Clinical Reports

Substitution of mivacurium for succinylcholine for ECT in elderly patients

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Three cases are reported where pre-existing medical conditions (severe osteoporosis, amyotrophic lateral sclerosis, cardiac arrhythmias) made the administration of succinylcholine during ECT potentially dangerous. Therefore, mivacurium was substituted as the muscle relaxant necessary for safe therapy. Full reversal of the non-depolarizing muscle relaxant was assured by post-reversal use of the peripheral nerve stimulator with full recovery of train-of-four response.

Cette observation rapporte trois cas de conditions médicales préexistantes (ostéoporose grave, sclérose amyotrophique latérale, arythmies cardiaques) qui rendaient l'administration de succinylcholine pour l'ECT potentiellement dangereuse. Pour cette raison, la mivacurium a remplacé la succinylcholine comme myorelaxant pour la thérapie. La décurarisation complète a été contrôlée à l'aide d'un stimulateur nerveux pour assurer la reprise complète de la réponse au train de quatre.

Recently, ECT therapy has received renewed emphasis in the management of severe depression in elderly patients. Antidepressant drug therapy may be contraindicated or failed to have produced clincial improvement. Elderly patients frequently develop medical conditions which make the use of succinylcholine for ECT potentially dangerous. Gitlin *et al.* reported a series of cases where mivacurium was used in place of succinylcholine for a planned prolonged duration of the ECT procedure which required intubation for airway management.[1] We wish to report three elderly patients in whom succinylcholine was contraindicated because of medical conditions (severe osteoporosis, amyotrophic lateral sclerosis and bradycardia with ventricular irritability after previous succinylcholine). Each anaesthetic was administered by a different anaesthetic team and no attempts were made to standardize the anaesthetic technique other than awareness of the specific anaesthetic needs of ECT.[2]

Key words
BRAIN: electroconvulsive therapy;
NEUROMUSCULAR RELAXANTS: mivacurium, succinylcholine.

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Case report

The first case was a 64-yr-old man with recurrent major depression. His medical history included coronary artery bypass grafting after two myocardial infarctions, abdominal aortic aneurysm repair and Crohn's disease. In addition, he had long-standing hypertension and a 40 pack-year history of tobacco use. Further evaluation revealed multiple thoracic and lumbar spinal compression fractures and he had been receiving steroids for two months to treat the Crohn's disease. A diagnosis of severe osteoporosis was made. Two years previously the patient had undergone a series of ECT treatments without problems although no records were available. Succinylcholine was avoided because of the concern that in the presence of severe osteoporosis there may be a risk of fractures associated with fasciculations. After application of monitors, (ECG, pulse oximetry, peripheral nerve stimulator with the electrodes placed over the orbicularis oculi area, and automated blood pressure) and pre-oxygenation, anaesthesia was induced with 100 mg methohexitone. The airway was stable and the lungs could be ventilated easily by mask. A bite block was inserted and mivacurium 0.2 $mg \cdot kg^{-1}$ was given slowly *iv.* An aneroid blood pressure cuff was inflated to 250 mmHg on one calf prior to the injection of the muscle relaxant to allow for observation of seizure intensity and duration. The ECT electroshock

was applied after the peripheral nerve stimulator showed full obliteration of the train-of-four response. Reversal of the neuromuscular block was monitored by the peripheral nerve stimulator with full restoration of the train-of-four response, after atropine 1 mg and neostigmine 3 mg were administered. Subsequent ECT treatments demonstrated that suitable conditions could be achieved with a reduced dose of mivacurium of 0.16 mg · kg^{-1}.

The second case involved a 69-yr-old man with major depression and a history of suicide attempts with paranoid delusions. In addition, he gave a history of endocarditis, mitral regurgitation and amytrophic lateral sclerosis (ALS) diagnosed one year earlier. Mivacurium was selected because of concern about the response of patients with ALS to succinylcholine. Monitoring and anaesthesia were performed as in case #1. Mivacurium 0.2 mg · kg^{-1} was then given slowly. Full reversal of neuromuscular block was monitored by peripheral nerve stimulator with full recovery of train-of-four response, after reversal with atropine 1.2 mg and edrophonium 1 mg · kg^{-1}. A total of six treatments were given in this manner over 13 days and the patient was discharged.

The third case involved a 76-yr-old man with severe depression resistant to all pharmacological and psychotherapeutic treatment. During the course of his first ECT treatment he developed multiple arrhythmias including severe bradycardia (pulse rate of 35 bpm), ventricular irritability, ventricular tachycardia and asystole following the seizure. During subsequent ECT treatments he continued to have multiple arrhythmias with hypertension (220/110 mmHg). All of these ECT treatments included succinylcholine. For subsequent therapy, 8 mg mivacurium was substituted for succinylcholine. Anaesthetic management and monitoring were similar to the other two cases. Aside from transient mild hypertension, no haemodynamic or rhythmn disturbances were seen. Full reversal of the neuromuscular block was monitored by use of the nerve stimulator with full recovery of response to train-of-four stimulation after reversal with glycopyrrolate 0.6 mg and neostigmine 3 mg.

Discussion

We have presented three patients with specific contraindications to the use of succinylcholine as part of an anaesthetic sequence for ECT. Elderly patients are particularly susceptible to fractures of the thoracic and lumbar spine associated with osteoporosis.[3] In the presence of severe wide-spread osteoporosis, fasciculations following succinylcholine may cause pathological fractures. Amyotrophic lateral sclerosis is an upper and lower motor neuron disease with neurophathological lesions at several levels of the central nervous system. Susceptibility to hyperkalaemia following administration of a paralyzing dose of succinylcholine has been suggested. In the third patient succinylcholine was contrainicated because its administration has been associated previously with severe arrhythmias. Another case has been described where mivacurium was substituted for succinylcholine in a patient with spastic quadriparesis following unsuccessful surgical decompression of severe cervical stenosis.[4] Fredman reports the substitution of mivacurium for succinylcholine in a patient with a history of neurolept malignant syndrome.[5]

Conclusion

In elderly patients coming for ECT therapy, osteoporosis, ALS and multiple arrhythmias are systemic medical conditions which make the intravenous administration of succinylcholine potentially dangerous. There is now clinical evidence that mivacurium may be safely and successfully substituted for succinylcholine in ECT therapy. Monitoring with a peripheral nerve stimulator is necessary to assure complete reversal of the non-depolarizing muscle relaxant.[6]

References

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