

Title : REVERSAL OF NEUROMUSCULAR EFFECTS OF PANCURONIUM IN THE NEONATAL INTENSIVE CARE UNIT

Authors : Nishan G. Goudsouzian, M.D., Robert K. Crone, M.D., and I. David Todres, M.D.

Affiliation: Anesthesia Department and Joseph C. Barr Pediatric Intensive Care Unit, Massachusetts General Hospital, Boston, Massachusetts

Introduction. We evaluated the neuromuscular function of 17 critically ill newborn infants undergoing mechanical ventilation by recording the force of contraction of the thumb. All of these premature and term infants received repeated doses of pancuronium bromide for longer than 48 hours. In each case, the infants were receiving ampicillin and gentamycin intravenously. At the time of the study, their arterial blood gases were within the normal range, and their serum total calcium level was higher than 7.5 mg/dl.

Methods. When the cardiorespiratory status of these infants was considered satisfactory for spontaneous respiration, the force of contraction of the adductor of the thumb in response to supramaximal ulnar nerve stimulation at 0.25 Hz, 2 Hz (train-of-four) and 50 Hz was recorded by a Grass polygraph via a Grass force displacement transducer (FT-03). We considered recovery from muscle relaxants satisfactory when the train-of-four was more than 80%, fade at tetanus less than 30%, and tetanus:twitch ratio higher than 1.9. These data were chosen arbitrarily based on our previous work in anesthetized infants.¹

Results. By this technique, we could identify three groups of infants based on their requirement for reversal of muscle relaxation: Group I (N=5) showed spontaneous recovery from pancuronium and did not require pharmacologic reversal, Group II (N=8) required a single dose of atropine (0.02 mg/kg) and neostigmine (0.06 mg/kg) for adequate reversal, Group III (N=4) required two separate doses of reversal agents.

Discussion. The time intervals between the last dose of pancuronium and the evaluation of neuromuscular parameters was significantly longer in Group I infants ($P<0.05$) compared with Group II indicating that if enough time was allowed, these Group II infants could have reversed spontaneously. However, this could not have happened in Group III patients as evidenced by the similar intervals of Group I and III. After reversal, the train-of-four and tetanus:twitch ratios were lower in Group III when compared to Group I (Table II) indicating either a lesser maturation of neuromuscular function in this group of infants, or a delayed metabolism/excretion of pancuronium.

In the individual situation there was marked variation in each separate parameter but by evaluating them as a whole, we could reach adequate clinical decisions as evidenced by the fact that none of the infants studied demonstrated clinical evidence of residual muscle relaxation and were weaned from mechanical ventilation uneventfully.

In conclusion, electrophysiologic evaluation of neuromuscular function in critically ill neonates receiving muscle relaxants is a useful technique for assessing the requirement for pharmacologic reversal.

References.

1. Goudsouzian, NG, Liu, L, Savarese, JJ: The response of the adduction of the thumb to slow and rapid rates of stimulation in anesthetized infants and children. Abstracts of Scientific Papers, ASA Annual Meeting, Chicago, Illinois, pp 609-610, 1978

Table I

	Days on Pancuronium	Dose of Pancuronium mg/kg/day	Interval Between Last Dose and Testing
Gp I	4.2±0.8	0.3±0.05	* 14.6±2.7
Gp II	3.5±1.1	0.7±0.2	* 7.3±1.2
Gp III	3.0±0.4	0.23±0.04	15.2±8.3

Table II

	Train-of-Four	Fade of Tetanus %	Posttetanic Facilitation %	Tetanic: Twitch Ratios
Gp I	97±2	* 6±4	-0.5±3.5	* 4.9±0.6
Gp II				
Before Reversal	49±4	56±9	** 33±11	1.8±0.1
After Reversal	90±3	* 20±3	1.1±4.6	* 3.1±0.3
Gp III				
Before Reversal	34.5±2	70±5	** 104±22	1.9±0.2
After Reversal	85±3	19.7±4.8	-2.5±15	† 2.3±0.2

* Significant difference ($P<0.05$) between Gp I & II

** Significant difference ($P<0.05$) between Gp II & III

† Significant difference ($P<0.05$) between Gp I & III