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COMPARATIVE STUDY OF ROCURONIUM VERSUS VECURONIUM AS INTUBATION AGENT IN TETRALOGY OF FALLOT SURGERY CASES

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ABSTRACT:

Background :The Randomized retrograde blinded study was carried out to evaluate the intubation condition of two different muscle relaxants in 50 cases of Tetralogy of fallot. **Material &Method** :Patients were Anaesthetized with inj. Rocuronium 0.9 mg/kg IV or inj. Vecuronium 0.1 mg/kg after inj. Fentanyl 1 µg/kg, inj. Midazolam 0.01 mg/kg & inj. Ketamine 2 mg/kg. Neuromuscular blockage was assessed by twitchresponse of Adductor pollicis longus muscle after supramaximal stimulation of ulnar nerve. **Observations**Tracheal intubation conditions were assessed by blinded anesthetist after 60 sec.till patient got intubated. Time of onset % of Neuro-muscular blockage duration of action were more in vecuronium group.**Conclusion**Rocuronium is better alternative than vacuronium in tetralogy of fallot surgery cases.

KEYWORDS :Neuromuscular relaxant, Rocuronium , Tetralogy of Fallot, Vecuronium

INTRODUCTION: Tetra logy of fallot was first described by Fallot in 1888⁽¹⁾.It is characterized by large VSD, Right ventricular outflow obstruction, overriding of aorta over pulmonary artery and Right ventricular hypertrophy. Pathophysiology of right to left shunting is there which produce cyanosis in these patients. Magnitude of shunt depends on SVR and PVR^(2, 3).Increase in PVR and decrease in SVR worsens the cyanosis by increasing magnitude of shunt so paroxysmal attacks of cyanosis occur which is known as tet spells(Hyper cyanotic spells).Due to chronic hypoxemia Erythropoietin production increase which leads to polycythemia and clubbing^(4,5)

Goal of anesthesia in this patient is to (1)Decrease PVR by 100% oxygen and early intubation.(2)To increase SVR by knee chest position(if s Hyper cyanotic spells) and alpha adrenergic agonist(phenylephrine).(3)To overcome dynamic outflow obstruction by beta blocker and deep plane of anesthesia^(2,5)

Rocuronium in new steroidal Non depolarization Muscle Relaxant having Rapid onset of action & intermediate duration of action & good hemodynamic stability. Rocuronium is ORG 9426, 2

Morpholino-16 allyl Pyrididino derivative of 3-Hydroxy analog of vecuronium with NM potency of 1/5 of Vecuronium^(6,7)

Main objective of study was to evaluate intubation condition with Rocuronium. After administration of 2-3*ED95 0.9 mg/kg with Vecuronium 0.1mg/kg which is commonly used NMR in congenital cardiac surgery cases as it has excellent hemodynamic stability. We have used TOF guard as main parameter to assess NMDA.

Material & Methods:

Starvation Protocol for Patients was followed in following manner^(2,5)

- No solid milk or formulated milk for 6 hrs
- No breast milk for 4 hrs
- No water or clear juice for 2 hrs.

All patients were evaluated day before surgery thoroughly and optimized medically. After approval of institutional committee & informed consent of patients, this randomized controlled double blinded study was carried out in 50 patients of TOF of ASA grade III & IV. I.V. line secured and prophylactic antibiotic given. All patients premeditated with inj. Fentanyl 2 µg/kg and inj. Midazolam 0.01 mg/kg. Pulse oxy-meter ECG attached and vitals evaluated.

Nerve stimulator TOF guard of Drager applied to forearm to stimulate ulna Nerve. Reference electrode placed on palmar surface of base of index finger. Active electrode between thumb and index finger. Test hand was immobilized in supine position by arm board. Free movement during thumb adduction was allowed by fixation of extended ulnar side fingers by adhering tapes⁽⁸⁾

Patients were pre-O₂ by 100% O₂. Anesthesia was given with Inj. Ketamine 2mg/kg^(9,10) & Inj. Rocuronium 0.9mg/kg^(6,7) or Inj. Vecuronium 0.1mg/kg⁽¹¹⁾. Before administration of any relaxants, supra maximal stimulus was determined by help of TOF guard by contraction of Adductor pollicis & Flexor digitorum muscles. Thumb adduction was quantified via force displacement transducer. Injection time of Muscle relaxant was noted. Every one sec. Single twitch was given till 100% suppression of control of twitch response⁽⁸⁾. Same blinded anesthetist assessed intubation condition by Cooper scale. After intubation ET Tube was fixed by checking equal bilateral air entry. After intubation nasal infant feeding tube was introduced. Patient was put on ventilator (Pressure mode). Internal Jugular venous cannulation done with shel-dingers technique & appropriate size cannula inserted and fixed. Femoral artery cannulation was done for invasive arterial monitors. Routine antibiotic Prophylaxis was given to prevent endocarditis from transient bacteremia.

We have taken two types of surgery for present study⁽¹²⁾

- Palliative Surgery- Blalock taussig shunt where surgery is done through Thoracotomy
- Intracardiac Repair- TOF surgery is done through Sternotomy.

ABGA, sugar, calcium, electrolytes, ECG, Invasive blood pressure, Oxygen saturation monitored intermittently and throughout operation. B-blocker like Esmolol & Propranolol kept ready to decrease Heart Rate⁽¹³⁾. Inotropes in form of Noradrenalin, Dobutamine, Phenylephrine kept ready^(14,15). Inj. Tranexamic acid 1 mg/kg bolus given and then infusion started. Venodilator in form of NTG kept ready. Heparinization done with 300 IU/kg and 100IU/kg if BT shunt surgery. As surgical cannulation was done and patient is on heart lung perfusion, ventilation was standby. Heparin repeated at 50 min. Interval. Temp., HR, Invasive BP, CVP, urine output maintained. Perfusion flow was maintained 100-150 ml/kg/min. Temp. Monitored with nasopharyngeal probe. On heart lung machine:membrane oxygenator with filter used and priming is done with crystalloid(patient is cyanotic).mean bypass time is 60±15 minute in ICR cases.On CPB maintenance of anesthesia with narcotics(Fentanyl) and relaxant.Hypothermia between 25 c to 28 c which cause Haemodilution.cardioplegia given by perfusionist.All investigation ABGA, electrolytes,Urine output and temperature were checked periodically and maintained within normal limits. After total ICR, slowly patient is weaning from CPB to normal ventilator by partial flow. Heparin was reversed by inj. protamine by 1:1.5 correction^(2,5)

As proper clotting is assessed clinically and normal ABGA, Sternum is closed.Before shifting patients antibiotic and inj ondansatrom given. Patient is shifted to open heart ICU where patient is put on body warmer, maintains surface temp. 36-37°C. Patient was nebulised and put on Pressure controlled ventilator. As if chances of bleeding are there prophylactically FFP, PRC given to stop post CPB bleeding secondary to dilutional thrombocytopenia and coagulopathy.patients were reversed in ICU after stable haemodynamics and no any drain output^(2,5)

RESULTS & DISCUSSION

	Group R	Group V
Mean Age (Years)	7±1	6±1
Mean Wt. (Kg)	10±3	11±2
Sex(Male:Female)	19:6	20:5
Total No.	25	25

Statistical significance of different variables by Turkey test and Students T test and P<0.05 was significant.

Type of surgery	No. Of Patients
	(Group R)/(Group V)
Blcock tausing shunt	6 5

Intracardiac repair of TOF	19 20
Total	25 25

ONSET AND DURATION OF RELAXATION:

	Group R	Group V	P value
Onset Time Of Relaxation (Seconds)	90±30.4	174±20.6	P<0.001
Duration Of Action (minutes)	28±6	30±5	P<0.001

W.M sahramn, K. strasser and C.K. Spiss studied that onset time in their study for rocuronium (0.6mg/kg) onset was 142 second and for vecuronium 192 second⁽¹⁶⁾. In our study rocuronium (0.9mg/kg) was used and onset was early.

In R group 22 patients have 100% suppression of supramaximal stimulus and 3 have 95% suppression. In V group 21 patients have 100% suppression and 4 have 90% suppression of supramaximal stimulus. With intubation dose 22 patient intubated within 60 sec. And 3 patients within 90 sec. With V group 21 patients within 2.4 min. And 4 patients within 3 min. Onset time is shorter with R group (90±30.4 sec.) than with V group (174±20.6) sec.

HAEMDYNAMICS:

Heart Rate/Min.

	Resting	After induction.	After intubation at 1 Min.	3 Min.	5 Min.
Group R	110±8	112±10	118±9	113±8	108±8
Group V	106±7	108±8	110±5	108±5	106±5

Mean arterial Pressure (mmHg)

	Resting	After induction.	After intubation at 1 Min.	3 Min.	5 Min.
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Group R	55±5	56±4	58±3	59±2	60±4
Group V	54±6	55±2	58±5	60±5	59±3

W.M sahramn,K.strasser and C.K. Spiss studied that there are no changes in HR and MAP in neurosurgical patients⁽¹⁶⁾

M.Naguib,A.H Samarkandi and associates have studied histamine release haemodynamic changes produced by rocuronium,vecuronium,mivacurium and tubocurarine ,they found no significant change in HR and in MAP in both R and V group⁽¹⁷⁾

Mild increase in HR and MAP was in R group which might be vagolytic effect of Rocuronium which came to almost basal level within 10 min. In case of TOF slight increase HR and MAP needed as it decrease magnitude of shunt. There is no difference in SpO₂, ETCO₂ and other vitals.^(16,17,18)

Cooper et al Scale (Scoring of intubation condition)⁽¹¹⁾

Score	Jaw relaxation	Vocal Cord Movement	Response to intubation
0	Poor(impossible)	Closed	Severe Coughing or bucking
1	Minimal(difficult)	Closing	Mild Coughing
2	Moderate(fair)	Moving	Slight Diaphragmatic movement
3	Good(easy)	Open	None

Total Score : 8-9 =Excellent 6-7 =Good

3-5 =Fair 0-2 =Poor

In both R and V Group score was 8-9.

Bronchospasm, Tet spells (24 %) and cyanosis (24%) were noted in both R and V group.

Aim of our study was to compare intubation condition of patient by using 2 non-depolarizing agents Rocuronium 1mg/kg or Vecuronium And to confirm that Rocuronium in good intermediate acting non-depolarizing agent.

Okelly et al. Studied pharmacokinetics of rocuronium in pediatric patient and concluded that weight rather than surface area is more useful for calculation of dosage in pediatric patients depending on this. We choose bolus dose of rocuronium 0.9 mg/kg ($3 \times ED_{95}$)⁽¹⁹⁾

Quality of neuromuscular junction block was comparable by intubation condition. Early blockage of laryngeal muscle rather than adductor pollicis by Rocuronium and ease of intubation can not be judge by depression of single twitch. All the patients in R group. Have no diaphragmatic movement.

J. F. Curl and colleagues observe good intubation condition even with 0.6 mg/kg of Rocuronium at 45 sec. With propofol and Fentanyl. Fentanyl is short acting opioid as hypnotic as well as analgesic effect. Curl also used propofol which relaxes laryngeal muscles so that they could intubate in shorter duration with less dose.⁽²⁰⁾

Fuchs Budder and Tassongi demonstrated increase dose of 0.6 to 0.9 mg/kg of rocuronium in children significantly decrease onset of action and prolong duration of action.⁽²¹⁾

Susan Woolfel found clinical duration 26.7 ± 1.9 min. Stoddart observed 24.2 ± 6.6 min. In our study it was 28 min. Which is due to 2 ED₉₅ dose as well as summative effect of rocuronium and Fentanyl.^(22,23)

Our result support that onset of motor blockage and vocal cord and diaphragm is earlier with rocuronium than vecuronium. ($P < 0.05$)

Pre induction administration of opioid with anxiolytic improves condition of intubation specifically in R group.

TOF patient are very sensitive patients early intubation is good option to overcome tet spell. The infundibular spasm in total 24 % of patient. Tet spell was three in R group and Three in V group. P is not significant as it is due to pathology it self which was corrected by knee chest position, inj. Phenylephrine $5 \mu\text{g}/\text{kg}/\text{min}$. Over 5 min. With inj. Propranolol $0.1 \text{ mg}/\text{kg}/\text{min}$. But in R group intubation was early while in V group patient has to be ventilated through bag and mask till suitable intubation condition was achieved.^(13,14,15)

CONCLUSION:

In nutshell we conclude that Rocuronium is a better alternative to vecuronium as a intubation agent in TOF surgery patients. Rocuronium provides better hemodynamic stability and early intubation to overcome TET spells.

SUMMARY: We have taken 25 pediatric patients ASA grade(3&4) in each group. group R and group V. In both group we have given Inj. Ketamine as a induction agent $2 \text{ mg}/\text{kg}$. In group R we have used rocuronium $0.9 \text{ mg}/\text{kg}$ and In group V Inj. Vecuronium $0.1 \text{ mg}/\text{kg}$ as a muscle relaxant. Neuromuscular monitoring done with adductor polliis longus and flexor digitorum muscles by TOF guard. Intubation conditions were judged by Cooper scale. In both group excellent intubation conditions achieved. (score 8-9). Onset time was 90 ± 30.4 seconds in

rocuronium group and 174 ± 20.6 seconds in vecuronium group. so early intubation possible in R group. In both group no haemodynamic adverse actions.

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