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ONSET AND RECOVERY OF ROCURONIUM (ORG 9426) AND VECURONIUM UNDER ENFLURANE ANAESTHESIA

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SUMMARY

We have studied the onset, duration of action and recovery index of twice the ED_{90} of rocuronium (Org 9426) (0.6 mg kg^{-1}) and of vecuronium (0.08 mg kg^{-1}) in patients during enflurane anaesthesia. Rocuronium had a significantly shorter mean onset time of 1.8 (SD 0.4) min, compared with vecuronium 3.4 (0.8) min. Clinical duration (time for the first twitch in the train-of-four to recover to 25% of control) was similar for both drugs (29 (10) min vs *31 (12) min). Spontaneous recovery times (TOF ratio 70%) did not differ significantly between rocuronium (47 (10) min) and vecuronium (44 (11) min).* (Br. J. Anaesth. 1992; **69**: 511–512)

KEY WORDS

Neuromuscular relaxants: rocuronium (Org 9426), vecuronium.

Rocuronium (Org 9426) is a new, non-depolarizing neuromuscular blocking agent with a chemical structure derived from that of vecuronium. Results from a previous study using the ED_{90} and three times this dose [1] prompted us to compare the onset time, intubating conditions, clinical duration of action and spontaneous recovery of twice the ED_{90} of rocuronium and of vecuronium under normal clinical conditions. We used rocuronium in a dose of $2 \times ED_{90}$ because in the above study $1 \times ED_{90}$ did not provide adequate intubating conditions and $3 \times ED_{90}$ considerably prolonged its clinical duration.

METHODS AND RESULTS

We studied 24 patients (18–65 y), ASA I or II, undergoing elective surgery, in an open, randomized, prospective study approved by the University's Ethics Committee. All patients gave written informed consent.

Patients with abnormal liver or kidney function, and those receiving drugs which might interfere with neuromuscular blocking drugs, were excluded from the study. Patients were allocated randomly to two groups of 12 subjects each (groups 1 and 2). All patients were premedicated with lormetazepam 2 mg orally approximately 1 h before induction. Anaesthesia was induced with midazolam 0.07 mg kg^{-1} and etomidate 0.3 mg kg^{-1} and maintained with 0.6–1.5 vol% enflurane (end-tidal) and 67% nitrous oxide in oxygen; supplements of fentanyl 0.05–0.1 mg were given when needed. Ventilation was controlled to maintain normocapnia as assessed by end-tidal carbon dioxide measurement (end-expiratory P_{CO_2} 4–4.5 kPa).

Neuromuscular block was assessed by stimulating the ulnar nerve with supramaximal 2-Hz trains-of-four (TOF) every 20 s and recording the evoked compound electromyogram (EMG) of the hypothenar muscles using a Datex relaxograph.

After 5 min ventilation with 1.5% enflurane; group 1 received rocuronium 0.6 mg kg^{-1} and group 2 received vecuronium 0.08 mg kg^{-1} into a fast flowing i.v. infusion. Tracheal intubation was performed when the neuromuscular block exceeded 90%. The following variables of neuromuscular function were obtained from twitch recording: onset time (time from end of injection to maximal effect or T1 = 0), abolition of the first twitch of the train-of-four, clinical duration ($T1_{25}$ = time from end of injection to 25% recovery of T1), $T1_{75}$ (T1 recovery to 75% of control), recovery index (T1 recovery from 25% to 75%) and spontaneous recovery of TOF ratio to 70% (TOF_{70}). Neuromuscular block was not antagonized in any patient.

Normal distribution was assessed with the Pearson–Stephens test and comparisons between the groups were made by Student's t test for unpaired data. $P < 0.05$ was considered significant.

There were no statistical differences in patient characteristics between the two groups. Onset time after administration of rocuronium was significantly shorter than after injection of vecuronium at a similar degree of maximal neuromuscular block

TABLE I. *Time course of action and recovery after rocuronium 0.6 mg kg^{-1} and vecuronium 0.08 mg kg^{-1} (mean (SD)).* * $P < 0.05$ *between groups*

	Rocuronium 0.6 mg kg^{-1} ($n = 12$)		Vecuronium 0.08 mg kg^{-1} ($n = 12$)
Onset time (min)	1.8 (0.4)	*	3.4 (0.8)
Maximum block (%)	97 (3)		94 (6)
Clinical duration (min)	29 (10)		31 (12)
$T1_{75}$ (min)	38 (10)		39 (12)
TOF_{70} (min)	47 (10)		44 (11)
Recovery index (min)	10 (3)		9 (3)

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($P < 0.05$). Clinical duration and recovery index did not differ significantly between the two groups (table I). Tracheal intubation was performed after 1.8 (SD 0.5) min in the rocuronium group and 3.5 (0.4) min in the vecuronium group.

COMMENT

Arterial pressure and heart rate did not differ after administration of the two agents, confirming the haemodynamic stability reported in the literature [2–4].

Twice the ED_{90} of each neuromuscular blocker was administered and provided good to excellent intubating conditions. Intubation was achieved in all patients at 90% block or more. Only a few patients in both groups exhibited slight coughing.

Onset time to neuromuscular block after rocuronium 0.6 mg kg^{-1} was significantly shorter than after a comparable dose of vecuronium (0.08 mg kg^{-1}). The rocuronium onset time of 1.8 min, which was nearly twice as fast as that of vecuronium, is consistent with data from other studies [2, 3, 5]. Increasing the initial dose of vecuronium does not lead to a substantially shorter onset [4], whereas the onset time after administration of three times the ED_{90} of rocuronium (0.9 mg kg^{-1}) was reduced to 70 s [1]. This represents the main advantage of rocuronium over vecuronium.

Rocuronium possesses a relatively small neuromuscular blocking potency compared with vecuronium [2]. Therefore administration of a larger dose of rocuronium, by producing a greater concentration gradient and a greater free plasma concentration, may account for the shorter onset time [6]. The reason why vecuronium did not behave similarly is not clear.

Clinical duration and spontaneous recovery of the TOF ratio to 70% were similar in both groups. This indicates that rocuronium, given in twice the ED_{90}, is a neuromuscular blocking drug with an intermediate duration of action, similar to vecuronium [3, 5]. Enflurane may potentiate neuromuscular block [5], but it would have affected the two drugs equally. In our study, however, during enflurane anaesthesia the recovery differed only slightly from results obtained during balanced anaesthesia [3, 5].

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