Materials and Method
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The present study was conducted in the department of Anaesthesiology, M L B Medical College, Jhansi (U P ) during the year 1996-97, on patients from different surgical specialities, between the age group of 20-60 years, belonging to ASA I and II scheduled for various elective operations.

Selection of patients :-

Subjects for the present study were selected at random, keeping in mind the following criteria

(1) Patients should be in the age group of 20-60 years.

(2) Sex should be no bar in selecting the patients.

(3) Patients with cardiovascular disease or suffering from systemic disorders other than that for which they were scheduled for surgery were excluded from the study.

(4) Patients suffering from any neuro-muscular disease were not scheduled for the study.

(5) Any history of drug intake, that might influence the pharmacodynamics of neuromuscular blocking drugs, were also not included in the study.

(6) Only those cases where duration of surgery was anticipated to be more than one hour, were accepted.

PRE-ANAESTHETIC CHECK UP :-

All the patients were subjected to detailed preanaesthetic check up including history, general and systemic examination and routine investigations.
Routine investigations required during the study were:

1. Blood - Hb%, TLC, DLC, ESR, Blood urea, Blood sugar

2. Urine - Sugar and albumin, Microscopic examination

3. Radiological - X-Ray chest

4. ECG

Apart from these investigations any specific test if required was also ordered, after proper pre-operative anaesthetic check up, an informed consent of the patient to participate in the study was obtained.

The selected patients were then randomly divided into two groups (50 patients in each group) on the basis of muscle relaxant used:

Gp I- Patients received atracurium

Gp II- Patients received vecuronium

These two groups were again subdivided into two subgroups of 25 each, according to the technique of maintenance doses used:

Gp I A- After loading dose of Atracurium 0.5 mg/kg, intermittent bolus doses
of 0.1 mg/kg were given as and when required

Gp I B - After same loading dose of atracurium, infusion was started at the rate of 0.45 mg/kg/hr after 15 min of loading dose

Gp II A - A loading dose of 0.08 mg/kg vecuronium followed by intermittent bolus doses of 0.015 mg/kg given, as required

Gp II B - Loading dose of vecuronium was followed by infusion at the rate of 0.08 mg/kg/hr after 10 min of loading dose

NMBA

Gp I

(Atracurium)

I A

Intermittent bolus doses

I B

Continuous infusion

Gp II

(Vecuronium)

II A

Intermittent bolus doses

II B

Continuous infusion

Starting of infusion pump 15 min after loading dose of atracurium and 10 min. after loading dose of vecuronium were based on the fact that duration of action of loading dose of atracurium and vecuronium have been reported to be 30 - 35 min. and 20 min respectively and starting of infusion at the t½ of drug would maintain a steady plasma concentration

PRE-MEDICATION:--

All the patients were kept on fasting for 8 hours and were advised tab Diazepam 5-10 mg a night before surgery. After obtaining informed consent to participate in the
Peripheral nerve-muscle stimulator - Model AMCA - 100

Nerve - muscle stimulator with electrodes attached at the wrist joint
Kymograph
Starling's heart lever and kymograph assembly attached to the patient's hand to record contractions.
study and consent for the surgery, these patients were premedicated with inj Glycopyrrolate 0.2 mg, inj Promethazine 25 mg, inj Buprenorphine 0.3 mg i m 45 min prior to the induction of anaesthesia. Basal pulse rate, systolic, diastolic and mean arterial pressure were recorded. IV cannulation was performed with 18 gauze cannula under full aseptic precautions. ECG electrodes were connected to the patients.

Surface electrodes of nerve-muscle stimulator (AMCA model 100) were applied at the wrist after applying jelly and were firmly secured in place with adhesive tape.

Ulnar nerve at wrist was stimulated at the wrist joint and isometric twitch contraction produced by single twitch was recorded as a control twitch height on a moving drum of Kymograph.

**INDUCTION :-**

Pre-oxygenation with 100% oxygen was initiated 3-5 min before induction. Induction of anaesthesia was performed with thiopentone sodium 2-5%, 4-5 mg/kg given intravenously, slowly till the abolition of eye lash reflex, followed by bolus dose of suxamethonium 1.5 mg/kg IPPV with mask was done with 100% oxygen. When jaw muscles were adequately relaxed, direct laryngoscopy was performed and the patients were intubated with adequate sizeduffed endotracheal tube. Pulmonary entry of air was checked bilaterally, tube was secured in place with tape and cuff inflated. Connections were made to attach from the patient to the Boyle machine through Bain's circuit. IPPV was continued with N₂O and O₂ in the ratio of 60% and 40%.

When the respiratory excursions were first felt in the reservoir bag, loading doses of Atracurium 0.5 mg/kg and Vecuronium 0.08 mg/kg were given to the Gp I & Gp II patients respectively.
Infusion pump - Vial Medical Program 1: France.

Infusion pump connected to the patient, with neuromuscular relaxant diluted in 50 ml. disposable syringe.
Pulse rate and B P were recorded at 2.5 and 10 min after the loading dose of muscle relaxants. At the same time, onset time (i.e., time from injection to peak effect) was also recorded. Peak effect was judged by suppression of twitch response after single stimuli and depression of all four twitches after four consecutive pulses delivered at 2 Hz for 2 sec that is, train of four stimuli.

When there was 25% recovery of blockade (as assessed by comparing evoked twitch with control value and by giving TOF stimuli), intermittent bolus doses of Atracurium and Vecuronium were given to Gp IA and II A patients respectively and infusion was started 15 min after the loading dose of atracurium and 10 min after the loading dose of vecuronium in Gp IB and Gp II B patients respectively. For infusion, Vial Medical Program I pump was used. Infusion solutions, used during the study, were made by diluting 2.5 ml (25 mg) Atracurium or 2 ml (4 mg) Vecuronium in 50 ml normal saline. Pulse rate and blood pressure were recorded at 10 min interval and EKG monitoring was done in lead II throughout the surgery. At the same time, any signs of histamine release such as unexplained hypotension, tachycardia, urticaria, rashes or bronchospasm were also noted.

Degree of muscle relaxation was assessed clinically by asking the surgeon and by neuromuscular monitoring and was categorized as excellent, good, or unsatisfactory.

10 min before the anticipated completion of surgery, infusion pump was stopped. When there was 25% recovery of blockade (assessed by TOF stimuli), patients were reversed with usual doses of neostigmine and glycopyrrolate and patients were extubated after thorough suctioning. Time taken for full recovery was noted. Criteria taken for full recovery were.
(1) Spontaneous & sustained eyes opening
(2) Protrusion of tongue
(3) Head raising for atleast 5 sec
(4) Ability of patients to follow commands
(5) By the use of N M stimulator by giving TOF stimuli to see if there was any fade present

Absence of any of the above mentioned signs were considered as inadequate or partial recovery and any such delay was noted and managed accordingly

**MONITORING :-**

(1) Pulse rate
(2) Systolic and diastolic B P
(3) E C G monitoring in lead II
(4) Neuromuscular monitoring using single twitch and TOF stimuli
(5) Any signs of histamine release

All the above parameters were recorded as follows -

(1) Before induction (to serve as basal values)
(2) Post intubation
(3) Before non depolarizer muscle relaxant (N D M R)
(4) 2,5 & 10 min after loading dose of N D M R
(5) At every 10 min throughout the surgery
(6) After reversal

All the above data were recorded on pre designed proforma by the same observer.

At the completion of study, the results were compiled and analysed statistically using paired 't' test for changes within the group and unpaired 't' test for comparison among groups