Commonly Used Muscles Relaxant and Reversal Agents for Children Treated Under General Anaesthesia - A Retrospective Cohort Study

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Abstract
Background: Pediatric patients going through dental systems and who are incredibly uncooperative, unfortunate, restless, or actually safe without any assumption for conduct improvement are gone through for general anaesthesia (GA) to do the treatment. Changes in the training and advancement of general sedative medications have impacted the utilization of muscle relaxants and inversion specialists in pediatric patients. Aims: The aim of the review was to survey the commonly used muscle relaxant and reversal agents for pediatric patients treated under general anesthesia in Saveetha dental college from March 2020 to February 2021. Setting and Design: A retrospective study was conducted on pediatric patients treated under general anesthesia to determine the commonly used muscle relaxants and reversal agents. Materials and Methods: From pediatric patients visiting private dental hospital, those who are treated under general anesthesia from March 2020 to February 2021 considered as inclusion. Exclusion criteria involve those who are not treated under general anesthesia. The final sample size 100. The age, gender, muscle relaxants and reversal agents prescribed were considered and tabulated and SPSS (Statistical Package for the Social Sciences, Chicago,USA) was used to analyze the data. The results were compared using descriptive statistics and Chi-square-test. Then 0.05 was set to be a P value for the level of significance. Results: From the results of the study, atracurium(99%) and vecuronium(1%) were the commonly used muscle relaxants and neostigmine + glycopyrrolate(100%) was the commonly used reversal agents for pediatric patients treated under general anesthesia. Conclusions: From the study , there were only a few standard drugs like atracurium and vecuronium used as muscle relaxant and neostigmine + glycopyrrolate reversal agents were used for pediatric patients who were treated under general anesthesia .

Keyword: general anesthesia, muscle relaxants, pediatric patients, reveal agents .

INTRODUCTION:

General anesthesia, as well as wiping out the view of improvements, has significant physiologic impacts in different frameworks including the cardiovascular and respiratory frameworks. It is by and large concurred that the vast majority of the pediatric patients who are going through operations and who are uncooperative and unfortunate ought to be made do with behavior management strategies(1,2). Rather, a small population of pediatric patients can't be effectively dealt with these procedures(3). Pediatric patients who are going through dental treatments (4) and who are very uncooperative, unfortunate, restless, or actually safe without any assumption for conduct improvement are treated under general anesthesia (5).
Pediatric patients vary from grown-up patients due to the pharmacokinetic and pharmacodynamic profiles(6). Appropriately different neuromuscular hindering specialists are every now and again utilized during general sedation for pediatric patients to work with tracheal intubation, artificial ventilation, and surgeries(7). The ideal muscle relaxant ought to have a brief term of activity, fast and complete recuperation and immaterial aftereffects. Suxamethonium has the most limited span of all muscle relaxants as of now accessible yet there is a high frequency of postoperative muscle pain(8). Atracurium and vecuronium have less postoperative effects in patients treated under general anesthesia(9). The small-dose atracurium may be a choice to mivacurium for youngsters going through a methodology of brief length given pharmacological reversal isn't contraindicated. The troublesome effects related with atracurium relate basically to receptor discharge. This normally achieves a restricted or general erythema joined by hypotension, tachycardia or bronchospasm(10). Vecuronium was utilized in mix with pharmacological inversion, as low-portion vecuronium can be utilized in pediatric medical procedure of brief span. Be that as it may, the vecuronium can be viewed as a long acting NMBA in youngsters and infants. The deferred term of vecuronium in kids and children is probably a result of a greater volume of spread (showing a larger ECF volume) with no qualification in plasma clearance. Vecuronium is prominent for its shortfall of colossal cardiovascular and receptor conveying properties in both pediatric and adults(11).

Inversion specialists (for example, neostigmine or edrophonium) are generally regularly recommended to speed up recuperation from neuromuscular barricade and forestall postoperative remaining acceptance of muscular relaxation(12). The inversion specialist, neostigmine, is the most generally perceived foe for neuromuscular bar with the advantages of extensive territory inversion of all non depolarising neuromuscular obstructing drugs, negligible cost, and openness of more related data for clinical practice(13). In the pediatric patients, PRNB was as often as possible noticed (28.1%), however more usually in cases switched with inversion specialist neostigmine (37.5%)(14). At the point when neostigmine was directed after the main jerk came to 10% of control, the speed of recovery for vecuronium was dependent upon age, which was faster in young people than in infants and adult patients(15). Glycopyrrolate was contemplated over in doses, given intravenously either beforehand or in a blend in with neostigmine, at the hour of reversal of neuromuscular square. Therefore the 10-microgram/kg part of glycopyrrolate, when overseen in a blend in with neostigmine, was connected with the most consistent heartbeats. So neostigmine + glycopyrrolate was a strong reversal expert to be used for pediatric patients(16).

According to the present study’s aim was to assess the commonly used muscle relaxants and reversal agents for pediatric patients who are treated under general anaesthesia for oral rehabilitation.

MATERIALS AND METHODS:
The retrospective study was conducted in a private dental college in India. Ethical approval was obtained from the Institutional review board prior to the start of the study. The data was collected from the records of the children who were treated under general anesthesia between March 2020 to February 2021. Convenience samples of 100 pediatric patients treated under general anesthesia were included in the study. Data collection of parameters like age, gender, muscle relaxants and reversal agents prescribed. SPSS (Statistical Package for the Social Sciences, Chicago,USA) was used to verify the data. In SPSS, the individual frequency distributions of each category were assessed and bar charts were obtained. The results were compared using descriptive statistics and Chi-square-test.

RESULT:

100 children with mean age of 3.05±2.341 years treated under general anaesthesia were added in the present study. The demographic data of participants are tabulated in Table 1. Atracurium and vecuronium are found to be the most commonly used muscle relaxant in children undergoing dental treatment under general anaesthesia [Figure 1]. No significant difference in type of muscle relaxant was noticed with increase in age [Figure 2]. Neostigmine + Glycopyrrolate was the only reversal agent used in children undergoing dental treatment under general anaesthesia [Figure 3].

<table>
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<th>Table 1: Demographic details of the participants</th>
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<td><strong>Age</strong></td>
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Females - 56%

**Figure 1:** Bar graph presents the frequency distribution of the commonly used muscle relaxants. The x axis is a representative of muscle relaxant and Y axis is representative of the percentage of pediatric patients treated under general anaesthesia. According to the graph 99% belonged to Atracurium and 1% belonged to vecuronium.

**Figure 2:** Bar graph presents the association between gender and commonly prescribed muscle relaxant. The X axis represents the age of pediatric patients treated under general anaesthesia and Y axis is representative of the percentage of commonly used muscle relaxants. Blue colour represents atracurium and green colour represents the vecuronium. Majority of pediatric patients aged between 0-3 years (69%), 4-9 years (27%) and 10-13 years (3%) were treated with Atracurium (brown) and only 1% of 0-3 years patients were treated with vecuronium (orange). Chi square test was done to associate the variables. Chi square test value is 1.286; p value is 0.994 (p>0.05). Hence there is a no statistical significant difference between age of pediatric patients.
Figure 3: The graph presents the frequency distribution of the commonly used reversal agent. The x-axis is a representative of the reversal agent while the Y-axis is representative of the percentage of pediatric patients treated under general anaesthesia. According to the graph, 100% of pediatric patients are treated with Neostigmine+Glycopyrrolate (blue).

**DISCUSSION:**

In the study, we observed that atracurium and vecuronium are the commonly used muscle relaxants, and Neostigmine + glycopyrrolate is the commonly used reversal agent. The requirements for profiling the commonly used muscle relaxants and reversal agents categorized based on the age of the pediatric patients is essential to identify the effect of commonly used muscle relaxants and reversal agents in pediatric patients treated under general anaesthesia and their postoperative effects. Dental treatments utilizing general anaesthesia is a recovery treatment for pediatric patients. General sedation is a controlled condition of obviousness where defensive reflexes are lost (17). Whereas pedodontists must limit dental procedures using GA in cases which are routine clinic practice because it may cause some side effects (18).

In the present study, it was found that Atracurium was administered and was preferred in 99% of the cases and there was no significant difference with increase in age. Previous studies conducted in which after use of atracurium there was a faster recovery of neuromuscular function (19) have indicated that it is significantly longer in patients under 2 years of age than in older infants or children and adolescents. Hence the atracurium remains a relaxant of intermediate duration of action even in small infants. In another study (20), the postoperatively the neuromuscular capacity in day care patients after muscle relaxant and reversal agent was evaluated that there is no massive contrast in the age of the pediatric patients in recuperation of neuromuscular blockade. Therefore, postoperative muscle weakness or respiratory impairment is unlikely in pediatric day-care surgical patients more than 2 yr old when these anesthetic techniques were used.

Vecuronium was one more muscle relaxant regulated in the current review. Portion reaction bend of vecuronium was evaluated by recording neuromuscular squares by thenar electromyographic reactions. Along these lines for patients matured 13 years or more seasoned, which didn't contrast from the neonatal and baby esteem however was essentially lower than that of kids somewhere in the range of 3 and 10 years old. Inferred that the portion of vecuronium essential for tracheal intubation is age-subordinate. (17) In another study (21), Vecuronium induced prolonged paralysis in two pediatric intensive care patients was discussed. It is concluded that however these drugs have some morbidity in the long term use neuromuscular but has an important role for the patient treated under general anesthesia hence to prevent such side effects NMBD drugs like vecuronium should be stopped while the patient is recovered. In another study (22) the vecuronium infusion rate was compared with the age of the pediatric patient. Therefore the steady infusion rate in youngsters and
babies. This rate was 40% of that expected by youngsters 3 to 10 years of age. In youths the vecuronium prerequisite was not exactly in youngsters.

With regards to reversal agent Neostigmine + Glycopyrrolate was the only reversal agent used in children undergoing dental treatment under general anaesthesia in the present study. A previous study (23), reviewed for the reexamination and update on sufficiency and prosperity of neostigmine for reversal of neuromuscular blockade appropriately. It was seen that when neostigmine was managed after the chief jerk came to 10% of control, the speed of recovery for vecuronium was dependent upon age, which was speedier in kids than in newborn children and grown-ups. In another study (24), the studied about the clinical use of glycopyrrolate therefore glycopyrrolate is an effective and potent anticholinergic and is a welcome addition to the drugs that anaesthetists use very frequently in pediatric patients. In another study (25) the reversal of neuromuscular block after usage of glycopyrrolate mixture with neostigmine compared with atropine therefore it is concluded that the glycopyrrolate can be used as safely and effectively in children as it can be in adults in correlation with the atropine bunch was not critical and the benefits just negligible. They concluded that the glycopyrrolate mixture with neostigmine should be used more frequently in reversal and this could include pediatric patients as well.

CONCLUSION:

From the resulting data it is concluded that the Atracurium and Vecuronium are most commonly used muscle relaxants and Neostigmine + Glycopyrrolate mixture is the most commonly used reversal agent which has lesser side effects than other drugs for pediatric patients treated under general anaesthesia.

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AUTHOR CONTRIBUTIONS:

Gajapriya. M executed the research work, collected data and drafted the manuscript. Dr. Lavanya Govindaraju contributed to the concept and design of the study, contributed to validation of the data collection.

CONFLICT OF INTEREST:

The authors declared that there is no conflict of interest.

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REFERENCE: