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Reply from the authors

Editor—We thank Dr Langer and colleagues for their thoughtful comments on our article1 and agree that it is important to implement protocols for the management of patients with CIEDs undergoing a variety of both surgical and non-surgical procedures. Dr Langer and colleagues should be congratulated for their efforts in doing so. It is clear that their established protocol maintains patient safety as the primary concern. Their protocol as outlined is comprehensive and importantly breaks down the management strategy into pre-, intra-, and post-procedural management. While we agree that there is little concern for patients undergoing radiation therapy (RT), especially when the location of RT delivery is distant to the implanted device, only through the use of established protocols will we learn more about the interaction between CIEDs and the numerous external sources of potential interference.

Declaration of interest

A.F. has performed consulting work for and has received honoraria from Medtronic, Boston Scientific, St Jude Medical, and Spectranetics. A.F. has also received research support from Medtronic and St Jude Medical.

M. Stone*
A. Fischer
New York, USA
E-mail: marc.stone@mountsinai.org


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Titration of electroconvulsive therapy: the use of rocuronium and sugammadex with adjunctive laryngeal mask

Editor—Regarding general anaesthesia for titration of electroconvulsive therapy (ECT), where three to four inductions of grand mal seizures are planned, it may be prudent to update the standard method of repeated boluses of succinylcholine and periods of apnoea. With the availability of rocuronium, a rapid-acting neuromuscular blocking agent, and now sugammadex, a rapid reversal agent for steroidal-based neuromuscular blocking agents, this combined with adequate airway management allows for an equally time-efficient alternative.1

My colleagues and I have anaesthetized a 37 yr old, 65 kg male, who suffered from major depression with suicidal tendency and family history of malignant hyperthermia. The patient refused to have a muscle biopsy and hence an anaesthetic avoiding triggering medications was used. More than 50 sessions of ECT were conducted at our hospital. Anaesthesia was induced with propofol (1 mg kg⁻¹) and rocuronium (0.6 mg kg⁻¹), three re-titrations were performed, in which a laryngeal mask with bilateral gauze bit blocks were used to aid airway management. Neuromuscular junction activity was monitored until a reduction in train-of-four to two out of four before ECT. The initial seizure modification was deemed adequate, with subsequent ECTs free of physical seizure but adequate seizure recorded by EEG. The use of a laryngeal mask allowed for pressure-controlled ventilation throughout the 20 min period, reliably lowered $e_{CO_2}$ to 4 kPa and avoided periods of apnoea without disruption of EEG recording. Reversal with sugammadex 3 mg kg⁻¹ was given immediately upon conclusion of procedure. The recovery conditions were clinically similar to patients post general anaesthesia for day-case procedures.

The abovementioned technique was utilized successfully for this patient during standard singular ECT as well, given his contraindication to succinylcholine. We learnt that it took 2 min of ventilation before reaching an appropriate train-of-four reduction and spontaneous ventilation was reliably established within a minute, upon immediate administration of sugammadex, even though the singular ECT period was about 7 min (column 3, Fig. 1). This compared favourably with the standard succinylcholine technique which usually takes 6 min as was the case as charted in two patients (columns 1 and 2, Fig. 1).

The advantage of rocuronium and sugammadex over repeated boluses succinylcholine can be deduced from its well-documented side-effect profile.2 This combination also has advantages over other neuromuscular blocking agents such as atracurium with reversal with neostigmine and atropine as demonstrated in column 4 (Fig. 1). The onset of rocuronium (0.6 mg kg⁻¹) is quicker than other neuromuscular blocking agents such as atracurium (0.5 mg kg⁻¹) and from our experience more effective in modifying the grand mal seizure. The availability of sugammadex allows for a near instantaneous reversal (column 5, Fig. 1); therefore, there is no need to wait for return of train-of-four before reversal (~12 min), should the psychiatrist decides that three ECTs were enough instead of four.

My colleagues and I have found the adjunctive use of a laryngeal mask airway to be useful in several clinical scenarios, exemplified by titration of ECT in this report. It is also useful in patients with difficult to manage airway with a bag and mask, such as patients with a beard or morbidly obese patients. The laryngeal mask allows for better control of $Pa_{CO_2}$ which may aid to lower the seizure threshold.1 Importantly, it avoids the period of apnoea to which elderly patients with ischaemic heart disease or morbidly obese patients who tolerate low $Pa_{O_2}$ poorly.

Currently, it is cost limited due to the expense of sugammadex. However, it is justified in patients with


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contraindications to succinylcholine. In time, if the cost of sugammadex is reduced, this technique may replace succinylcholine as it has in the rapid sequence induction scenario.

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Declaration of interest
None declared.

T. K. F. Chow*
Box Hill, Australia
*E-mail: tchow@bhhda.org.au

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Extended-release epidural morphine (DepoDur™) as analgesia for rib fractures

Editor—In blunt chest trauma, the number of rib fractures predicts respiratory morbidity and mortality with pain contributing to the development of respiratory complications. Thoracic epidural analgesia is recommended for patients with four or more rib fractures.5 Certain injury patterns may render conventional epidural analgesia difficult or suboptimal. We present two patients with rib fractures who responded well to extended-release epidural morphine (EREM) (DepoDur™).

A previously well 51-yr-old man sustained right-sided scapula and clavicle fractures, fractures of the 3rd–8th ribs, pulmonary contusions, and a pneumothorax in a road traffic collision. His pain was poorly controlled with a fentanyl patient-controlled analgesia (PCA), paracetamol 1 g q.d.s., diclofenac 50 mg t.d.s., and pregabalin 25 mg nocte. Positioning for a thoracic epidural was too painful to be practical. We therefore administered a lumbar (L1–2) injection of 10 mg EREM (DepoDur) and were able to discontinue the fentanyl PCA. In addition, he received oramorph 20 mg 17, 20, and 23 h after EREM. Immediately after EREM—and discontinuation of the PCA—his sequential numerical pain scores decreased from 8/10 to an average of 4/10, and 3/10 after 36 h. Most of his pain came from his clavicles.

The second case was an 84 yr-old-male admitted with type 2 respiratory failure. He sustained fractures of his right clavicle, right 3rd–10th ribs, and a small pneumothorax after falling down stairs. Despite a morphine PCA and regular paracetamol, his cough was limited by pain and he became increasingly hypercarbic. Eight hours after his accident, we exchanged the PCA for a thoracic (T5–6) epidural infusion of 0.1% bupivacaine with 4 μg ml⁻¹ of fentanyl, achieving a consistent bilateral thermal block to T4. The initial analgesic benefit was not sustained and required supplementation with a fentanyl PCA, which delivered 74 10 μg boluses over the ensuing 48 h. Concerned about his fragile respiratory status, we administered 7.5 mg of EREM before removing the epidural catheter. For 48 h thereafter, his pain scores decreased dramatically, requiring scant supplementation with the fentanyl PCA (18 10 μg boluses over 48 h). His sequential numerical pain scores are in Figure 1.

Both patients benefited from EREM and although they required supplementary analgesia, this is not unexpected in view of their fractured clavicles—an injury requiring more cephalad neuroaxial block than either conventional epidural analgesia or EREM provide.

Neither patient reported any adverse effects.

EREM offers several advantages over epidural catheter-based infusions. As a single-shot injection, it represents a lower infection risk than indwelling catheters. Secondly, EREM is given at the lumbar level and therefore avoids the complications of thoracic epidurals, and positioning for a lumbar epidural may be easier in injured patients.

We report the safe and effective use of EREM for rib fractures. It requires further study and evaluation before being...