Effect of pre-treatment with magnesium sulphate on the duration of deep and intense neuromuscular blockade with rocuronium: a randomized, double-blind clinical study

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Background and Goal of Study

- Magnesium sulphate increases the duration of neuromuscular blockade, but its effect on each phase of neuromuscular blockade is not described with rocuronium.
- Deep and intense neuromuscular blockade benefits procedures as robotic and videolaparoscopic surgeries.
- To determine the duration of deep and intense neuromuscular blockade following a single dose of rocuronium with pre-treatment with intravenous infusion of magnesium sulphate.
- We did not find in the main database any paper that determine the duration of deep and intense neuromuscular blockade.

Materials and Methods:

- Clinical Trial NCT02989272
- Sixty adult patients, ASA I to II, were randomized and allocated in two groups of 30.
- **Group S:** pre-treatment with intravenous infusion of 60 mg.kg⁻¹ of magnesium sulfate diluted in 100 ml of saline.
- **Group C:** pre-treatment with an intravenous infusion of 100 ml of saline.
- Rocuronium bolus (0.6mg.Kg⁻¹) was administered after loss of consciousness.
- Neuromuscular function was evaluated by accelerometer of the thumb adductor with the TOF Watch SX™ monitor.
- Deep neuromuscular blockade - time period from the reappearance of the first response to PTC stimulation until the reappearance of the first response to TOF stimulation.
- Intense neuromuscular blockade - time period where there is no response to PTC stimulation.

Results and Discussion

- There was difference between the magnesium concentration in magnesium sulphate group between pre and post treatment (table 1).
- The groups were also homogeneous in the clinical numerical variables: Age, body mass index, ASA, gender (Table 2).
- The mean duration of the deep neuromuscular blockade in magnesium sulphate group was 23,91 (min) and there was no statistical difference (table 3).
- The mean duration of the intense neuromuscular blockade in the magnesium sulfate group was 20,35 (min) and significantly higher than the control group (table 3).
- The mean duration in minutes of the intense + deep neuromuscular blockade in magnesium sulphate group was significantly higher than control group (table 3).

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Table 1 – Serum calcium and magnesium levels in patients receiving magnesium sulfate or saline. Values are mean;median (SD[CI]).

Magnesium concentration (mmol.l ⁻¹)			
	Before infusion of study solution	After infusion of study solution	p value
Magnesium sulfate (n=30)	2.123;2.100 (0.249[2.030-2.216])	4.213;4.250 (0.627[3.979-4.448])	<0.0001
Saline (n=30)	1.993;2.000 (0.256[1.898-2.089])	2.103;1.950 (0.619[1.872-2.334])	0.8525
Calcium concentration (mmol.l ⁻¹)			
	Before infusion of study solution	After infusion of study solution	p value
Magnesium sulfate (n=30)	9.520;9.300 (0.666[9.271-9.769])	8.843;8.800 (0.613[8.614-9.072])	0.0142
Saline (n=30)	9.323;9.500 (0.539[9.122-9.525])	8.903;8.750 (0.642[8.663-9.143])	<0.0001

SD: Standard deviation; CI: confidence interval.

Table 2 – Characteristics of patients receiving magnesium sulfate or saline. Values are mean;Me (SD[CI]) or number (%).

	Magnesium sulfate (n=30)	Saline (n=30)	p value
Male/female	14(47)/16(53)	15(50)/15(50)	0.7961
Age (years)	36.47;32.00 (14.27[31.14-41.80])	36.87;32.50 (16.44[30.73-43.01])	0.9469
BMI (kg.m⁻²)	22.88;23.41 (1.79[22.21-23.54])	22.34;22.42 (2.07[21.57-23.11])	0.4333
ASA status (1/2)	23(77)/7(23)	22(73)/8(27)	0.7656

SD: Standard deviation; CI: confidence interval; ASA: American Society of Anesthesiologists

Table 3 – Pharmacodynamics parameters of rocuronium (onset, deep, intense and deep + intense). Data are mean, median, SD; IC, *Significant at P=0.05

	Magnesium (n=30)	Saline (n=30)	P-value
Onset (min)	1.34;1.31 (0.44[1.17-1.50])	1.92;1.59 (1.43[1.38-2.45])	0,0385*
Deep blockade (min)	23.91;20.31 (13.06[19.04-28.79])	18.70;18.27 (10.49[14.79-22.62])	0,1809
Intense blockade (min)	20.35;21.68 (16.14[14.32-26.38])	7.67;0.00 (9.73[4.04-11.31])	0,0011*
Deep + Intense blockade (min)	44.30;40.82 (13.81[39.14-49.46])	26.21;28.01 (10.63[22.25-30.18])	<0.0001*

SD: Standard deviation; CI: confidence interval

Conclusion:

- Magnesium sulphate increases the duration of intense neuromuscular blockade allowing a mean increase of 12,68.
- There was no statistical difference in duration of deep neuromuscular blockade.
- In the magnesium sulphate group, increased duration of intense and deep neuromuscular blockade may have practical implications.

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