CLINICAL RESEARCH

Bradycardia after the use of atracurium

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Abstract

Four cases of severe bradycardia developed during surgery in patients given the neuromuscular blocking agent atracurium as part of the anaesthesia. In all cases sinus rhythm was restored by giving intravenous atropine.

It is recommended that in all operations in which vagal stimulation is expected patients should be given atropine as part of the premedication or induction sequence and should undergo full electrocardiographic monitoring during surgery.

Introduction

Atracurium is a recently introduced neuromuscular blocking agent which is stated to cause no clinically notable changes in heart rate or blood pressure in the range of recommended dosages.¹

At this hospital atracurium has been used since its general release. I report four cases in which profound bradycardia requiring treatment occurred during that time.

Case reports

Case 1—A fit 84 year old woman undergoing cholecystectomy was given diazepam 10 mg by mouth as premedication two hours before surgery. Anaesthesia was induced with methohexitone 70 mg, fentanyl 100 µg, and atracurium 35 mg (0.75 mg/kg) and maintained with nitrous oxide and oxygen. When traction was applied to the gall bladder a nodal bradycardia of 30/min occurred. This responded promptly to intravenous administration of atropine 0.6 mg. The remainder of the period of anaesthesia was uneventful.

Case 2—A fit 60 year old woman undergoing surgery for retinal detachment was given diazepam 10 mg by mouth as premedication, two hours before surgery. Anaesthesia was induced with fentanyl 200 µg, droperidol 5 mg, thiopentone 300 mg, and atracurium 35 mg (0.57 mg/kg), and maintained with nitrous oxide and oxygen. During the anaesthetic a nodal bradycardia of 20/min occurred and was treated

with atropine 0.6 mg intravenously. The electrocardiogram reverted to sinus rhythm. The remainder of the period of anaesthesia was uneventful.

Case 3—A fit 29 year old woman who had undergone an examination under anaesthesia that morning required an urgent ovarian cystectomy. The patient had not received any premedication. Anaesthesia was induced with thiopentone 350 mg, morphine 10 mg, and atracurium 50 mg (0.625 mg/kg) and maintained with nitrous oxide and oxygen. Peritoneal traction provoked a nodal bradycardia, but as her systolic blood pressure was 80 mm Hg this did not require treatment. The bradycardia rapidly developed into complete heart block at a rate of 20/min. Sinus rhythm was restored by giving atropine 0.6 mg intravenously. The period of anaesthesia was subsequently uneventful.

Case 4—A fit 36 year old woman undergoing vaginal hysterectomy was given papaveretum 15 mg and scopolamine 0.3 mg as premedication. Anaesthesia was induced with thiopentone 300 mg and atracurium 35 mg (0.52 mg/kg) and maintained with nitrous oxide, oxygen, and halothane. During the procedure a sinus bradycardia of 35/min developed and this was treated with atropine 0.6 mg intravenously. The heart rate increased to 70/min. The patient's condition was reversed satisfactorily when atropine 1.2 mg and neostigmine 2.5 mg were given. In the recovery ward the heart rate decreased to 48/min; atropine 0.6 mg was given and the heart rate increased to 68/min. The blood pressure was stable at 90/50 mm Hg. The subsequent recovery was uneventful.

Comment

Atracurium is a new neuromuscular blocking agent which undergoes Hofmann elimination, the spontaneous degradation of atracurium by non-enzymic mechanisms. It is facilitated by the combined electron withdrawal properties of the two β-linked ester carbonyl groups and the positively charged nitrogen of the quaternary ammonium groups. This occurs readily at physiological pH and temperature to give laudanosine as the main metabolite.² Vagal blockade occurs after dosages eight to 16 times greater than those required for neuromuscular blockade and the effects on the sympathetic system are minimal.³

Since its general release, however, several cases of profound bradycardia requiring treatment with atropine have occurred at this hospital, and this has made the medical staff cautious in the use of this drug. At the time of writing neither Calmic Medical Division nor the Committee on Safety of Medicines has received any reports of problems of this nature, although

cases of histamine release induced bronchospasm and hypotension have been reported to the Committee on Safety of Medicines.

Although in the past the combination of fentanyl, halothane, and curare has been noted for producing episodes of bradycardia, they do not seem to have been as profound or to have caused such concomitant changes in the QRS complexes as those observed with atracurium. There are two possibilities for this phenomenon: firstly, atracurium's lack of cardiovascular effects may mean that the cholinergic actions of other anaesthetic agents are unattenuated, and, secondly, perhaps a metabolite is having an effect. Laudanosine, the main metabolite,² has a structure similar to apomorphine and may be contributory to these electrocardiographic changes.

Whatever the cause, I consider that it would be advisable in

all operations in which vagal stimulation is expected that the patients undergo full electrocardiographic monitoring and that atropine should be given as part of the premedication or induction sequence.

References

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Recovery of renal function after prolonged dialysis and transplantation

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Abstract

Out of 250 patients with renal failure, seven (2.8%) treated by regular haemodialysis alone (four) or given cadaveric allografts (three) later showed recovery of function of their own kidneys lasting from one to four years. In the patients receiving haemodialysis alone recovery was easily recognised from their serum creatinine concentrations, but in those with transplants recovery was discovered unexpectedly during radio-nuclide scanning.

These findings suggest that recovery of renal function may be more common than generally recognised, which should be borne in mind when beginning renal replacement treatment and particularly when contemplating bilateral nephrectomy.

Introduction

Recovery of renal function in patients receiving long term dialysis or after renal transplantation has been reported.^{1,2} The registry of the European Dialysis and Transplant Association has collected 573 patients from a total of 91 866 who had been treated by dialysis for more than six weeks in whom recovery lasted more than three months—an incidence of 0.6%.² In our renal unit recovery occurred in seven of the first 250 patients (2.8%) accepted for renal replacement therapy. Recovery of renal function was proved by radionuclide imaging in three patients who had received kidney transplants. Without isotope scanning recovery of function by the patients' own kidneys would not have been detected.

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^{99m}Tc-DTPA gammacamera scan of transplant recipient with crescentic glomerulonephritis showing uptake by her own two kidneys.

Present series

Four of the seven patients we describe had received regular haemodialysis as the only form of renal replacement therapy. Their primary renal diseases were mesangiocapillary glomerulonephritis in two, crescentic glomerulonephritis in one, and Goodpasture's syndrome in one. The periods of dialysis before detection of recovery of renal function were 13, 41, 13, and 12 weeks respectively. In the two patients with mesangiocapillary glomerulonephritis recovery of renal function was sufficient to remove the need for dialysis for 50 and 41 weeks respectively. The patient with crescentic glomerulonephritis remained well for four years with a serum creatinine concentration of 380 μmol/l (4.3 mg/100 ml) or less before her renal disease recurred and dialysis again became necessary. The patient with Goodpasture's