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The Effect of Anticholinergic Drug on Thermoregulation in Paediatric Patients

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Abstract

Introduction and Objectives: Delayed discharge of paediatric patients due to post-surgical fever is frequently observed in patients anaesthetized with Ketamine and Glycopyrrolate. Hence the present study was done to evaluate and compare the body temperature of paediatric patients with and without pre-anaesthetic medication with Glycopyrrolate. *Material and Methods:* A randomised, double blind prospective study was done on 40 paediatric patients of age 1 – 8 years posted for lower abdominal surgeries. The patients were randomly allocated into two groups, Group I – Glycopyrrolate group, receiving 0.005mg/Kg i.v. glycopyrrolate and Group II – Placebo group, receiving the equivalent volume of normal saline .Both groups were treated with ketamine – 3mg/kg with caudal block after 30 mins of premedication. *Inclusion criteria* - paediatric patients of age 1-8 years posted for lower abdominal surgeries. *Exclusion criteria* – patients with fever, Upper respiratory tract infection, Bilateral Surgeries, Syndromic child, history of increased oral secretions, surgeries more than 1hr duration were excluded. The tympanic temperature of all the patients were recorded pre-operatively for baseline body temperature and at 0, 30, 60, 90 mins post – operatively. The intra-operative quantity of oral secretions in both the groups was measured using VAS score. *Result:* The body temperature was significantly higher in Glycopyrrolate group than placebo group at 30, 60, 90 mins post – operatively. The salivation was significantly less in glycopyrrolate group than placebo group. *Conclusion:* The routine use of Glycopyrrolate as pre-anaesthetic adjunct with Ketamine should be considered after weighing the risk of post-operative hyperthermia.

Keywords: Anticholinergic Drug; Glycopyrrolate; Ketamine; Salivation; Temperature.

Introduction

Sedating a child for surgical procedures has always been a challenge [1]. Ketamine, a dissociative agent allowing potent sedation, analgesia and amnesia during painful procedures with minimal respiratory depression is generally used [1]. Hypersalivation and increased oral secretions is one of the most common adverse effect of Ketamine [2]. Hence, Ketamine is always used with an adjunctive anti-cholinergic drug such as Glycopyrrolate to limit excessive secretions [2]. There are many studies with controversial findings about role of anticholinergic drugs when used as an adjunct with Ketamine in suppressing oral secretions [1]. But it has always been used routinely. Delayed discharge of paediatric patients due to post- surgical fever is frequently observed in patients anaesthetized with Ketamine and Glycopyrrolate. Hence, the present study was done to evaluate the risk of hyperthermia in patients given anticholinergic drug (Glycopyrrolate) as adjunct with Ketamine.

Material & Methods

The present study is a randomised double- blind prospective study done in 40 paediatric patients of age group 1 – 8 yrs who were posted for lower abdominal surgeries requiring sedation and analgesia at the Department of Anaesthesia in a

Rural Medical College. Written informed consent was taken from parents and guardians of all patients after explaining the process and procedure of study in detail. The study was approved by local ethical committee. *Inclusion criteria*- pediatric patients of age 1-8 years posted for lower abdominal surgeries. *Exclusion criteria* – patients with fever, Upper respiratory tract infection, Bilateral Surgeries, Syndromic child, history of increased oral secretions, Surgeries more than 1hr duration were excluded The patient was randomly allocated in two groups –

Group I – Glycopyrrolate group-(20 patients) – Given 0.005mg/Kg Glycopyrrolate

Group II – Placebo group-(20 patients) –Given Equivalent quantity of normal saline

Rossmax RA600 infrared ear thermometer was used to measure the tympanic temperature. As tympanic membrane thermometry is reliable, accurate, easy to use and quick [3]. Baseline tympanic temperature was recorded preoperatively in both the groups.

Both the groups were given caudal block in lateral position with 0.5ml/kg of equal amount of 1% lignocaine with 0.25%bupivacaine after giving i.v. ketamine 3mg/kg after 30 min of premedication in operation theatre. Oxygen was given by face mask at 5L/min. ECG, SPO_2, HR & BP were monitored. The researcher who recorded the data and the patients were blinded. The quantity of saliva produced was assessed during surgery by VAS score from 0 to 100, 0-means no secretion, 100 means very high secretions. Incidence of any desaturation, bronchospasm, conversion to General anesthesia with ET tube were noted in both groups. After surgery, tympanic temperature was measured immediately (0 min) and at 30, 60 & 90 mins postoperatively. The statistical analysis was done using 2-sided unpaired t test.

Results

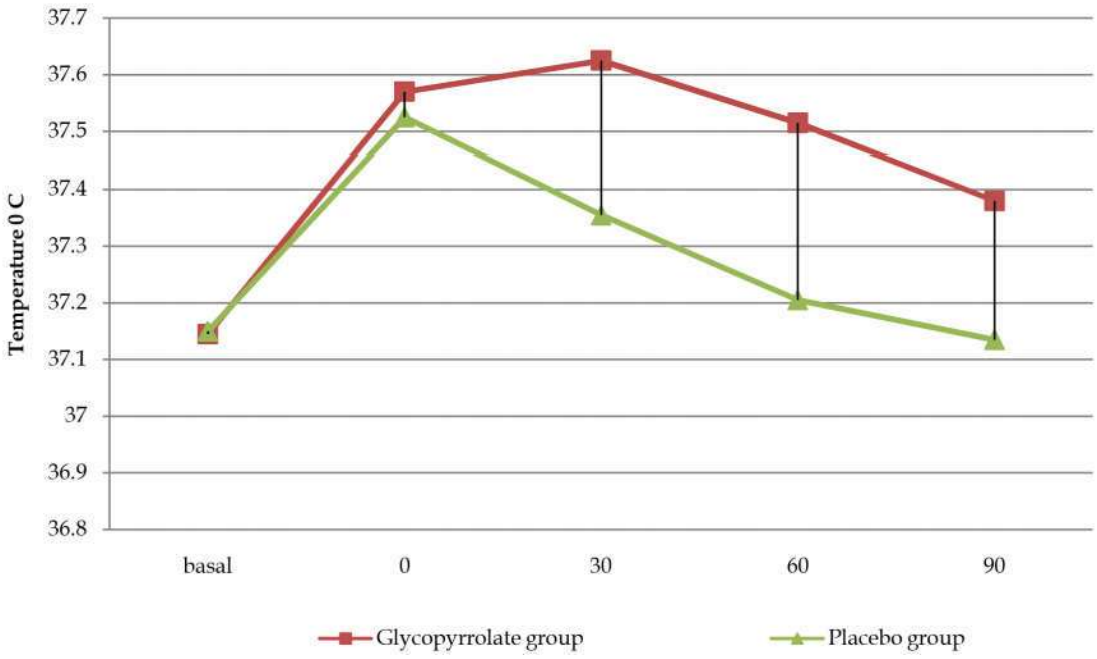
The mean ± S.D. of age, weight, duration of surgery and basal body temperature did not show any statistically significant difference in both the groups Table 1. Table 2 shows data regarding body temperatures at 0, 30, 60, 90 mins after procedure in both the groups. The basal and immediate postoperative (0min) temperature did not show any statistically significant difference in both the groups. But the temperatures recorded at 30, 60, 90 mins post-operatively is significantly increased in Group 1 receiving Glycopyrrolate than in group II receiving Normal saline i.e. Placebo. The temperature of the patients in placebo group reached the basal body temperature by 90 min whereas temperature continued to be increased in patients of glycopyrrolate group even at 90 mins. The salivation was significantly less in glycopyrrolate group as compared to placebo group.

Table 1: Comparison of Age, weight, duration of surgery and basal body temperature in both the groups

Characteristic	Glycopyrrolate Group (Mean±SD)	Placebo Group (Mean±SD)	P Value	Significance
Age (years)	3.9 ± 2.1	3.7 ± 1.85	0.750	Not significant
Weight (kg)	15.20 ± 3.81	14.50 ± 3.75	0.561	Not Significant
Duration of surgery (mins)	43.15 ± 9.84	40 ± 10.76	0.340	Not Significant
Basal body temperature (^{0}c)	37.14 ± 0.12	37.15 ± 0.11	0.893	Not Significant

Table 2: Comparison of body temperature at 30, 60, 90 mins post-operatively and salivation VAS score in both the groups

		Glycopyrrolate Group (Mean±SD)	Placebo Group (Mean±SD)	P Value	Significance
Temperature in ^{0}C - Postoperatively	0 min	37.57 ± 0.195	37.525 ± 0.129	0.395	Not Significant
	30 min	37.625 ± 0.171	37.355 ± 0.119	0.0001	Highly Significant
	60 min	37.515 ± 0.169	37.205 ± 0.119	0.0001	Highly Significant
	90 min	37.380 ± 0.154	37.135 ± 0.093	0.0001	Highly Significant
Salivation VAS score		11.50 ± 9.33	40.50 ± 17.31	0.0001	Highly Significant



Graph 1: Line – diagram of basal body temperature and temperature at 30, 60,90 mins post-operatively in both the groups

Discussion

The VAS score of oral secretions was significantly decreased in Glycopyrrolate group as compared to placebo group. Moreover, the VAS score of 5 patients in Placebo group was more than 60 out of which 2 suffered from desaturation and bronchospasm. They required a treatment of i.v. Hydrocortisone and nebulisation. In a similar study by *Payman Asadi et al.*, concluded that salivation was significantly decreased by anticholinergic drug (Atropine) when used as an adjunct to Ketamine but without causing any adverse effect on the success rate and duration of procedure [1]. Hence, use of an antisialogouge in the pre-operative medication is often recommended to decrease the likelihood of coughing and laryngospam due to Ketamine induced salivary secretions [4].

The basal body temperature and immediate post-operative temperature in both the groups did not show any statistically significant difference. But the post-operative body temperature recorded at 30, 60 and 90 mins was significantly increased in Glycopyrrolate group as compared to placebo group. *Kyung Woo Kim et al.*, in his study too observed that the amount of salivation was significantly less in Glycopyrrolate group as compared to Control group and that the paediatric patients are at a increased risk of fever. He further concluded that the routine premedication with anticholinergic drug should not be considered in paediatric patients [2].

The anticholinergic drugs inhibit muscarinic acetylcholine receptors, exerting antimuscarinic actions such as dry mouth hence used as an adjunct with ketamine which has increased salivation as a side effect [5].

The eccrine sweat glands play an important role in heat loss mechanism for thermoregulation. Hence they are said to be responsible for thermal sweating. In children, the thermoregulation is mainly dependent on sweating [6].Hence its suppression causes less heat loss which may be the reason of increase in body temperature in children post-operatively when an anticholinergic adjunct is used with Ketamine. The body temperature of the patients in Placebo group reached the basal body temperature by 90 mins post-operatively but the body temperature in Glycopyrrolate group continued to remain high even at 90 mins post-operatively. The temperatue of 4 patients in Glycopyrrolate group was observed to be more than 37.8^0C suggesting, they may be suffering from fever.

Conclusion

The routine use of Glycopyrrolate as pre-anaesthetic adjunct with Ketamine should be considered after weighing the risk of post-operative hyperthermia, if used and intra-operative increase in salivation, if not used in paediatric patients.

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