Original Research Article

Comparison of intramuscular atropine and glcopyrrolate in children undergoing various surgical procedures under general anaesthesia

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Abstract

Background: Antiocholinergic premedication in paediatric patients undergoing surgeris under general anaesthesia plays in important role in blocking the potentially dangerous vagal reflexes and in also controlling the oropharyngeal secretions and respiratory secretions. **Aim and objective:** To compare the clinical effects of intramuscular atropine 0.02 mg/kg and intramuscular glcopyrrolate 0.01 mg/kg as premedicant drugs in children undergoinig various surgical procedures under general anaesthesia. **Methodology:** 50 children in the age group 5-19 yrs were allocated to 2 groups of 25 each. Glycopyrrolate was administered at the dose of 0.01 mg/kg IM and atropine 0.03 mg/kg IM, half an hour before surgery. The following clinical parameters were compared at different time intervals heart rate, temperature and dryness of mouth. In the post operative period incidence of nausea and vomiting was compared in both the groups. **Results and discussion:** Majority of the children who received intramuscular glycopyrrolate 0.01 mg/kg showed sable heart rate, superior antisialogogue action, minimal or no rise in body temperature compared to children receiving intramuscular atropine 0.02 mg/kg. The incidence of postoperative nausea and vomiting was less in the glycopyrrolate group, but this was not statistically significant compared with the incidence in the atropine group.
Key Word: intramuscular atropine, glcopyrrolate.

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Received Date: 10/06/2018 Revised Date: 21/07/2018 Accepted Date: 05/08/2018
DOI: https://doi.org/10.26611/1015723

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 10 August 2018

INTRODUCTION

Anaesthetic Management of patients begins with preoperative psychological preparation and premedicatation. As premedication is a part and beginning of the anaesthetic, choice of premedication is based on the patient's physical status and requirements of the surgery. Suitable pre medication is necessary for facilitation of smooth induction of anaesthesia[1]
Premedicaiton is given with the following objectives.

- To dry secretions in the respiratory tract.
- To block possible harmful vagal reflexes.
- To produce sedation, ease of separation and facilitate smooth induction of anaesthesia.
- To supplement analgesia and reduce the requirement of general anaesthetic drgs.[2]

The first two objectives are achieved with the use of anticholinergic drugs. Autonomic innervation of the heart in infacts and children is predominantly parasympathetic because of the relatively sparse sympathetic innervation. Therefore, a variety of physicological stimuli that might occur during anaesthesia and surgery may produce serious bradycardia. Instrumentation of the airway, especaily during lighter planes of anaesthesia, an intial intravenous dose of succinylcholine[3] and halothane adminstration[4] cause bradycardia and decrease in cardiac output. Because children's stroke volume is relatively constant, a slow heart rate is invariably Accompanied by decreased cardiac output and decreased systemic blood pressure. Excessive airway secretions associated with

How to site this article: Raja shekar Reddy Motkar, Venkatesh Babu Thippeswamy, Surendra M Chinnappa. Comparison of intramuscular atropine and glcopyrrolate in children undergoing various surgical procedures under general anaesthesia. *MedPulse International Journal of Anesthesiology.* August 2018; 7(2): 53-58. http://medpulse.in/Anesthsiology/index.php

installation anaesthetic induction and instrmentation can cause difficulty in tracheal intubation.[3] Due to these multiple factors that may cause bradycardia and hypotension during anaesthesia, and the difficulty in securing the airway due to excessive airway secretions inclusion of anticholinergic drugs in the paediatric patinet's premedication regimen is imperactive.[4] Route of administration is an important factor in paediatric patients. Establishing venous access is difficult and is usually accomplished by inducing the patient under halothane anaesthesia. Bradycardia associated drugs on the hear due to the longer circulation time that accompanies the decrease in caridiac output. Absorption of atropine from the gastrointestinal tract is unpredictable and is dependent upon gastic content, pH and motility Glycopyrrolate is not absorbed from the gastrointestinal tract. Intramuscular administration of both atropine and Glycopyrrolate produce predictable and reliable plasma concentrations. Therefore intramuscular administration of anticholinergic drugs pror to induction of anaesthesia helps to avoid the complincations associated with induction of anaesthesia and secuirng the airway. Atropine, a amine anticholinergic agent, has been in use to overcome these complications and for conduciton of safe and smooth anaesthetic induction. But it is associated with cardivascular inbsability like tacharrythmias, mydriasis, urinary retention and central nervous system complcations. Glycopyrrolate, a quaternary ammonium anticholinergic agent, protects against the vagal reflexes, controls oropharyngeal secretions and maintains cardiovascular stability. It being a quaternary ammonium compound does not cross the blood brain barrier and placental barrier and so do not have CNS effects and fetal effects. Anticholinergics in common use in anaesthesia are atropine and giycopyrrolate. These drugs differ pharmacologiclaly and have different pharmacodnamic and pharmacokinetic responses. Hence the present study was planned to compare clinically the effcacy of atropine 0.02 mg/kg IM and glycopyrrolate 0.01 mg/kg IM as a pre anaesthetic medication with respect to control of oropharyngeal secretions, duration and extent of vagolysis, body temperature and postoperative nauses and vomiting.

MATERIAL AND METHODS

This study was conducted on patients admitted to Chigateri General Hospital and Bapuji Hospital, Davangere, during the period of April 2002 to January 2004, in the departments of General surgery, Paediatric surgery, NET and Orthoaedics. 50 Patients of ASA grade 1 and grade 2, of either sex aged 5-10 years were included in the study. Children undergoing any surgical procedure were selected for the study. Patients were divided into 2 groups of 25 each. Group A (atropine)– 0.02 mg/kg.IM Group G (glycopyrrolate)–0.01 mg/kg.IM The above drugs were given intramuscularly in the gluteal region 30 minutes prior to surgery. The Ethics and Standards Committee of this institution approved the study. Informed consent was also obtained from the parents or gurdians for conducting the study on children. All patients were visited and evaluated for fitness for the intended procedure and anaesthesia on the day prior to the surgery. During this visit, the procedure of the study planned was explained to the parents. An attempt was made to alleviate the anxiety of the patients and their parents. Parents were also instructed on the nil per oral guidelines. General clinical examination of the patient was performed by assessing built, nourishment, hydration, weight, mental status, pulse, B.P, temperature. Anxiety and emotional status of the child was noted. Systemic examination was done. The following laboratory investigations were performed on all the subjects in the study, Blood: Hb%, HIV and Hbs Ag, Bleeding time and clotting time as required, Urine: routine and microscopy and Chest –X-ray: as required. In the preanaesthetic room baseline recordings of heart rate, temperature, dryness of mouth of the child were noted. In our study 25 cases were given atropine 0.02 mg/kg IM and 25 cases were given glycopyrrolate 0.01 mg/kg IM, 30 minutes prior to surgery. Just before induction, pulse rate, temperature and oral examination for dryness of mouth of the children were recorded. General anesthesia was induced by facemask with oxygen (40%), nitrous oxide (60%) and incremental halothane administration (0.5-3%) until the loss of eyelash reflex. I, V line was secured. Preoxygenation was done and depolarizing muscle relaxant succinylcholine 1, 5-2 mg/kg was given to facilitate endotracheal intubation. Balanced anaesthesia technique with Nitrous oxide (60%) + Oxygen (40%) + Non Depolarizing muscle relaxant + IPPV was used. Injection Pentazocine 0.5 mg / kg was given. At the end of the surgical procedure patients were reversed with neostigmine (0.05 mg/kg) and atropine (0.02mg/kg) or glycopyrrolate (0.01 mg/kg) for respective groups. Extubation was done. The following parameters were studied before, during the procedure and post operatively. 1.Pulse rate. 2.Temperarture. 3.Dryness of mouth. 4.Postoperative nausea and vomiting. All parameters were compared for both the groups. Data was analysed with appropriate statistical tests.

RESULTS

A total of 50 children were enrolled in the present study, 25 of them received 20 µg.kg atropine and 25 of them received 10 µg.kg of glycopyrrolate IM 30 minutes before the procedure. The mean age in atropine group is

6.9 years. The mean age in glycopyrrolate group is 7.4 years. In the atropine group of the 25, 14 were male and 11 were female. In the glycopyrrolate group of the 25, 16 were male and 9 were female. In the atropine group weights ranged from 12 kg to 30kg. Mean weight of the patients was 18.68 ± 5.00 kg. In the glycopyrrolate group weights ranged from 14 kg to 30 Kg. Mean weight of the patients was 20.04±4.82 kg. Table II showed distribution of patients according to type of surgery.

Table 1: Distribution of patients according to age

Age (Yrs)	Atropine	Glycopyrrolate
5-6	12	9
7-8	7	8
9-10	6	8
Total	25	25

Table 2: Distribution of Patients According to Type Of Surgery

SL. No	Surgery	Atropine	Glycopyrrolate
1.	Anoplasty	1	Nil
2.	Circumcision	5	1
3.	Cleft lip repair	5	1
4.	Clwft palate repair	1	2
5.	Contacture release	2	3
6.	Hemangioma excision	1	Nil
7.	Hemiotomy	5	5
8.	Hypospadias repair	1	4
9.	Orchidopexy	1	2
10.	Rectal polyp excision	1	1
11.	Urethroplasty	2	Nil
12.	Appendicetomy	Nil	1
13.	Colostomy closure	Nil	1
14.	Fistula repair	Nil	1
15.	Muscle biopsy	Nil	1
16.	Skin grafting	Nil	1
17.	Tongue tie release	Nil	1
18	TOTAL	25	25

Table 3: Comparison of Atropine and Glycopyrrolate group according to heart rate

Time Interval	Groups	Cardiovascular Stability Good (2)	Fair (1)	Poor (0)	Atropine. Vs X^2 P
AP	Atropine	1(4%)	8(32%)	16(64%)	30.4 <0.001, HS
	Glycopyrrolate	20 (80%)	3 (12%)	2 (8%)	
1	Atropine	1(4%)	9(36%)	15(60%)	23.4 <0.001, HS
	Glycopyrrolate	17 (68%)	5 (20%)	3 (12%)	
1-15	Atropine	1(4%)	9(36%)	15(60%)	26.3 <0.001, HS
	Glycopyrrolate	18 (72%)	5 (20%)	2 (8%)	
1-30	Atropine	3(12%)	7(28%)	15(60%)	24.1 <0.001, HS
	Glycopyrrolate	20 (80%)	3 (12%)	2 (8%)	

Cardiovascular stability was graded by the changes in heart rate from the baselines as Good 0-15% above baseline given a score of 2.Fair15-30% adbove baseline given a score of 1.Poor >30% above baseline given a score of. The heart rate was compared at different time intervals: 30 minutes after premedication (AP), Induction (I), 15 minutes after induction (1-15), 30 minutes after induction (1-30). 30 minutes after premedication (AP), In Glycopyrroplate group 80% of case had good, 12% had fair and 8% had poor heart rate control while In Atropine Group 4% had well, 32% had fair and 64% had poor heart rate control. At the time of induction Patients in Glycopyrrolate group 68% had good, 20% fair, 12% had poor heart rate control while patients in Atropine group 4% had good, 36% had fair, 6% had poor heart rate control. At 15 minutes after induction Patients In Glycopyrrolate group 72% had good, 20% fair, 8% had poor heart rate control and patients In Atropione group: 4% had good, 36% had fair, 60% had poor heart rate control. At 30 minutes after induction Patients In Glycopyrrolate group 80% had good, 12% had fair and 8% poor heart rate control and patients in Atropine group 12% had good, 28% had fair and 60% had poor heart rate control. Atropine group showed sever and persistent

tachycardia in 60-64% of cases and this seen till the end of procedure. Glycopyrrolate showed good heart rate control in 68-80% of cases at all the time intervals. The P value was <0.001. (table 3)

Table 4: Comparison of Atropine and Glycopyrrolate group according to temperature

Time Interval	Groups	Temperature Good (2)	Fair (1)	Poor (0)	Atropine.Vs X^2 P
AP	Atropine	-	5 (20%)	20 (80%)	30.4 <0.001, HS
	Glycopyrrolate	20 (80%)	3 (12%)	2 (8%)	
1	Atropine	-	5 (20%)	20 (80%)	23.4 <0.001, HS
	Glycopyrrolate	20 (80%)	3 (12%)	2 (8%)	
1-15	Atropine	-	6 (24%)	19 (78%)	26.3 <0.001, HS
	Glycopyrrolate	20 (80%)	3 (12%)	1 (4%)	
1-30	Atropine	1 (4%)	6 (24%)	18 (72%)	24.1 <0.001, HS
	Glycopyrrolate	21 (82%)	3 (12%)	1 (4%)	

Temperature was recorded before premedication, 30 minutes after premedication, induction, 15 minutes after induction, 30 minutes after induction. Grading was given as Good: 2 upto 0.40C rise. Fair: 10.4^0 to 0.9^0Crise. Poor: $0>1^0$C rise. At the time of Induction[1] In atropine group 0% had good, 20% fair and 80% poor grading. In glycopyrrolate group 80% had good, 12% fair and 8% poor grading.15 minutes after induction (1-15) In atropine group 0% had good, 24% fair and 76% poor grading. In glycopyrrolate group 84% had Good, 12% fair and 8% poor grading. 30 minutes after induction (1-30) In atropine group 4% had good, 24% fair and 72% poor grading. In glycopyrrolate group 82% had good, 12% fair and 8% poor grading. Glycopyrrolate group showed a grading of poor at all time intervals in 72 to 80% cases. Atropine group showed a grading of poor at all time intervals in 72 to 80 % cases. There was a rise in temperature in the atropine group when compared to the glycopyrrolate group. The P value was < 0.001 (P.value < 0.05 significant) (table 4)

Table 5: Comparison of Atropine and Glycopyrrolate group according to Control of oropharyngeal secretions

Time Interval	Groups	Control of oropharyngeal secretions Good (2)	Fair (1)	Poor (0)	Atropine.Vs X^2 P
AP	Atropine	17 (68%)	8 (32%)	-	0.0 1.0, NS
	Glycopyrrolate	17 (68%)	8 (32%)		
1	Atropine	17 (68%)	8 (32%)	-	4.50 <0.05, NS
	Glycopyrrolate	23 (92%)	2 (8%)		
1-15	Atropine	17 (68%)	8 (32%)	-	4.50 <0.05, S
	Glycopyrrolate	23 (92%)	2 (8%)		
1-30	Atropine	17 (68%)	8 (32%)	-	24.1 <0.08, S
	Glycopyrrolate	23 (92%)	2 (8%)		

Control of oropharyngeal secretions by the 2 drugs was assessed at different time intervals.30 minutes after premedication, induction, 15 minutes after induction, 30 minutes after induction. Grading was given as: Good: 2 Dry. Fair: 1Just moist. Poor: 0 Saliva trickling.30 Minutes after premediction (AP) In atropine group 68% had good, 32% fair. In glycopyrrolate group 68% had good, 32% fair. At the time of Induction, In atropine group 68% had good, 32% fair. In glycopyrrolate group 92% had good, 8% fair. 15 minutes after induction (1-15) In atropine group 68% had good, 32% fair. In glycopyrrolate group 92% had good, 8% fair. 30 minutes after induction (1-30).In atropine group 68% had good, 32% fair. In glycopyrrolate group 92% had good, 8% fair. Antisialogogue effect in glycopyrrolate group was good in 92% of cases compared to 68% of cases in atropine group. The P value was <0.05 (P value of <0.05 significant) (table 5)

Table 6: Comparison of Atropine and Glycopyrrolate group according to post operative nausea and vomiting

Time Interval	Groups	Post operative Nausea and Vomiting Satisfactory (1)	Unsatisfactory (1)	Atropine.Vs X^2 P
10 Min	Atropine	16 (64%)	9 (36%)	0.9 0.77, NS
	Glycopyrrolate	17 (68%)	8 (32%)	
30 Min	Atropine	16 (64%)	9 (36%)	0.09 0.77, NS
	Glycopyrrolate	17 (68%)	8 (32%)	
1 Hr	Atropine	18 (72%)	7 (28%)	4.50 0.51, NS
	Glycopyrrolate	20 (80%)	5 (20%)	
6 Hrs	Atropine	21 (84%)	4 (18%)	0.00 1.00, NS
	Glycopyrrolate	21 (84%)	4 (18%)	

Nausea and vomiting was assessed at 10 minutes, 30 minutes, 1 hour and 6 hours postoperatively. Scoring was as follows No Nausea/ vomited one -1-Satisfactory, Repeated vomiting-0-Unsatisfactory. 10 minutes postoperatively, Atropone group satisfactory 64% and unsatisfactory 36%.Glycopyrrolate group satisfactory 68% and unsatisfactory 32%.30 minutes postoperatively, Atropone group satisfactory 64% and unsatisfactory 36%. Gycopyrrolate group satisfactory 68% and unsatisfactory 32%. 1hour postoperatively, Atropone gorup satisfactory 72% and unsatisfactory 28%. Gycopyrrolate group satisfactory 80% and unsatisfactory 20%. 6 Hours Postopertively, Atropone gorup satisfactory 84% and unsatisfactory 16%. Gycopyrrolate group satisfactory 84% and unsatisfactory 16%.Nausea and vomiting was seen in 16 to 36% of cases in atropine group compared 16 to 32% of cases in glycopyrrolate group. The P value of 0.51 to 1.00 showed that the difference was not statistically significant. table 6.

DISCUSSION

Antiocholinergic premedication in paediatric patients undergoing surgeris under general anaesthesia plays in important role in blocking the potentially dangerous vagal reflexes and in also controlling the oropharyngeal secretions and respiratory secretions. In our study there were no bradycardic events in both the groups. The atropine group showed severe and persistent tachycardia in 64% of cases compared to 12% of cases in the glycopyrrolate group at different time intervals. The glycopyrrolate group had good cardiovascular stability the heart rate not rising more than 15% above baseline in 68-80% of cases at the different time intervals. In our study in the atropine group 64% of cases had tachycardia compared to 8% of the cases in the glycopyrrolate group at 30 minutes after intramuscular premedication. At the time of induction atropine group had 60% cases with tachycardia and glycopyrrolate group had 12% cases with tachycardia. Annila P *et al* compared the effect of pre treatment with intravenous atropine 0.02 mg/kg and glycopyrrolate 0.004 mg/kg 3 minutes before induction of anaesthesia. Bradycardia was observed in 0% and 4% patients in the atropine group and glycopyrrolate group respectively. Persistent sinus tachycardia occurred in 23 of the 25 patients i.e. 92% of the cases in the atropine group. They concluded that atropine premedication produces a hyperdynamic cardiovascular state. The effect of glycopyrrolate on hemodynamic variables was moderate compared with that of atropine.[5] Mirakhur *et al* conducted a comparative study between atropine and glycopyrrolate premedication with regard to their effects on cardiac rate and rhythm during induction of anaesthesia. They found that atropine led to a greater rise in hear rate before and during induction of anaesthesia.[6] In the present study 72% cases in the atropine group showed an increase in temperature of 10^{c} or above while 82% of cases in glycopyrrolate group showed an increase in temperature of 0.4^{0}C and only 4% of them showed rise ub temperature above 1^{0}c. Pandey *et al* in 1983 found that the increase in body temperature following premedication with atropone, hyoscine and glycopyrrolate were significant in all groups, but was of greater significance following the administration of atropine. In their study the mean rise in temperature was 0.6^{0}C in the atropine group.[7] In our study both the drugs had control of oropharyngeal secretions. Glycopyrrolate group had greater efficacy- 92% cases had good control and 8% of cases had fair control compared to the atropine group- 68% of cases had good control and 32% of cases had fair control. Our study concurs with the above study in that glycopyrrolate has the greatest efficacy. Brokman *et al* (1997) conducted a study to determine if anticholinergic agents improved fiberoptic intubating conditions and compared the efficacy and side effects of these drugs. They compared atropine, glycopyrrolate and hyoscine. Their study suggested that atropine produces variable and less potent antisalogogue action. Glycopyrrolate has the greatest efficacy in attenuating reflex secretions and improving the visual field.[8] In our study the incidence of vomiting in the postoperative period was the same and not statistically significant. Nausea was seen in 28% of cases in atropine group compared to 20% of cases in glycopyrrolate group 1 hr post operatively and this was found to be statistically not significant. Joshi *et al* (1999) evaluated the effects of neostigmine and glycopyrrolate on the incidence of PONV in patients undergoing ambulatory surgery. They demonstrated that administration of neostigmine 2.5 mg and glycopyrrolate 0.5 mg reverse neuromuscular blockade does not increase the incidence of POBV.[9] Our study concurs with the above study by demonstrating no satisfactory significant difference in the incidence of PONV between the atripine and glycopyrrolate groups. Salmenpera M et aI (1992) conducted a study to establish if anticholinergics might influence postoperative nausea and vomiting in 100 ASA 1-2 adult patients. In the recovery room, up to 2 hrs after surgery 28% of patients in glycopyrrolate group and 8% in the atropine group experienced nausea and was statistically significant. The incidence of vomiting was not significant statistically between both groups. They concluded that substitution of glycopyrolate fro atropine increases the like hood of postoperative nausea.[10]

CONCLUSION

Advantages of glycopyrrolate over atropine as anticholinergic premedication cardiovascular stability,

superior antisialogogue effect, minimal rise in body temperature and no increased incidence of postoperative nausea and vomiting

REFERENCES

1. Paul G. Barash, Bruce F Culleb abd Robert K Stoelting, Preoperative medicaton" chapter 21 in Clinical Anaesthesia 4th Edition, Ed- John R moyers and Carla M. Vincent , Philadelpha, Luppincott Williams and Wilkins, 2001:551-563.
2. George A. Gregoiry, M.D." Proeperative evaluation and preparation for surgery" Chapter 8 in Paesdiatric Anaesthesia 4th Edition, Edt David J Steward , Philadephia, Churchill Livingston, 2002: 186-190.
3. Leman J.Chinyanga HM, "The heart rate response to succinyl choline in children: A comparison of atropine and glycopyrrolate" Can Anaes Soc Jour. 1983, 30:377-381.
4. Sorensen O, Erikeen S. Hommelgaard P, Viby-Mogensen J., "Thiopental- nitrous oxide- halothane anaesthesia and repeated succinyl choline: Comparison of p reoperative glycopyrrolate and atropine administration" Anesth Analg , 1980: 096-9.
5. Annila P, Rorarus M, Reinkainen P, Olkkonen M et at.," Effect of pre-treatment with intravenous or glycopyrrolate on cardiac anthythmia's during halothane anaesthesia for adenoidectomy in children" Br J Anaesth 1998: 80: 756-760.
6. Mirakhur RK, Clarke RSJ, Elliot J. Dundee JW, "Atropine and glycopyrronium premedication "Anaesthesia 1978: 33: 906-907.
7. Rautakorpl P, Manner T, Kanto J, "Metabolic and clinical responses to different types of premedication in children". Paediatr Anaesth 1999: 9(5):387-92.
8. Brookman CA, The HP, Morrison LM, "Anticholinergics improve fiberoptic intubating conditions during general anaeshesia" Cand J Anaesth 1997: 44 : (2) 165-167.
9. Joshi GP, Gard SA, Hailey A, Yu SY., "The effects of antagonizing residual neuromusoular blockade by neostigmine and glycopyrrolate on nausea and vomiting after ambulatory surgrey", Anaesth Analg 1999: 89: 628-631.
10. Salmenpera M, Kuoppamaki R, Slamenpera A., "Do anticholinergic agents affect the occurrence of postoperative nausea?" Acta Anaesth Scand 1992: 36: 445-8.

Source of Support: None Declared
Conflict of Interest: None Declared