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GLYCOPYRROLATE PREMEDICATION AND THE PERIOPERATIVE ADVERSE RESPIRATORY EVENT IN PAEDIATRIC ANAESTHESIA

Anaesthesiology

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ABSTRACT

In the past, anticholinergic agents were an inevitable premedicant in children as it reduces the oral secretions and bradycardia produced by anaesthetic agents. However, controlled studies evaluating their effects produced mixed results and gradually their use over the years has been declining. Presently, some of us still believe that anticholinergic agents are useful in children and continue to use glycopyrrolate as a premedication in almost all paediatric patients. Even with the controversies over the use of glycopyrrolate as a premedication, we have never looked seriously at the side effects of the anticholinergic drugs. The dry mouth caused by glycopyrrolate can be very uncomfortable for the patient, friable mucous membrane and inspissated secretions can be life threatening. We report a case of a four year old child undergoing choledochal cyst excision and hepaticojejunostomy with severe adverse respiratory event due to impacted inspissated secretions following glycopyrrolate premedication.

KEYWORDS

Glycopyrrolate, Anticholinergic agents, Premedication in Paediatric Anaesthesia, Perioperative adverse respiratory event.

INTRODUCTION:

Glycopyrrolate is a synthetic anticholinergic, approved for use by Food and Drug Administration in 1961. It inhibit the action of peripheral acetylcholine (muscarinic) receptors and antisialogue effect continue for seven hours. Glycopyrrolate is used as a premedication, to block the vagal reflex, antagonize the parasympathetic effect of neostigmine and treatment of sialorrhea in children with neurological condition.[1] Even with the controversies over its use many have ignored the severe side effects like, dry mouth which is very uncomfortable, friable mucous membrane and inspissated secretion. In our case report, we nearly lost a child due to hypoxia caused by the impacted inspissated secretion following glycopyrrolate premedication. Studies comparing atropine and glycopyrrolate found that hypoxia was more frequent in glycopyrrolate group.[2] Studies have also showed that glycopyrrolate is associated with more adverse respiratory event.[3]

Case History:

A four year old female child presented with pain abdomen and vomiting for two weeks. Ultrasound whole abdomen and MRCP revealed choledocal cyst and patient was scheduled for choledocal cyst excision with hepaticojejunostomy.

Preoperative assessment revealed a total billirubin of 2.6mg/ dl, direct billirubin 1.6mg/dl, SGOT 1163U/ L, SGPT 1204U/ L, alkaline phosphatase 476u/ l. The child was 16kg, other investigations were normal and there was no history of running nose, cough or fever. After an informed written consent, the patient was accepted for general anaesthesia in ASA I.

The child was pre medicated with injection midazolam 1mg IV, injection glycopyrrolate 80 microgm IVand shifted to the OT. Cardio respiratory monitoring was attached. Patient was induced with injection fentanyl 30 microgm IV, injection propofol 30 mg IV, injection atracurium 10mgIV, trachea intubated with 4.00mm uncuffed endotracheal tube (ETT), fixed at12cm at the lip and oral packing done. After caudal catheterization and on changing the position back to supine, copious secretion was present in ETT with bronchospasm. ETT suctioning was done and bronchospasm responded to injection deriphyllin 0.5milliliter IV and injection hydrocortisone 20mg IV.

Anaesthesia was maintained with oxygen, sevoflurane and injection atracurium. The procedure lasted for seven hours, vitals were stable, arterial blood gas (ABG) showed a pH 7.39, PaO_2 311 mmHg, $PaCO_2$ 34mmHg, HCO_3 21 mmol/ L, BE 4.0mmol/ L, Lactate 1.18mmol/ L.Approximately 1000 milliliter of blood was loss, which was replaced with crystalloid, blood and blood products. The urine output was50 milliliter and RBS- 126mg/dl.

Towards the end of surgery, ABG showed a pH 7.36, PaO_2 309 mmHg, $PaCO_2$ 54 mmHg, HCO_3 27 mmol/ L, BE 3 mmol/ L, Lactate 4.31mmol/ L and ETT suctioning showed solidified secretion. Following ETT suctioning, the patient had severe bronchospasm and desaturated with SPO_2 of 80%. Bronchospasm responded to injection adrenaline 0.1mg IM however, the oxygen saturation dropped further to 73% and air entry was present only in the upper lobe of the right lung. The ETT was changed, ETT installation with normal saline, chest physiotherapy and ETT suctioning showed thick solidified secretion and SPO_2 improved to 90%. ABG showed a pH 7.32, PaO_2 56mmHg, $PaCO_2$ 42mmHg, HCO_3 20mmol/ L, BE -4.3mmol/L. Chest physiotherapy, ETT suctioning continued and SPO_2 increased to 100% and ABG showed pH 7.43, PaO_2 367 mmHg, $PaCO_2$34 mmHg, HCO_3 24 mmol/ L, BE -1.1mmol/ L.

Postoperatively, trachea was extubated after four hours. Chest X-ray showed bilateral infiltrates and patient was put on asthalin, 3% normal saline nebulization and antibiotics. She was discharged on 9th POD after full recovery.

DISCUSSION:

In the past, anticholinergic agents were used routinely in children as a premedicant or at induction. However, the scientific knowledge is unclear about its administration in all paediatric patients except for its effect on heart rate.

Presently, we have anaesthetist who routinely administer glycopyrrolate to all paediatric patients citing, the advantage of dry mucous membrane during inhalational induction, less airway complication and suppression of vagal response in children whose cardiac output is dependent on heart rate.[4] These were supported by studies done to evaluate the effect of anticholinergics on heart rate, rhythm during peadiatric anaesthesia. They concluded that secretion can be problematic in children which can be controlled effectively by anticholinergics and that glycopyrrolate provides better protection and is associated with less dysrhythmias.[5] Another study, concluded that

anticholinergic should be given when intubation is contemplated unless, there are any contraindication to its use.[6]

Other anaesthetist stopped using glycopyrolate routinely, stating that it was essentially used during ether anaesthesia and that modern inhalational agents like, sevoflurane produce smooth induction without excessive secretion and promotes tachycardia.The use of succinylcholine, the drug that can cause bradycardia is declining, bradycardia during paediatric anaesthesia is mainly due to hypoxaemia and the treatment is oxygen and not anticholinergics.[4] A study done on the effects of atropine on the velocity of tracheal mucous and emphasized that anticholinergic agents decrease mucociliary clearance for several hours.[7]

Presently, the overall use of anticholinergic agents is declining. It's use is based on clinical need such as ENT, eye surgery, endoscopic procedures and children less than one year. Even in procedures like flexible bronchoscopy, where they are commonly used to reduce secretion, they do not reduce cough, oxygen desaturation and patient discomfort. Its use as a premedication in flexible broncoscopy may be unnecessary or even harmful.[8]A study done to determine the effect of glycopyrrolate in children with upper respiratory tract infections concluded that it does not reduce the perioperative respiratory adverse events and in fact, it increases postoperative adverse events.[9] Co-administration of glycopyrrolate and ketamine for sedation in children was associated with more airway and respiratory events and none of the anticholinergic agents showed any efficacy in decreasing airway and respiratory adverse events. [3]Another case report highlighted that anticholinergics can cause respiratory arrest and that strict vigilance is required even during premedication.[10]

Thus, anticholinergic premedication is still a subject of controversy but, in today'point of view, these drugs should be used only when indicated. However, Atropine a vagal blocker should be drawn and kept available throughtout anaesthesia.

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