COMPARISON BETWEEN MIVACURIUM CHLORIDE AND VECURONIUM BROMIDE IN OPERATIONS REQUIRING WAKE-UP TEST DURING SURGRY

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List of abbreviations

Ach	Acetylcholine
DBS	Double burst stimulation
dTc	d-tubocurarine
ED 50	dose required to produce 50% depression of the twitch of the thumb to stimulation of the ulnar nerve
ED 90	dose required to produce 90% suppression of the muscle twitch response with balanced anesthesia
ED 95	dose required to produce 95% depression of the twitch of the thumb to stimulation of the ulnar nerve
EMG	Electromyography
epc	end plate current
epm	end plate membrane
epp	end plate potential
IOM	intraoperative monitoring
LMA	laryngeal mask airway
MAP	muscle action potential
MEP	Motor Evoked Potentials
Mepp	miniature end plate potential
MH	malignant hyperthermia
NMJ	neuromuscular junction
ORG 9487	rapacuronium
pH	hydrogen ion concentrations
PTC	post tetanic count
SD	standard deviation
SSEP	Somatosensory evoked potentials
ST	Single Twitch Stimulation
TOF	Train-of-Four Stimulation
T4	the amplitude of the fourth response in TOF
T1	the amplitude of the first response in TOF
TI	the first twitch

Abstract

Wake –up test is used to assess the integrity of the spinal motor pathways during spine surgery . The anesthetic management for wake-up test is challenging for the anesthetist as the patient must be awakened at the proper time , be analgesic , moderately sedated and amnesic.

Muscle relaxants are particularly important adjuvant to general anaesthesia since they provide muscle relaxation during the operation and reduce the need for inhalational or intravenous anaesthesia allowing rapid recovery from anaesthesia.

From this study we can conclude that mivacurium chloride and vecuronium bromide are appropriate muscle relaxants to be used as infusion for operations requiring wake-up test. but we issued that mivacurium chloride is more suitable than vecuronium bromide as it is a non-cumulative drug and provides better recovery profile allowing rapid wake-up test to be done when needed.

Key wards:

Mivacurium chloride - Vecuronium bromide - Wake-up test –TOF Guard-Scoliosis.

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Introduction

Introduction

The anesthetic management of surgical patients requiring wake-up test has special consideration. The patient must be awakened at the proper time, be analgesic, moderately sedated and amnesic.

The neuromuscular junction must be completely recovered or only very minimally affected to allow obvious motor movement. The last important goal will be achieved by a neuromuscular blocker that is short or intermediately acting so that at the time of awakening the patient can move his muscle effectively **(Raw et al., 2003).**

Two neuromuscular blockers will be studied, mivacurium chloride from the benzylisoquinolone group and vecuronium bromide from the steroid group.

Mivacurium chloride is an intermediate onset, short acting non-depolarizing neuromuscular blocking agent. The ED 95 during intravenous anesthesia is estimated to be 0.08 mg kg and the estimated duration is 15 to 20 m. Mivacurium chloride is hydrolyzed by plasma cholinesterase at 77 % to 80% the rate of succinylcholine and the breakdown products of mivacurium which are pharmacologically inactive have been identified in human urine **(Ali and Savarese 1991)**

Compared with healthy subjects, the duration of relaxation produced by mivacurium was approximately times greater than normal in patients with kidney disease and 3 times greater than normal in patients with liver failure **(Diefenbach et al., 1992).**

The short duration of action of mivacurium enables maintenance of relaxation by continuous infusion for short to intermediate length surgical procedures of 30 to 90 minutes or more. Longer infusions may be given with minimal increase in recovery time i.e. it is not cumulative. The block is antagonized by anticholinesterase or by administration of pseudocholinesterase **(Goudsouzian et al., 1997)**.

Vecuronium bromide, the 2-desmethyl analogue of pancuronium have much less vagolytic effect and a shorter duration of action than pancuronium. The ED 95 is 0.05 mg/kg And the estimated duration is 45 min. Vecuronium is taken up into the liver and deacelylated at the 3-position by liver microsomes. Although the liver is the principal organ of elimination for vecuronium, the drug also, undergoes significant (up to 25% renal excretion) **(Caldwell and Szenohradszky , 1994).**

The principal metabolite, 3-desacetylvecuronium is a potent neuromuscular blocking drug in its own right. In patients in the ICU who have renal failure, 3-desacetylvecuronium can accumulate and produce prolonged neuromuscular blockade i.e. it is somewhat cumulative **(Segredo et al., 1992).**

Wake-up test is used to assess the integrity of the spinal motor pathways during spine surgery and is performed by lightening the depth of anesthesia sufficiently to allow the patient to follow commands. Neuromuscular blockade is relatively shallow so the patient will usually respond to verbal command to move their feet. Anesthesia is reinduced as soon as movement

is demonstrated. Complications of this technique include accidental extubation in the prone position, self injury, and dislodgment of instrumentation, myocardial ischemia and
air embolism **(Lang et al., 1996).**

Aim of the work

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The aim of this thesis is to study and compare the suitability and safety of the two non-depolarizing neuromuscular blockers vecuronium and mivacurium in operations requiring wake- up test.

Review of literature

Neuromuscular Anatomy & Physiology

The neuromuscular junction (NMJ) is the synapse between the presynaptic motor neurone and the postsynaptic muscle membrane, as the motor neurone approaches the muscle it loses its myelin coat but remains partially covered by processes of the Schwann cells, which elsewhere surround the nerve and produce myelin **(Hall and Merlie , 1993)**.

The nerve then branches several times, indenting the surface of the muscle to form the end plate that occupies only a small region of the total surface area of the muscle. The synaptic cleft that separates the nerve from the muscle is 50-70 nm wide which contains the basement membrane (basal lamina) and filled with extracellular fluid. **(Fig 1)** In higher organisms each muscle fibre is innervated by a single motor nerve fibre **(Hall and Merlie , 1993)**.

The neural signal is an electrical impulse that is conducted from the motor nerve cell body in the spinal cord along the nerve axon to its destination, the neuromuscular junction. No electrical continuity exists between the nerve and the muscle; the signal is transmitted by chemical means that require specialized presynaptic and postsynaptic structures **(Witzeman et al., 1991)**.