case illustrates that a prolonged block with 2-chloroprocaine (hence the high epidural) can occur not only with abnormal but also with low pseudocholinesterase activity. Even though the frequency of abnormal pseudocholinesterases is low,¹ reduced pseudocholinesterase activity has been described in pregnancy^{2,3} and with drugs like magnesium. Caution about the possibility of abnormal reactions is warranted.

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References

- 1 Whittaker M. Plasma cholinesterase variants and the anaesthetist. *Anaesthesia* 1980; 35: 174–9
- 2 Whittaker M, Crawford JS, Lewis M. Some observations of levels of plasma cholinesterase activity within an obstetric population. *Anaesthesia* 1988; 43: 42–5.
- 3 Kuhnert BR, Philipson EH, Pimental R, Kuhnert PM. A prolonged chloroprocaine epidural block in a post-partum patient with abnormal pseudocholinesterase. *Anesthesiology* 1982; 56: 477–8.

TOF monitoring is required to achieve effective transient neuromuscular blockade in ICU patients

To the Editor:

National recommendations for clinical practice of sedation in the ICU have been published recently in France.¹ These highly support the usefulness of Train of Four (TOF) monitoring during prolonged neuromuscular blockade, as reported previously.^{2–4} We would like to emphasize, in addition, the usefulness of TOF monitoring to titrate bolus doses of neuromuscular blocking drugs (NMBD) in ICU patients when a transient neuromuscular blockade is required.

We undertook a clinical trial in 22 ventilated patients requiring transient neuromuscular blockade for bronchoscopic procedures. A bolus of 0.1 mg·kg⁻¹ *iv* of pancuronium was administered initially and a second bolus of 0.05 mg·kg⁻¹ 15 min later if the TOF response at the orbicularis oculi muscle was not completely abolished, using a standard peripheral nerve stimulator with surface electrodes. The initial dose of pancuronium was found to completely abolish the TOF response in only 36% of patients, whereas 68% of patients had a completely abolished response following administration of the second dose (Table). Therefore, a “standard intubating dose” of pancuro-

nium (as determined in healthy anesthetized patients and expected to achieve complete paralysis) has only limited relevance in critical care patients. Our results strongly suggest that bolus injections of NMBD in ICU patients should be titrated to the specific target required for brief relaxation, and that TOF monitoring should be used systematically, as recommended for long-term infusions of NMBD.

TABLE

	TOF=0/4	TOF=1/4	TOF=2/4	TOF=3/4	TOF=4/4
First bolus	36%	14%	5%	0%	45%
Second bolus	68%	0%	5%	5%	22%

% of patients having 0/4 to 4/4 responses at TOF at orbicularis oculi after pancuronium boluses

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References

- 1 Anonyme. Sédation, analgésie, et curarisation en réanimation: recommandations pour la pratique clinique. *Réanimation Urgences* 1999; 8(Suppl 2): 33s–104s.
- 2 Coursin DB, Kelly JS, Prielipp RC. Muscle relaxants in critical care. *Curr Opin Anaesthesiol* 1993; 6: 341–6.
- 3 Shapiro BA, Warren J, Ego AB, et al. Practice parameters for sustained neuromuscular blockade in the adult critically ill patient: an executive summary. *Crit Care Med* 1995; 23: 1601–5.
- 4 Rudis MI, Sikora CA, Angus E, et al. A prospective, randomized, controlled evaluation of peripheral nerve stimulation versus standard clinical dosing of neuromuscular blocking agents in critically ill patients. *Crit Care Med* 1997; 25: 575–83.

Pulmonary carbon dioxide embolism during laparoscopic cholecystectomy

To the Editor:

We wish to report an unusual¹ pulmonary carbon dioxide (CO₂) embolism which occurred after intra-hepatic CO₂ insufflation following inadvertent puncture of the liver by a Verres needle.

A 77-yr-old man underwent laparoscopic cholecystectomy under general anesthesia. A Verres needle was inserted at the right subcostal area. Shortly after the onset of CO₂ insufflation, end-tidal CO₂ (P_{ET}CO₂)