BRIEF REPORT

NEUROMUSCULAR BLOCKADE WITH ATRACURIUM BESYLATE IN A PATIENT WITH MYASTHENIA GRAVIS

***D. F. Murphy and J. B. Magner**

Department if Anaesthesia, Mater Misericordiae Hospital, Eccles Street, Dublin 7, Ireland.

Summary

Atracurium besylate was used in a patient with myasthenia gravis for muscle relaxation during transthoracic resection of a thymic tumour. The quality and duration of neuromuscular blockade and the rate of spontaneous recovery of neuromuscular function is described.

Introduction

The basic abnormality in myasthenia gravis is a reduction in the number of acetylcholine receptors at neuromuscular junctions, resulting in impairment of neuromuscular transmission which accounts for the weakness and fatigability typical of the disorder (Drachman, 1978a). Present evidence suggests that the pathogenesis of myasthenia gravis involves an autoimmune attack directed at aceylcholine receptors and autoantibodies to these receptors are detectable in the serum of more than 80% of patients with myasthenia (Drachman *et al*, 1982). Myasthenic muscles have been shown to exhibit 70-89% reduction in the number of available acetylcholine receptors per neuromuscular junction as compared with control muscles (Fambrough *et al*, 1973). The exact origin of the autoimmune attack in myasthenia gravis is unknown but the thymus gland has been implicated in this effect since 75% patients with myasthenia have been shown to have thymic abnormalities; either hyperplasia (85%) or neoplasia (15%) (Castleman, 1966). Thymectomy in these patients results in a clinical improvement in 57-86% with remission in 20-36% (Drachman, 1978b).

Anaesthesia poses particular problems in patients with myasthenia since administration of minimal doses of neuromuscular blocking agents may induce prolonged myasthenia and reversal with anticholinesterase agents may precipitate a cholinergic crisis in patients maintained on these agents. In most cases, neuromuscular blocking agents are considered to be best avoided altogether.

* Present address :
Department of Anaesthesia, Sir Charles Gardner Hospital, Verdun Street, Nedlands, Perth, Western Australia.

Atracurium besylate is a new nueuromuscular blocking agent which is spontaneously degraded in physiological conditions, independent of renal or hepatic function but little information is available on its use in patients with abnormal neuromuscular function. The authors describe its use in a patient with myasthenia gravis who underwent transthoracic thymectomy for removal of a thymic tumour associated with this condition.

Case Report

A 68 kg, 62 year old female patient was referred for thymectomy because of the presence of a thymic tumour in association with symptoms of myasthenia gravis. The patient presented two months prior to surgery with a three year history of progressive eyelid weakness and difficulty with speech and swallowing. She also complained of weakness of her left arm and leg. The diagnosis of myasthenia gravis was based on a significant improvement in motor function following intravenous edrophonium administration. Initially, bulbar symptoms were severe and treatment involved administration of pyridostigmine and high dose prednisolone. Prior to surgery the patient was successfully treated with prednisolone 5 mg orally, eight hourly and anticholinesterase agents were no longer required. Respiratory function tests were normal at this time.

Premedication was with lorazepam 4 mg orally, 90 minutes prior to anaesthesia.

Anaesthesia was induced with thiopentone (4 mg/kg) and maintained with 66% nitrous oxide in oxygen and incremental doses of fentanyl and droperidol as required. Volatile anaesthetic agents were not used. One milligram of preservative free morphine was injected into the lumbar subarachnoid space for post-operative analgesia prior to commencement of surgery. Neuromuscular function was monitored throughout anaesthesia using evoked adductor pollicis responses to train of four (TOF) stimuli of the ulnar nerve. Following establishment of a control TOF, neuromuscular blockade was induced with atracurium 0.3 mg/kg. By five minutes, complete suppression of all TOF responses had occurred and orotracheal intubation was performed with ease. Thereafter neuromuscular blockade was main-

tained with injection of 5 mg (0.075 mg/kg) increments of atracurium each time the second twitch from TOF stimulation had returned. Surgery, involving the uneventful excision of a small thymic tumour, was completed 105 minutes after the induction of neuromuscular blockade. A total dose of 35 mg of atracurium was given. A bolus increment was required 35 minutes after the initial dose and 20, 15 and 20 minutes respectively after subsequent increments.

One hundred and two minutes after the initial dose (12 minutes after the last increment) of atracurium, all four responses to TOF had returned and at 110 minutes TOF responses had returned to control values, at which time the trachea was extubated. Anticholinesterase agents were not required to reverse residual neuromuscular blockade. The patient could sustain head-life for greater than three seconds at the time of extubation. The postoperative course was uneventful. Subsequent histological examination confirmed the removal of a 5.52 gm well circumscribed encapsulated thymoma.

Discussion

The characteristic of Hofmann elimination, peculiar to atracurium amongst the neuromuscular blocking agents would appear to confer upon this drug a distinct advantage over other agents in the safe anaesthetic management of patients with renal, hepatic and neuromuscular disease.

Hofmann elimination involves a non-enzymatic chemical degradation of a quanternary ammonium compound which is both pH and temperature dependent and which, in the case of atracurium, occurs readily under physiological conditions (Stenlake *et al*, 1983). The resultant breakdown products are virtually devoid of pharmacological properties (Chapple and Clarke, 1983).

In the case report described, atracurium was evaluated in a patient with deranged neuromuscular function as little information is available on this aspect of its use. To optimise conditions for its degradation, ventilation was controlled to maintain an aterial pH of 4.0 to 4.5 kPa and temperature was maintained with warming of inspired gases and surface warming with a water blanket. The onset time, peak effect and duration of action were found to correlate closely with previously published work (Foldes *et al*, 1983; Rupp *et al*, 1983). This is in keeping with a non-enzymatic biodegradation. No problems with spontaneous or anticholinesterase induced reversal of neuromuscular blockade were encountered and recurarization did not occur.

The authors consider atracurium to be in the neuromuscular blocking agent of choice for patients with myasthenia gravis.

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