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Incidence Of Myoclonus On Induction With Etomidate And Etomidate With Rocuronium As Priming Agent-A Comparative Study.

Anaesthesiology

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ABSTRACT

BACKGROUND AND AIMS:-
The comparative study of etomidate on induction and Etomidate with rocuronium as priming agent during general anesthesia was studied to compare for the following aims:-

1. Incidence of myoclonus.
2. Pre-operative /intra-operative / post-operative hemodynamic changes (HR/BP/MAP).
3. Any incidence of complications.

And in turn assess the role and usefulness of etomidate in clinical practice as induction agent in general anesthesia.

MATERIAL AND METHODS:-
This study was conducted in two groups in 50 trauma patients in the age group of 20-50 years of ASA-1 status who weighed between 40-70kgs and were of height 5'3" to 5'8" after pre loading with 1 liter of ringer lactate. A sterile 16G IV cannula placed on left or right dorsum of hand, etomidate 0.3-0.6mg/kg/ body weight , rocuronium 0.6-0.8 mg/kg/ body weight, glycopyrolate 0.1-0.2mg , fentanyl 1-2 mcg/kg/ body weight, Boyles anesthesia machine, airway equipment and standard monitoring intraoperatively.

RESULTS:-
Incidence of myoclonus was 100% in group-1 patients where etomidate 0.3-0.6mg/kg/body weight was given prior to rocuronium and nil in group-2 patients, where a priming dose of 5mg of total calculated dose of rocuronium was given before the induction dose of etomidate and followed by injecting the rest of calculated dose of rocuronium.
The hemodynamic/cardiovascular stability was good in both the groups on induction and throughout the surgery except for transient rise of HR/BP/MAP in group-1 patients on induction.

CONCLUSION:-
As hemodynamic stability is seen to be good with etomidate on induction and its main side effect myoclonus can be counteracted with use of priming dose of rocuronium, It is prudent to use etomidate in trauma patients where patients have bled profusely and are unstable hemodynamically being taken up for emergency surgeries.

KEYWORDS:

Etomidate, Rocuronium, General Anaesthesia, Boyles Machine, Airway equipment.

INTRODUCTION:-
Etomidate is a short acting intravenous anesthetic agent used for the induction of general anesthesia and sedation for short procedures such as reduction of dislocated joints, emergency tracheal intubation and cardioversion.

It was developed as Janssen pharmaceutica in 1964 and was introduced as an intravenous agent in 1972 in Europe and in 1983 in United States. Etomidate has a rapid onset of action and a safe cardiovascular risk profile and therefore is less likely to cause a significant drop in blood pressure than other induction agents.

Etomidate is often used because of its easy dosing profile, limited suppression of ventilation, lack of histamine liberation, and protection from myocardial and cerebral ischemia. Thus etomidate is good induction agent for patients who are hemodynamically unstable.

Though with such good properties, etomidate was seldom used in clinical practice for its high incidence rate of myoclonus on induction. Recently many study papers have pointed out that inspite of the high incidence of its side effects myoclonus, etomidate is still a good choice for its cardiovascular stability properties and should be routinely used in clinical practice especially in trauma patients and unstable patients taken up on emergency basis.

We, at Nizams Institute of Medical Sciences- Hyderabad have studied and found that the side effect myoclonus of etomidate can be avoided by giving a priming dose of rocuronium (i.e., 5mg of the calculated dose) before giving etomidate for induction.

Our study revealed nil incidence of the side effect myoclonus of etomidate , on use of priming dose of rocuronium.

MATERIAL / METHODS And TECHNIQUE:-
The study was conducted in 50 trauma patients at Nizams Institute of Medical Sciences, Hyderabad after obtaining prior permission of the institute ethics committee and informed consent of every patient in the study and their near blood relatives.

Detailed history and clinical examination was undertaken in all the

patients such that patients with systemic disease as hypertension, diabetes mellitus , neurological problems were excluded and the patients of only ASA-1 and MPG-1 and 2 status were included in the study.

All the patients were investigated for complete blood picture, urine analysis, electrocardiography, renal function test, chest X-ray to rule out any organic disease and respiratory abnormality. Patients selected were in the age group of 20-50 years, weighed between 40-70kgs and of height between 5'3" – 5'8".

Patients were allocated to two groups comprising of 25 patients each.

Boyles working station, circuits, airway equipment were checked prior to beginning of each case with standard monitoring.

All patients pre-op haemodynamics like HR/BP/MAP were noted prior to start of general anesthesia.

IN Group-1 :-
General Anesthesia was given by rapid sequence method in the following way

-Preoxygenation for 5 min
-Inj. Glycopyrolate 0.1-0.2mg
-Inj. Fentanyl 1-2 mcg/kg/ body weight
-Inj. Etomidate 0.3-0.6 mg/kg/ body weight over 60 seconds
-Appropriate cricoid pressure applied.
-Inj. Rocuronium- 0.6-0.8 mg/kg/ body weight.

Airway secured after 60 seconds with appropriate size endotracheal tube with cricoid pressure for any untoward aspiration and ventilation resumed with 6-7 mg/kg/ body weight tidal volume (VT) with O2 + Air mixture of 2:2 liters.

Hemodynamic parameters like HR/ BP/ MAP were noted every minute for 5 minutes for study purpose .

Later the case was managed with O2 :N2O of 2:2 L + sevoflurane 2% and Atracurium + fentanyl infusion of 1mg:1mcg ratio throughout the surgery.

IN GROUP 2:-
Patients were anesthetized with standard monitoring in the following way after noting pre op hemodynamics like HR/ BP/ MAP-

-Pre oxygenation for 5 min
-Inj. Glycopyrolate- 0.1- 0.2 mg
-Inj. Fentanyl - 1-2 mcg/kg body/ weight
-Inj. Rocuronium - 5mg of the total calculated dose for the patient body weight.
-Inj. Etomidate - 0.3- 0.6 mg /kg/ body weight over 60 sec .
-Appropriate cricoid pressure applied .
-Inj. Rocuronium - 0.6- 0.8 mg/kg body weight remaining dose

Airway secured after 60 seconds with appropriate size endotracheal tube with cricoid pressure and ventilation resumed with 6-7 mg/kg/ body weight tidal volume (VT) with O2 + Air mixture of 2:2 liter.

Hemodynamic parameters like HR/ BP/ MAP were noted every minute for 5 minutes for study purpose.

Later the cases were managed with O2 :N2O: sevoflurane of 2L:2 L:2% and atracurium + fentanyl infusion of 1mg:1mcg ratio throughout the surgery.

OBSERVATION AND RESULTS :-
IN GROUP 1 PATIENTS-

s.no	Type of surgery	Preophaemodynamics		Incidence of myoclonus on induction with etomidate		Haemodynamic changes noted on induction with etomidate every minute for 5 minutes														
		HR	BP	MAP		1minute			2minute			3minute			4minute			5minute		
						HR	BP	MAP	HR	BP	MAP	HR	BP	MAP	HR	BP	MAP	HR	BP	MAP
1	Degloving injury lt upperlimb with # humerus compound	92	110/70	83.3	Appreciated for 12 sec	88	100/70	80	82	110/70	83.3	78	110/70	83.3	80	120/70	86.6	82	120/70	86.6
2	BB # left leg with vascular injury with fungal infection on patient back	96	130/80	96.6	Appreciated for 10 sec	90	110/80	90	88	110/70	83.3	94	130/80	96.6	90	130/80	96.6	88	120/70	86.6
3	Crush injury right hand	84	110/70	83.3	Appreciated for 15 sec	80	110/70	83.3	76	130/80	96.6	80	110/70	83.3	84	120/70	86.6	84	120/70	86.6
4	BB # rt forearm	98	110/70	83.3	Appreciated for 8 sec	100	130/80	96.6	96	120/70	86.6	88	120/70	86.6	80	110/70	83.3	80	110/70	83.3
5	# lt humerus + bb #	92	110/70	83.3	Appreciated for 10 sec	96	130/70	90	95	110/70	83.3	84	110/70	83.3	80	120/70	86.6	80	120/70	86.6

6	Degloving injury rt upperlimb with #humerus	88	110/70	83.3	Appreciated for 12 sec	88	130/70	90	80	110/70	83.3	78	110/70	83.3	75	120/70	86.6	82	110/70	83.3
7	Degloving injury abdomen	110	110/70	83.3	Appreciated for 10 sec	100	130/70	90	95	120/70	86.6	90	110/70	83.3	90	110/70	83.3	85	110/70	83.3
8	Crush injury lt hand for groin flap	88	110/70	83.3	Appreciated for 15 sec	88	120/70	86.6	80	120/70	86.6	80	110/70	83.3	80	110/70	83.3	80	110/70	83.3
9	Blunt injury abdomen	98	130/90	103.3	Appreciated for 8 sec	90	140/100	113.3	90	130/90	103.3	88	110/70	83.3	82	110/70	83.3	80	110/70	83.3
10	Crush injury Index finger	88	120/70	86.6	Appreciated for 14 sec	92	140/90	106.6	90	120/80	93.3	86	120/70	86.6	84	110/70	83.3	84	110/70	83.3
11	Degloving injury rt upperlimb with humerus #,LD flap,ext fixation	88	110/70	83.3	Appreciated for 14 sec	92	130/70	90	88	120/70	86.6	84	110/70	83.3	80	110/70	83.3	80	110/70	83.3
12	Blunt injury abdomen	84	110/70	83.3	Appreciated for 8 sec	90	130/90	103.3	84	120/80	93.3	86	120/80	93.3	80	120/70	86.6	80	120/70	86.6
13	#BB rt forearm	96	130/70	90	Appreciated for 10 sec	110	140/90	106.6	100	140/90	106.6	96	130/80	96.6	92	130/80	96.6	92	130/80	96.6
14	Crush injury rt hand	88	110/70	83.3	Appreciated for 6 sec	96	130/70	90	90	110/70	83.3	90	110/70	83.3	88	110/70	83.3	84	110/70	83.3
15	#BB lt forearm	92	130/90	103.3	Appreciated for 10 sec	100	150/100	116.6	100	140/100	113.3	95	130/90	103.3	88	130/90	103.3	86	130/90	103.3
16	Blunt injury abdomen	110	100/70	80	Appreciated for 8 sec	110	110/90	96.6	100	130/90	103.3	96	120/90	100	98	110/90	96.6	100	110/90	96.6
17	Polytrauma with blunt injury abdomen	90	110/70	83.3	Appreciated for 12 sec	90	120/90	100	88	110/70	83.3	86	110/70	83.3	88	110/70	83.3	80	110/90	83.3
18	Compound # humerus lt upperlimb	88	130/70	90	Appreciated for 14 sec	92	140/90	106.6	96	130/70	90	98	130/70	90	92	110/70	83.3	88	110/70	83.3
19	Crush injury left leg with blunt injury abdomen	110	110/70	83.3	Appreciated for 7 sec	115	110/70	83.3	112	120/70	86.6	100	120/70	86.6	98	110/70	83.3	98	110/70	83.3
20	Compound # BB forearm	92	130/90	103.3	Appreciated for 12 sec	100	130/100	110	100	130/90	103.3	98	130/90	103.3	90	130/90	103.3	88	130/80	96.6
21	Crush injury rt hand	88	110/70	83.3	Appreciated for 8 sec	92	120/70	86.6	90	120/70	86.6	88	110/80	90	86	110/70	83.3	88	110/70	83.3

22	Degloving injury abdomen	98	100/70	80	Appreciated for 12 sec	110	110/60	76.6	110	110/60	76.6	102	110/70	83.3	98	110/70	83.3	92	110/70	83.3
23	Compound #BB lt forearm	88	130/90	103.3	Appreciated for 16 sec	94	140/90	106.6	96	140/90	106.6	90	130/90	103.3	88	130/90	103.3	88	130/90	103.3
24	Crush injury rt hand	96	140/100	113.3	Appreciated for 7 sec	100	140/90	106.6	98	130/90	103.3	96	130/90	103.3	100	130/70	90	98	130/70	90
25	Blunt injury abdomen	92	140/90	106.6	Appreciated for 8 sec	100	150/90	110	98	130/70	103.3	100	130/70	90	100	130/70	90	96	130/70	90

IN GROUP-2 PATIENTS-

						GROUP 2 PATIENTS													
S no	**Type of surgery**	**Preophaemoynamics**			**Incidence of myoclonus on induction with etomidate**	**Haemodynamic changes noted on induction with etomidate every minute for 5 minutes**													
		HR	**BP**	**MAP**		**1 minute**			**2 minute**			**3 minute**			**4 minute**			**5 minute**		
						HR	**BP**	**MAP**	**HR**	**BP**	**MAP**	**HR**	**BP**	**MAP**	**HR**	**BP**	**MAP**	**HR**	**BP**	**MAP**
1	Crush injury lt hand	110	110/70	83.3	Not seen	110	130/70	90	100	120/90	100	98	110/70	83.3	92	110/70	83.3	90	110/70	83.3
2	Blunt injury abdomen	98	130/90	103.3	Not seen	100	140/90	106.6	98	130/90	103.3	90	120/80	93.3	92	110/70	83.3	90	110/70	83.3
3	Crush injury rt hand	92	110/70	83.3	Not seen	96	120/70	86.6	98	110/70	83.3	90	110/70	83.3	90	110/70	83.3	90	110/70	83.3
4	# com pound BB lt forearm	88	130/70	90	Not seen	90	130/70	90	94	130/70	90	92	130/90	103.3	88	120/80	93.3	84	120/80	93.3
5	Crush injury rt hand	82	140/90	106.6	Not seen	90	140/90	106.6	92	140/90	106.6	88	130/90	103.3	92	130/90	103.3	90	130/90	103.3
6	# compound BB rt fore arm	88	110/70	83.3	Not seen	92	120/80	93.3	90	110/70	83.3	88	110/70	83.3	86	110/70	83.3	90	110/70	83.3
7	Compound # rt humerus	92	130/80	96.6	Not seen	100	130/90	103.3	96	120/90	100	100	110/70	83.3	96	110/70	83.3	92	110/70	83.3
8	Crush injury rt hand	84	110/70	83.3	Not seen	90	120/90	100	88	110/70	83.3	88	110/70	83.3	92	110/70	83.3	90	110/70	83.3
9	Blunt injury abdomen	88	130/90	103.3	Not seen	96	140/90	106.6	94	130/90	103.3	96	130/90	103.3	90	130/70	90	90	130/70	90
10	Degloving injury upper limb	92	140/100	113.3	Not seen	100	150/100	116.6	98	140/90	106.6	96	140/90	106.6	90	130/90	103.3	92	130/90	103.3
11	Depressed # frontal bone with CSF rhinorrhoea	96	130/90	103.3	Not seen	100	140/90	106.6	100	130/90	103.3	98	130/90	90	96	130/70	90	92	130/70	90
12	Rt wrist cut injury	88	110/70	83.3	Not seen	90	120/80	93.3	88	120/70	86.6	92	110/70	83.3	90	110/70	83.3	88	110/70	83.3
13	Blunt injury abdomen	78	100/70	80	Not seen	84	110/90	96.6	90	110/90	96.6	88	110/70	83.3	92	110/70	83.3	90	110/70	83.3
14	Crush injury lt hand	86	130/90	103.3	Not seen	90	140/90	106.6	88	140/80	100	92	130/90	103.3	96	130/90	103.3	92	130/90	103.3
15	Above elbow amputation for crush injury left upperlimb	92	140/70	93.3	Not seen	100	130/70	90	88	120/70	86.6	90	120/70	86.6	86	110/70	83.3	84	110/70	83.3
16	Blunt injury abdomen	110	100/70	80	Not seen	108	110/70	83.3	100	110/70	83.3	98	110/70	83.3	96	110/70	83.3	94	110/70	83.3

17	Degloving injury with humerus #+BB fore arm rt upperlimb	98	130/90	103.3	Not seen	100	140/90	106.6	98	130/90	103.3	96	130/80	96.6	100	130/90	103.3	92	130/70	90
18	Blunt injury abdomen	96	110/70	83.3	Not seen	100	110/80	90	98	110/70	83.3	92	110/70	83.3	90	110/80	90	88	110/80	90
19	Polytrauma with diaphragmatic hernia	110	130/90	103.3	Not seen	110	140/90	106.6	108	140/90	106.6	102	130/100	110	98	130/90	103.3	96	130/90	103.3
20	Scalp avulsion injury	90	110/70	83.3	Not seen	94	120/90	100	90	120/70	86.6	88	110/70	83.3	90	120/70	86.6	88	120/70	86.6
21	Blunt injury abdomen	110	130/70	90	Not seen	108	140/90	106.6	100	130/90	103.3	98	130/90	103.3	92	120/90	100	88	130/90	103.3
22	Compound # humerus with brachial artery injury rt upper limb	96	110/60	76.6	Not seen	100	120/70	86.6	98	110/70	83.3	88	130/70	90	86	120/60	80	88	120/60	80
23	Lt wrist cut injury	88	120/70	86.6	Not seen	90	130/80	96.6	92	120/80	93.3	88	120/80	93.3	92	120/80	93.3	90	120/80	93.3
24	Compound # BB forearm rt upper limb	92	110/70	83.3	Not seen	90	120/70	86.6	88	110/70	83.3	92	110/70	83.3	86	110/80	90	82	110/80	90
25	Crush injury rt hand	88	130/90	103.3	Not seen	92	130/100	110	88	130/90	103.3	84	130/90	103.3	80	130/80	96.6	82	130/80	96.6

COMPLICATIONS:-
Nil in both the groups.

DISCUSSION:-
The study was conducted in 50 selected patients undergoing surgeries for trauma and were allotted to two groups of 25 patients each.

In group-1-->patients were given etomidate 0.3-0.6mg/kg/ body weight as induction agent and in group-2 --> patients received priming dose of rocuronium (5mg) prior to etomidate for induction followed by rest of the calculated dose of rocuronium 0.6-0.8mg/kg/ body weight.

The mean age of the patients studied in both the groups were same (37 years) such that age was not a criteria for any variation of the parameters studied and as well the type of surgeries were almost identical in both the groups.

Mean height and mean weight were also identical in both the groups and there was no variation in dosing of the drugs.

Etomidate which is an imidazole has the most favorable therapeutic index for single bolus administration as an induction agent in general anesthesia.

Though etomidate is known to be a cardiovascular stable agent on induction, the main concern of this drug always has been its two side effects I.e. myoclonus on induction and suppression of adrenal cortisol synthesis.

Our main aim of this study was to observe whether that the myoclonus side effect could be shunned and avoided by the priming dose of rocuronium(5mg) prior to induction by etomidate.

We also advice that the etomidate should be used cautiously or avoided in sepsis patients coming for emergency surgeries for its another troublesome side effect I.e cortisol suppression.

Apart from these, etomidate is hemodynamically stable drug on induction and the myoclonus side effect can be avoided by the use of priming dose of rocuronium prior to induction with etomidate.

CONCLUSION:-
This study was done to evaluate the hemodynamic stability of etomidate and avoidance of the side effect myoclonus on induction.

We conclude that the incidence of the myoclonus was nil in our study when a priming dose of rocuronium (5mg) was given prior to induction with etomidate (0.3-0.6mg/kg body/ weight) followed by remaining calculated dose of rocuronium(0.6-0.8mg/kg/body weight).

We also reiterate that etomidate is a cardiovascular stable induction agent and should be routinely used in trauma and hemodynamically unstable patients who come on emergency basis for surgery.

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CONFLICTS OF INTEREST:-
There are no conflicts of interest

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