intensive care unit, as our case shows, and rocuronium is now used as our firstline NMBA for reintubation after prolonged mechanical ventilation.

We declare no competing interests.

\*Anne-Flore Plane, Pierre-Emmanuel Marsan, Damien du Cheyron, Xavier Valette plane-af@chu-caen.fr

Department of Medical Intensive Care, Caen University Hospital, 14000 Caen, France

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