Using priming of vecuronium with magnesium sulphate for fast and safe intubation

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We evaluated the intubation time, quality and hemodynamic effects on 20 patients whom magnesium sulphate and vecuronium were used according to priming principle. All patients were premedicated with diazepam 0.15 mg/kg intramuscular, 30 minute prior to surgery. Subjects were given vecuronium 10 fig/kg intravenously and 50 mg/kg magnesium sulphate before induction. Anesthesia was induced with thiopentone 5-7 mg/kg given to loss of the eyelash reflex, followed by intubating dose of 0.1 mg/kg vecuronium. After, the thiopentone, neuromuscular monitoring consisted of stimulation of the ulnar nerve with a train-of four (TOF) stimuli at 20 seconds intervals of the adductor pollicis with a TOF Guard monitor was performed. At 30" second, after the final relaxant dose, intubation was attempted by the same experienced anaesthetists. All patients were successfully intubated in mean 44.15±4.15 seconds (At mean 44.15±4.15 seconds mean TOF ratios were 0.52±0.8). Blood pressure and heart rate changes showed no statistical difference. There was no evidence of prolongation effect of vecuronium. Application of priming principle with magnesium sulphate together reduces the intubation time and provides the same quality as succinylcholine. Administration of magnesium sulphate during induction prevents also the increase in blood pressure and heart rate that occur as response to laryngoscope and tracheal intubation. [Turk J Med Res 1996, 14 (3): 117-120]

Keywords: Vecuronium, Magnesium sulphate, Intubation

Rapid sequence induction is used to secure the airway in emergency surgical procedures in order to avoid aspiration of gastric contents. Succinylcholine is ordinarily the relaxant of choice because of its rapid onset of action. Tracheal intubation can be performed within one minute after the injection of succinylcholine IV. Succinylcholine, however, has unwanted side-effects and may cause serious complications (1). Succinylcholine may produce muscle fasciculations, myalgia and increases in intragastric, intraocular and intracranial pressures. Succinylcholine should also be avoided in patients with burns, renal failure, and in patients with a history of malignant hyperthermia or pseudocholinesterase deficiency (2-9).

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Non-depolarizing neuromuscular blocking drugs are devoid of many of the side effects of succinylcholine. With reasonable doses of non-depolarizing neuromuscular blocking drugs, suitable conditions for tracheal intubation cannot be achieved in less than 2-3 minute. Investigation into this problem concentrated on the modification of administration schedules of established non-depolarizing neuromuscular blocker, for example: supra-normal bolus doses, the priming principle and the use of combinations of two different non-depolarizing neuromuscular blocker drugs. None of these maneuvres seriously challenges the role of succinylcholine for rapid sequence tracheal intubation (10).

Magnesium decreases the amount of acetylcholine released from the motor nerve terminal, the depolarizing action of acetylcholine on the post-junctional membrane and the excitability of the muscle fiber itself, and the amplitude of the endplate potential.

Thus, magnesium enhances non-depolarizing neuromuscular blocking drugs-induced blockade by reducing acetylcholine output from the motor nerve terminal and by reducing sensitivity of the postjunctional membrane (11).

Effect of magnesium sulphate to intubation time with non-depolarizing neuromuscular blocking drugs are not clear yet in literature. In this study we used magnesium sulfate with vecuronium according to priming principle and evaluated the changes in blood pressure (BP) and heart rates (HR), intubation time and quality.

MATERIALS AND METHODS

The study was approved by the local ethical committee. We studied 20 patients (ASA I-II) of both sexes, aged 14-85 year, undergoing elective surgery requiring tracheal intubation. Subjects meeting the inclusion criteria for the study we asked to give informed consent: Exclusion criteria included absence of informed consent, significant intercurrent disease, pregnancy or possible pregnancy, medication which could affect neuromuscular function, history of previous adverse reactions whilst under general anaesthesia and known allergy to any of the drugs to be used in the study.

Premedication consisted of diazepam 0.15 mg/kg intramuscularly 30 minutes before induction of anaesthesia. Standard electrocardiogram (ECG) leads were monitored throughout the procedure and BP was monitored noninvasively with use of an automatic oscillotonometric device that recorded the BP every 60 seconds. HR was also recorded every 60 seconds. All patients underwent preoxygenation for not less than 3 minute. Before induction, subjects were given vecuronium 10 u.g/kg IV. and 50 mg/kg magnesium sulphate (over 30 second). Anaesthesia was induced with thiopentone 5-7 mg/kg given over 30 second to loss of the eyelash reflex followed by intubating dose of 0.1 mg/kg vecuronium. Ventilation was controlled manually via a face mask with 70 % nitrous oxide in oxygen until tracheal intubation was performed. Following intubation anaesthesia was maintained with 70 % nitrous oxide and 1 % halothane.

After the thiopentone a nerve stimulator (TOF Guard Sales Pack Biometry International AIS, Odense/ Denmark) was used to stimulate the ulnar nerve with supramaximal impulses of 0.2 millisecond duration at 2 Hz through subcutaneous needles. The TOF stimuli were repeated every 20 seconds. At 30rd seconds, after the final relaxant dose, intubation was attempted by the same experienced anaesthetists. Conditions for intubation were graded on a five-point scale: 1 = no jaw relaxation, unable to insert laryngoscope, 2 = gross movement in response to laryngoscopy, 3 = marked movement of vocal cord on visualization, 4 = minimal cord movement, 5 = ideal intubating conditions, with no movement. If the intubating condition were scored at 3 or greater, tracheal intubation was performed. If the score was 2 or less, laryngoscopy was terminated and intubation reattempted after a further 30 seconds. The time from administration of the intubating dose .of vecuronium to intubation was noted. BP and HR were noted before induction of anaesthesia (control), after induction, after vecuronium, after intubation.

Statistical analysis of the numerical data was performed using Fisher's exact test. A p-value of less than 0.05 was considered to represent a significant difference. Results for numerical data are presented as mean (SD).

RESULTS

There were 20 patients in study, of mean age 43.2±16.96 year, and mean weight 67.6±10.34 kg. All patients were successfully (5 point) intubated at mean 44.15±4.15 seconds. At 44.15±4.15 seconds mean TOF ratios were 0.52±0.8.

There were not any changes recorded in TOF stimulations on neuromuscular monitor and also no symptoms giving idea about muscle paralysis between the time from administration bolus dose of vecuronium to the priming dose and magnesium sulphate together.

Patients BP and HR values were compared with control groups. There were no statistically significant results recorded ($p>0.05$) Table 1.

DISCUSSION

By using non-depolarizing neuromuscular blocking agents with priming principle, intubation time can be shortened by 30-60 second (12). But for reaching the conditions of intubation that succinylcholine supplies, the priming dose should be so much increased, then the risk of adverse effect appears that is so high and dangerous to be accepted (10).

For shortening the time of onset of the non-depolarizing neuromuscular blocking agents magnesium sulphate was first used by James et **al.** They applied 60 mg/kg magnesium sulphate to a group of patients before pancuronium bolus dose, and priming that is 10 % of pancuronium dose to another group; and they determined the intubation time, BP and HR changes. As a result, they declared that the use of magnesium sulphate shortened the intubation time just as much as priming technique but also that they could not reach the quality and short time that succinylcholine supplied (13). Lampt et **al** used the same method for atracurium. In this search also, Magnesium sulphate has been as effective **as** priming principle in shortening the intubation period. In both of the searches, there has appeared no meaningful difference in BP and HR changes (14).

Table 1. Cardiovascular responses in the patients (mean (SD). SAP, DAP = Systolic and diastolic arterial pressures; HR = heart rate

	SAP (mmHg)	DAP (mmHg)	HR (beat/minute)
Control (Baseline)	139.2(23.42)	87.15(10.70)	90.7(14.65)
After induction	130.6 (23.50)	83.5 (10.07)	97.1 (11.86)
After vecuronium	131.7(22.48)	84.1 (9.50)	97.70(13.10)
After intubation	136.5(23.34)	87.0(7.23)	98.25(12.83)

Ghoneim et al have shown that the use of magnesium sulphate in clinical doses did not affect the deep tendon reflexes or respiratory functions, even it did not prolong the block time (15). In our study, when we gave magnesium sulphate before vecuronium bolus dose the was no difference in TOF stimulation of peripheral nerve stimulator. When the surgical procedure was finished, the spontaneous ventilation of patients had returned or they were easily reversed by block with neostigmine.

When we used magnesium sulphate and priming principle together in the same patients, the results were really interesting. At the 30'd second of the vecuronium bolus dose application, the laryngoscopy was evaluated by the same anaesthetist in all of the patients. Intubation was performed at mean 44.15±4.15 seconds in average with 5 score in all of the patients. The BP and HR changes of the patients did not show any meaningful difference when compared to control values. There are studies in the literature about magnesium sulphate that prevents the BP and HR changes occurring as a result of laryngoscopy and tracheal intubation (16,17).

As a result, we suggest you to use low dose priming technique and magnesium sulphate for fast and safe intubation

Hızlı ve güvenli entübasyon için priming prensiple vekuronyum magnezyum sülfat kullanılması

*Trakeal entübasyon gerektiren 20 hastada, magnezyum sülfat (Mg **SÛ4)** ve priming prensip ile vekuronyum kullanarak; entübasyon zamanı, entübasyon kalitesi ve hemodinamik etkileri değerlendirdik. Tüm hastalar 0.15 mg/kg intramusküler diazepam ile premedike edildi. Hastalara 0.01 mg/kg vekuronyum, 50 mg/kg Mg S04 (30 saniye) uygulandı. Anestezi indüksiyonu için 5-7 mg/kg tiopental kirpik refleksi kaybolana kadar verildi. Arkasından 0.1 mg/kg vekuronyum bolus dozu olarak uygulandı. Nöromusküler fonksiyonlar ulnar sinirin innerve ettiği adduktor pollicis kasının kontraksiyonlan Train on four (TOF) stimûlasyonlan ile 20 saniye aralarla sinir-kas monitöründe (TOF Ouard) izlendi. Vekuronyum bolus dozunun yapılmasından 30 saniye sonra entübasyona karar verildi. Ortalama entübasyon zamanı 44.15±4.15 saniye, entübasyon kalitesi 5 olarak bulundu (Ortalama TOF oranı 0.52± 0.8). Hastaların kan basıncı ve nabız değişiklikleri kontrol değerlerine göre anlamlı fark göstermedi. Hiç bir hastada vekuronyumun uzamış etkisine rastlanmadı.*

Priming prensip ile magnezyum sülfatın beraber kullanımı entübasyon süresini kısaltmaktadır. Süksinil kolin ile sağlanan hızlı ve kaliteli entübasyon şartlarını sağlamaktadır. Indüksiyonda kullanılan magnezyum sülfat laparaskopi ve trakeal entübasyona cevap olarak oluşan kan basıncı ve kalp hızı artışını da önlemektedir. [Türk J Med Res 1996, 14(3): 117-120]

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