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ORIGINAL ARTICLE

Effect of Intravenous Magnesium Sulphate, Lidocaine or Dexamethasone on Incidence and Severity of Laryngospasm and Postoperative Pain in Pediatrics Undergoing Adenotonsillectomy

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ABSTRACT

Background: Post-extubation laryngospasm is a common and serious complication in Pediatrics Undergoing Adenotonsillectomy. This study aimed to evaluate and compare the effect of intravenous magnesium sulphate, lidocaine or dexamethasone on the incidence and severity of laryngospasm and postoperative pain in pediatrics undergoing adenotonsillectomy.

Methods: Included Seventy-Five children undergoing adenotonsillectomy were divided into three groups, each of 25 children. Group M; received an intravenous infusion of 15mg/kg 10% magnesium sulfate in 50ml of 0.9% sodium chloride over 10min. Group L; received an intravenous infusion of 1 mg/kg 2% lidocaine in 50ml of 0.9% sodium chloride over 10min. Group D; received an intravenous infusion dexamethasone 0.5mg/kg in 50ml of 0.9% sodium chloride over 10min.

Results: There was a significant difference among the studied groups regarding recovery time that was higher in group I than group II and III. None of patients any complications, regarding incidence of laryngospasm after extubation at 1, 5, 10 and 15 minutes, which had no statistically significant differences.

Conclusion: that intravenous magnesium sulfate is more effective than intravenous lidocaine and dexamethasone in reducing the incidence and severity of laryngospasm, however, it is associated with a relatively prolonged recovery time compared with lidocaine and dexamethasone.

Keywords: Laryngospasm, Adenotonsillectomy, Magnesium sulfate, Lidocaine , Dexamethasone

INTRODUCTION

Around the world, tonsillectomy is a highly common treatment that is done on youngsters. Numerous morbidities, including postoperative pain, nausea, vomiting, hemorrhage, dehydration, and laryngospasm, are linked to it **[1].**

A particularly serious tonsillectomy consequence that happens after tracheal extubation is laryngospasm. The laryngeal muscles contract forcefully and involuntarily, causing apnea, cyanosis, severe respiratory distress, hypoxia, and hypercarbia. Negative pressure pulmonary edema, inadequate oxygenation, and even cardiac arrest may result if treatment is delayed**[2]**.

Laryngospasm affects 17 out of 1000 children under the age of nine, whereas upper respiratory tract infections affect 96 out of 1000 children. Between 12 and 25 percent of tonsillectomy patients experience laryngospasm following normal extubation. Children typically have a greater incidence rate of laryngospasm than adults do because of their narrower larynx and smaller tracheal width, which can be obstructed by edema following trauma or manipulation **[3].**

Good hemostasis during surgery, gentle suctioning of the oropharynx before to extubation, and awake tracheal extubation are some strategies to prevent postoperative laryngospasm**.** A variety of pharmacological drugs such as intravenous lidocaine **[4]** topical lidocaine, magnesium sulfate and propofol have been proposed as a means of preventing laryngospasm, but none of them have been

proven to be effective **[3,5]**.

Following a tonsillectomy, postoperative pain management is crucial for recovery time, length of hospital stay, hemodynamic effects, bleeding, nausea, vomiting, and financial expenses. However, the majority of patients getting this procedure are young children with lower pain tolerances who become restless at a young age, which has a detrimental psychological impact on them and their families **[6]**.

The pharmaceutical version of magnesium, magnesium sulfate (MgSO4), blocks N-methyl-D-aspartate (NMDA)-coupled channels physiologically and voltage-dependently. Magnesium's antinociceptive function involves blocking calcium influx, which reduces preexisting pain sensitivities and prevents central sensitization. **Soleimanpour et al. [7]** One significant drug that suppresses the central nervous system and can aid in deepening anesthesia is magnesium sulfate. Furthermore, magnesium inhibits the contraction of smooth muscles**[3]**.

Lidocaine belongs to the class of local anesthetics called amides. When used as a local anesthetic, lidocaine works by blocking voltage-gated sodium channels, which reversibly stops action potentials from propagating. Lidocaine provides anti-arrhythmic and analgesic effects for a number of pain problems in addition to being used as a local anesthetic. In addition, there are numerous ways to deliver lidocaine, such as topical, subcutaneous, intravenous, perineural, epidural, and intrathecal. Peak plasma levels are reached 3–5 minutes after intravenous administration, and they have a half-life of 30–120 minutes**[8]**.

In children undergoing tonsillectomy, dexamethasone and other steroid formulations have been utilized to lessen tissue damage, edema, and certain related morbidities such discomfort, difficulty eating, and low oral intake. With its long biological half-life of 36 to 48 hours and low cost, a single injection of dexamethasone may not have any adverse effects. Additionally, it has antiemetic and anti-inflammatory qualities that work together to lessen postoperative edema and eventually improve oral intake following tonsillectomy **[9].**

This study aimed to evaluate and compare the effect of intravenous magnesium sulphate, lidocaine or dexamethasone on the incidence and severity of laryngospasm and postoperative pain in pediatrics undergoing adenotonsillectomy, to record the side effects (hemodynamic instability, vomiting, agitation, coughing, respiratory depression and convulsions) and complications that may occur among the three groups and to assess the effect of intravenous magnesium sulphate, intravenous lidocaine, or

METHODS

This Prospective Randomized double blinded Clinical study was carried out in Zagazig University Hospitals, Anesthesia Department, Intensive Care and Pain Management Department during the period from September 2024 to February 2025. This study involved a random sample of 75 children undergoing adenotonsillectomy were divided into three groups using a computer-generated randomization table 25 children each were randomly assigned to patients after receiving written informed consent was signed from all parents after discussing the study design including procedure, drugs and possible adverse effects. Approval was obtained from Institutional Review Board (IRB# 283/2-April-2024). The World Medical Association's Code of Ethics for Human Studies, known as the Declaration of Helsinki, was followed when conducting the inquiry.

Double blinded; the type of the medication was not disclosed to the patients or the anesthesia assistant, who assesses the medication's effects. In order to take appropriate action in the event of unfavorable medical issues, only the anesthesiologist the person who wrote the prescription was aware of the drugs.

Sample size:

Assuming the mean recovery time was 38.4±8.1min vs 32.3±9.0min in magnesium

sulphate vs lidocaine group. At 80% power and 95%C1, the estimated sample will be 69 cases (23cases in each group), adding 10% to total number of cases for dropout cases, so the total number will be 75 cases (25 cases in each group), using Open EPI**[2]**.

Inclusion Criteria included family approval, children undergoing adenotonsillectomy, patients aged 2–6 years of both sexes, American Society of Anesthesiology (ASA) physical status I–II, body mass index (BMI) as a percentile between the 5th and 85th percentiles of the same age and sex, and surgery lasting less than one hour. Patients with a history of chronic or recent use of any sedative or analgesic medications, children with developmental, psychiatric, or neurological abnormalities, asthmatic patients, and children with a documented history of allergy to the research agents were also excluded.

The patient's parents may leave the study at any moment without affecting the patient's course of treatment, provided that the surgery lasted more than 1.5 hours or that the volume of blood lost during the procedure exceeded 100 cc (the total amount of blood available in the suction and gauzes used).

Preoperative:

A history was taken, including information about past surgical procedures, chronic illnesses, drug allergies, and anesthetic issues. Vital signs, cardiac condition, chest condition, and exposure of the intravenous cannulation site were all part of the physical examination. The following laboratory tests were performed: sedimentation rate, coagulation profile, and whole blood picture. Prior to the procedure, all patients were kept completely nil orally for eight hours for fatty meals, six hours for light meals, and two hours for clear drinks.

Intraoperative:

The electrocardiogram (ECG), noninvasive blood pressure (NIBP), pulse oximetry, and capnograph standard American Society of Anesthesiology (ASA) monitors were used to keep an eye on every patient. Measurements of oxygen saturation (SpO2), mean arterial blood pressure (MAP), and heart rate (HR) were taken at baseline. Prior to induction, a one-minute preoxygenation with 100% oxygen was performed. Sevoflurane 8% mask inhalation was used to produce anesthesia. An intravenous line was subsequently placed, and IV atracrium 0.5 mg/kg, atropine 10µg/kg, and fentanyl 1µg/kg were administered. An appropriately sized endotracheal tube was placed. (Age/4+4). Each group received the following medications following endotracheal intubation: **Group M (n=25);** Infusions of 15 mg/kg 10% magnesium sulfate in 50 ml of 0.9% sodium chloride were given to patients intravenously over a 10-minute period. **Group L (n=25);** Over ten minutes, patients received an intravenous infusion of 50 milliliters of 0.9% sodium chloride containing 1 mg/kg 2% lidocaine. **Group D (n=25);** Over ten minutes, patients received an intravenous infusion of 50 milliliters of 0.9% sodium chloride containing 0.5 mg/kg of dexamethasone. The study medications were manufactured in syringes of same size and form, labeled, and administered by the anesthesia assistant to prevent blindness to the patients and researcher. To reach an end-tidal CO2 level of 35–40 mmHg, patients were manually ventilated using volume-controlled ventilation (6–8 ml/kg). To address the hydration deficiency and maintenance, each patient got a warm intravenous lactated Ringer's solution based on their weight.

Maintenance :

Based on the patient's reaction, 2-3% sevoflurane was used to maintain anesthesia. Up to the conclusion of the procedure, HR, MAP, and SpO2 were recorded every ten minutes. Bradycardia and hypotension were noted if they were present. If hypotension (a drop in MAP of more than 20% from baseline) occurred, normal saline was used to treat it, and if blood pressure could not be restored, 0.3 mg/kg of ephedrine was given. When bradycardia (HR <60 beats/min) occurred, atropine 0.02 mg/kg was used as a treatment.

Procedure:

Following surgery, inhalation anesthesia was stopped, and atropine 0.02 mg/kg and neostigmine 0.05/kg were used to reverse

muscle relaxants. Extubation was performed in a lateral position once the patient was completely conscious, and the children were promptly evaluated for any indications of laryngospasm after the procedure. A four-point rating system was used to assess the frequency and severity of laryngospasm; 0: absence of laryngospasm; 1: stridor during inhalation; 2: total vocal cord blockage; 3: cyanosis **[4].** Laryngospasm was measured right after extubation as well as one, five, ten, and fifteen minutes later. The management of laryngospasm included chin lift, jaw thrust, pressure on the laryngospasm notch (the soft place immediately above the jaw and below the earlobe), 100% oxygen, and continuous positive airway pressure (CPAP) with a face mask. Pharmacological treatment for laryngospasm involves giving 2 mg/kg of propofol and/or 0.5–1 mg/kg of suxamethonium, as well as reintubation if required**[10]**.

Postoperative:

After being moved to the Post Anesthesia Care Unit (PACU), the patient was constantly monitored for SpO2, MAP, and HR, with recordings made every 15 minutes for two hours. Every five minutes for the first half hour and then every fifteen minutes for the next two hours, the Pediatric Anesthesia Emergence Delirium (PAED) score was used to measure the kid's level of agitation. If the PAED score was greater than twelve, the child was deemed disturbed**[11]**. If emerging agitation occurs, it can be managed by using either midazolam 0.02 mg/kg IV or propofol 0.5 mg/kg IV. Every 30 minutes for two hours, postoperative pain was measured using the Children and Infants Postoperative Pain Scale (ChIPPS) **[12]**. The time until the first dosage of analgesia was noted for children with a score of ≥4, who were given paracetamol (15 mg/kg rectal suppository). The numeric rank rating system was used to record and evaluate vomiting (0 = no vomiting, 1 = vomiting once, and 2 = vomiting twice or more) **[13]**. Ondansetron 0.1 mg/kg was used to treat vomiting episodes. Bradycardia, respiratory depression, and hypotension were evaluated and treated appropriately. The modified Aldrete score was used to determine discharge from the PACU**.** If a patient received a score of nine or higher, they were deemed ready for discharge.

Outcome measures:

The incidence and severity of laryngospasm and postoperative pain in pediatric patients following adenotonsillectomy were the primary outcome variables that were evaluated and compared among the three groups. Recovery time, time to first analgesia dose, and any potential complications or adverse effects among the three groups are evaluated as secondary outcomes.

Statistical analysis

Version 27.0 of the SPSS program (Statistical Package for Social Science) was used to computerize and statistically analyze the gathered data (IBM, 2020). Frequencies and relative percentages were used to illustrate the qualitative data. The difference between qualitative variables was computed using the Chi-square test. The mean ± SD (standard deviation) was used to express quantitative data. The Shapiro-Wilk test was used to determine whether the data distribution was normal. When data were normally distributed, parametric tests were employed to compare groups: When comparing three or more groups with quantitative variables, the one-way ANOVA test of significance is utilized. To assess the differences between the groups, the post hoc least significant difference (LSD) test is used. A value of $P < 0.05$ was considered statistically significant.

REULTS

Seventy-Five patients were enrolled in the present study as shown in flow chart Figure 1.

Table 1; demonstrated that, in terms of demographic statistics, there were no appreciable differences between the groups under study.

Table 2; revealed that while there was no significant difference in the heart rates of the groups under study at the time of extubation, there was a significant difference in the heart rates of the groups under study at the

preoperative, 15-minute post-recovery, and discharge times, with group III and II having significantly lower heart rates than group I. Nevertheless, there was no discernible difference between groups II and III.

Table 3; revealed that while there was no significant difference in DBP 15 minutes after recovery, there was a significant difference in blood pressure between the groups under study at various time intervals.

Table 4; demonstrated that the mean O2 saturation did not significantly differ across the groups under study.

Table 5; demonstrated that there was a significant difference between the groups under study in terms of the length of the anesthesia, which was shorter in group III than in groups I and II, and the length of the surgery, which was shorter in groups II and III than in group I. Group I had a longer recovery time than groups II and III, which indicated a significant difference between the groups under study. However, there was no discernible variation in operating type across the groups under study. The time to first oral consumption, there were no appreciable differences between the groups under study.

There were no complications for any of the individuals in any group. Table 6 shows that the incidence of laryngospasm at 1 and 5 minutes following extubation did not significantly differ among the groups under study, there were no patients develps laryngospasm at 10 and 15minutes post extubation among three groups

Table 7; VAS score was significantly lower in group I than group II and III at 0 and 4 hr and significantly lower in group III than group I and II at 8 hrs while it was non significant at 24 hrs. Swallowing pain there were no appreciable differences between the groups under study on 1st day.

Revealed that the groups under study did not differ significantly in terms of ChIPPS, modified Aldrete score, or emerging agitation.

Table 1: Demographic data among studied groups

		Group I: M (25)	Group II: L (25)	Group III: D (25)	P value
Age (years)	Mean± SD	4.34±0.98	4.76±1.0	4.28±1.1	0.201
	Range	3-6	3-6	3-6	
Sex	Male	13 (52.00%)	14 (56.0%)	16 (64.0%)	0.683
	Female	12 (48.00%)	11 (44. 0%)	9 (36.0%)	
Weigh t	Mean± SD	17.08±3.4	18.72±3.7	17±3.04	0.14
	Range	14-24	15-25	14-24	
Height	Mean± SD	105±7.17	106±7.07	103.4±7.2	0.447
	Range	95-118	95-115	95-116	
ASA	1	25 (100%)	25 (100%)	25 (100%)	-

P1: I and II, P2: I and III, P3:II and III, ASA: American Society of Anesthesiology

Table 2: Heart rate among the studied groups

		Group I: M (25)	Group II: L (25)	Group III: D (25)	P value	P value
Pre-Operative	Mean±SD	135.2±11.2	127.16±13.07	127.5±4.69	0.011	P1=0.01 P2=0.007 P3=0.902
	Range	115-151	102-151	122-136		
Extubation time	Mean± SD	124.72±13.3	125.12±14.04	126.88±8.6	0.803	
	Range	106-155	98-155	111-140		
15 minutes after recovery	Mean ± SD	130.5±11.9	110.68±11.4	111.36±8.16	0.001	P1=0.001 P2=0.001 P3=0.822
	Range	100-148	99-144	98-130		
Discharge time	Mean ± SD	127.6±13.28	117.48±14.8	118.96±17.4	0.047	P1=0.049 P2=0.022 P3=0.733
	Range	96-148	96-150	104-150		

Table 3: Blood Pressure among the studied groups

		Group I: M (25)	Group II: L (25)	Group III: D (25)	P value	P value
SBP pre Operatively	Mean± SD	116.7±12.04	105.56±15.16	94.2±3.69	0.001	P1=0.001 P2=0.001 P3=0.001
	Range	98-130	90-142	87-99		
DBP Pre Operatively	Mean± SD	61.8±6.7	58.24±10.6	47.9±4.6	0.001	P1=0.001 P2=0.104 P3=0.001
	Range	48-69	48-88	40-55		
SBP at extubation time	Mean± SD	110.04±11.2	102.08±13.9	88.2±6.68	0.001	P1=0.001 P2=0.013 P3=0.001
	Range	98-129	85-129	77-98		
DBP at extubation time	Mean± SD	56.32±5.6	57.32±9.7	49.36±7.12	0.001	P1=0.002 P2=0.647 P3=0.001
	Range	49-66	49-85	38-66		
SBP at 15 minutes after recovery	Mean± SD	102.48±4.9	104.24±15.15	93.16±7.3	0.001	P1=0.002 P2=0.54 P3=0.001
	Range	98-115	87-136	83-105		
DBP at 15 minutes after recovery	Mean± SD	53.48±9.9	58.16±11.7	51.96±5.8	0.061	
	Range	43-75	45-86	40-60		
SBP at discharge time	Mean± SD	99.16±2.79	103.8±9.97	95.48±8.23	0.001	P1=0.093 P2=0.035 P3=0.001
	Range	92-105	89-120	85-113		
DBP at discharge time	Mean± SD	48.28±5.06	59.16±5.34	53.28±3.23	0.001	P1=0.001 P2=0.001 P3=0.001
	Range	40-56	50-66	48-58		

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 4: Mean O2 Saturation among the studied groups

		Group I: M (25)	Group II: L (25)	Group III: D (25)	P value
Extubation	Mean ± SD	97.96±1.17	98.12±1.94	97.12±1.69	0.074
	Range	95-99	92-100	93-99	
15 minutes after recovery	Mean ± SD	98.48±0.77	98.4±0.5	98.56±0.50	0.648
	Range	97-100	98-99	98-99	
30 minutes after recovery	Mean ± SD	98.52±0.50	98.12±1.01	98.4±0.5	0.135
	Range	98-99	96-99	98-99	

O2: Oxygen saturation

Table 5: Operative data and time to first oral intake among the studied groups

		Group I: M (25)	Group II: L (25)	Group III: D (25)	P value	P value
Duration of surgery (min)	Mean ± SD	31±2.88	29.4±1.65	29.8±2.27	0.047	P1=0.072 P2=0.018 P3=0.545
	Range	25-35	25-30	25-35		
Duration of anaesthesia (min)	Mean ± SD	39.4±3.62	38.4±2.38	36.6±2.38	0.003	P1=0.001 P2=0.22 P3=0.029
	Range	35-45	35-40	35-40		
Recovery time (min)	Mean ± SD	8.12±1.67	6.08±1.68	5.72±0.98	0.0001	P1=0.001 P2=0.001 P3=0.392
	Range	6-11	5-10	5-7		

Table 6: Incidence of Laryngospasm after extubation

		Group I: M (25)	Group II: L (25)	Group III: D (25)	P value
1 min	No	25 (100%)	23 (92.00%)	23 (92.0%)	0.357
	Yes	0 (0%)	2 (8.0%)	2 (8.0%)	
5 min	No	25 (100%)	23 (92.00%)	23 (92.0%)	0.357
	Yes	0 (0%)	2 (8.0%)	2 (8.0%)	

Table 7: Pain scores among the studied groups

		Group I: M (25)	Group II: L (25)	Group III: D (25)	P value	P value
0 Hr	Mean ± SD	4.3±0.7	5.4±0.6	5.6±0.5	0.001	P1=0.001 P2=0.001 P3=0.509
	Range	3-5	4-6	5-6		
4 Hr	Mean ± SD	3.2±0.7	4.2±0.5	4.2±0.8	0.001	P1=0.001 P2=0.001 P3=0.847
	Range	2-4	3-5	3-6		
8 Hr	Mean ± SD	1.76±0.5	2.1±0.5	1.4±0.5	0.001	P1=0.012 P2=0.024 P3=0.001
	Range	1-3	1-3	1-2		
24 Hr	Mean ± SD	0.92±0.2	1.1±0.2	1±0.4	0.23	
	Range	0-1	1-2	0-2		

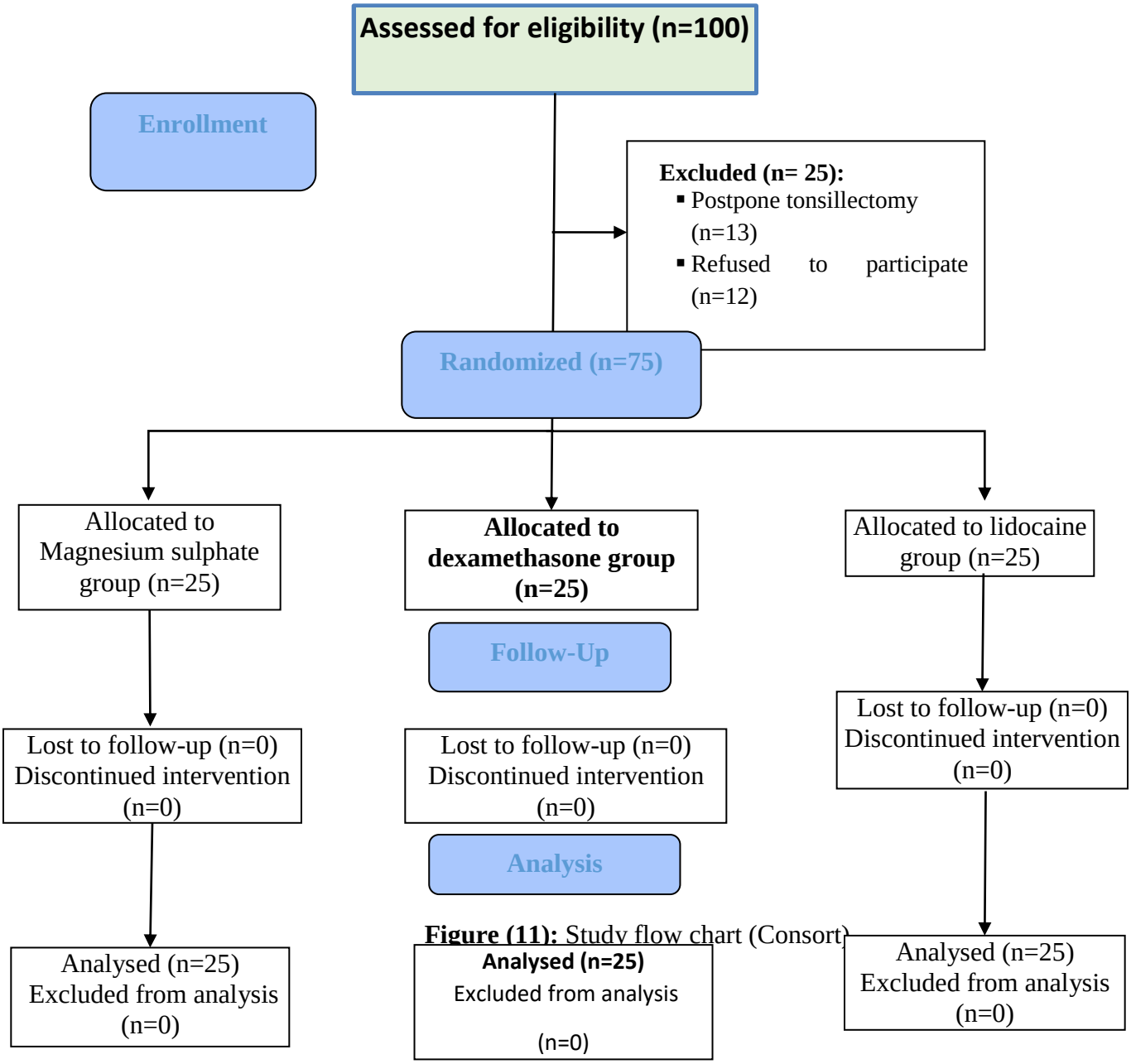

Figure (11): Study flow chart (Consort)

DISCUSION

Lidocaine, dexamethasone, and magnesium sulphate are examples of promising pharmaceuticals with possible defense mechanisms. By acting as an antagonist of N-methyl-D-aspartate receptors, magnesium sulfate (MgSO4) has been thoroughly investigated in adults, and recent systematic reviews have demonstrated its advantages in enhancing the effects of muscle relaxants and lowering postoperative pain and other complications by lowering the use of opioids **[1]**. A class B anti-arrhythmic medication, lidocaine lessens chronic glottis blockage by

blocking the upper laryngeal nerve's stimulatory action and activity. Cleft palate surgery, which lowers the risk of problems including cough and laryngospasm, is one procedure that has demonstrated the advantages of lidocaine in lowering complications. Furthermore, using this medication topically and inhaled has decreased problems **Heidari et al., [14]** although dexamethasone has strong analgesic and anti-inflammatory properties**[15].**

In this study, the effects of intravenous magnesium sulphate, lidocaine, or dexamethasone on the incidence and severity of laryngospasm and postoperative pain in pediatric patients undergoing adenotonsillectomy were evaluated and compared. Additionally, the side effects (such as hemodynamic instability, vomiting, agitation, coughing, respiratory depression, and convulsions) and complications that may arise among the three groups were documented, and the effect of intravenous magnesium sulphate, lidocaine, or dexamethasone on recovery time was evaluated.

Using a computer-generated table, pediatric patients scheduled for adenotonsillectomy under general anesthesia were randomly assigned into three equal groups for this prospective randomized double-blind clinical study, which was conducted in the anesthesia, intensive care, and pain management departments of Zagazig University Hospitals: **Group M (n=25):** After During ten minutes, patients undergoing endotracheal intubation received an intravenous infusion of 15 mg/kg 10% magnesium sulfate in 50 ml of 0.9% sodium chloride. **Group L (n=25):** Patients received an intravenous infusion of 1 mg/kg 2% lidocaine in 50 ml of 0.9% sodium chloride over a 10-minute period following endotracheal intubation. **Group D (n=25):** Patients received a 10-minute intravenous infusion of dexamethasone at a dose of 0.5 mg/kg in 50 milliliters of 0.9% sodium chloride following endotracheal intubation.

A balanced assessment of the therapies was ensured by the demographic data in our study, which revealed no discernible disparities between the three groups.

The heart rate readings in our investigation showed notable differences across the groups. In comparison to groups II (lidocaine) and III (dexamethasone), group I (magnesium sulphate) had greater heart rates prior to surgery, 15 minutes following recovery, and during discharge.

In harmony, **Ertiame et al.** discovered that the control group's mean heart rate and MAP values at 2, 5, 10, and 20 minutes post-extubation were statistically significantly greater than the lidocaine group's comparable values**[16]**.

These findings were in agreement with the reported finding of **Sanikop and Bhat [4]**. In comparison to the lidocaine group, they found that the control group's heart rate significantly increased ten minutes after extubation.

On the other hand, **Abdulatif et al.** examined the impact of administering magnesium sulphate intraoperatively on the occurrence of emerging agitation in children having sevoflurane anesthesia for adenotonsillectomy. A lower heart rate was linked to magnesium sulfate infusion. They explained this by saying that magnesium sulfate can block catecholamine receptors and prevent catecholamines from being released from the adrenal medulla and peripheral adrenergic nerve terminals**[17]**.

When magnesium sulfate was used to treat pediatric patients with status asthmaticus, a stable hemodynamic profile was seen**[18]**.

Systolic and diastolic blood pressure readings at several time points in our investigation revealed notable variations across groups. In line with the heart rate results, Group I continuously had greater blood pressure than the other groups.

In contrast, **Ertiame et al. [16]** found that giving 1 mg/kg of lidocaine intravenously two minutes before to endotracheal intubation stopped coughing and had no effect on heart rate or blood pressure during or after the procedure.

Regarding mean O2 saturation, our study found no discernible differences between the groups under investigation.

Sanikop and Bhat [4] revealed that severe post-extubation laryngospasm caused a considerable drop in oxygen saturation in the control group, whereas this did not happen in the lidocaine group.

Ertiame et al. [16] revealed that four patients (10%) in the control group experienced hypoxemia after extubation, whereas the lidocaine group did not. Only two minutes after extubation, the mean SpO2 values in the C group were statistically lower than those in the lidocaine group. Three patients had moderate post-extubation laryngospasm, and one patient had severe post-extubation laryngospasm, which were the reasons of this hypoxemia.

The length of anesthesia and operation varied considerably between groups in our study. In comparison to Group I (magnesium sulphate), Group II (lidocaine) and Group III (dexamethasone) had shorter surgical and anesthetic times. This result raises the possibility of differences in how these drugs' pharmacological properties affect anesthesia and surgical procedures.

Heidari et al. [14] sought to compare the utilization of medications like lidocaine and dexamethasone after tonsillectomy. Following surgery, patients were split into four groups and given dexamethasone 0.1 mg/kg and lidocaine 1 mg/kg, ketamine 0.5 mg/kg and dexamethasone 0.1 mg/kg, and normal saline. They found that the time of extubation, anesthesia, surgery, re-intubation, and repeated operation did not significantly differ among the four therapy groups, and that all cases in these groups had comparable outcomes for surgery and intubation.

No problems, including bradycardia, hypotension, hypoventilation, vomiting, or bleeding, occurred in any of the groups in our study. Only 8% of patients in groups II (lidocaine) and III (dexamethasone) experienced laryngospasm at 1 and 5 minutes after extubation.

These results align with **Xie et al. [1]** who assessed how magnesium sulfate affected the problems that followed tonsillectomies in children. They said that there was no difference in postoperative nausea and vomiting between the MgSO4 and control groups. Our study's considerable reduction in the incidence of postoperative laryngospasm in children receiving magnesium, particularly in topical usage subgroups, is another noteworthy finding. Magnesium is thought to have the ability to reduce laryngospasm by relaxing muscles and deepening anesthesia.

In agreement, **Cho et al.** who evaluated the effects of tonsillectomy in children against tonsillectomy with perioperative magnesium as an adjuvant. They found that magnesium groups saw a significant decrease in laryngospasm in the recovery room. Local magnesium injection was found to be more successful in lowering postoperative morbidities in subgroup analyses pertaining to pain and laryngospasm-related measures**[19]**.

Another useful medication for lowering problems from intubation is dexamethasone by itself. According to studies, dexamethasone injections can help patients feel less pain, nausea, and vomiting**[20,21]**.

Ertiame et al. discovered that the incidence and severity of post-extubation laryngospasm were statistically significantly reduced when 1.5 mg/kg of lidocaine was administered intravenously two minutes prior to extubation, as compared to the control group. Additionally, the two studied groups' rates and severity of post-extubation laryngospasm were statistically similar**[16]**.

Heidari et al. found that there were no appreciable variations in laryngospasm across any of the four treatment groups**[14]**.

Baraka found that giving children 2 mg/kg of lidocaine intravenously one minute before extubation prevented post-extubation laryngospasm **[22]**. **Malik et al.,** found that giving children undergoing tonsillectomy 1.5 mg/kg lidocaine intravenously two minutes before to extubation reduced the frequency and intensity of postextubation laryngospasm**[23]**.

Qi **et al.** they concluded that both intravenous and topical lidocaine could prevent laryngospasm in pediatric surgery following a network metaanalysis on the topic's

effectiveness in this regard**[24]**.

Aljonaieh, the incidence of post-extubation laryngospasm was found to be 19.5% in the placebo group and 0% in the group treated with lidocaine (1 mg/kg); this difference was statistically significant**[25]**.

Postextubation laryngospasm was thought to occur because afferent impulses from the vocal cord and larynx activated N-methyl-D-aspartate (NMDA) receptors in the brain stem, which in turn caused an efferent vagal response that resulted in vocal cord adduction, or laryngospasm**[5]**.

All groups in our study experienced the same level of pain and difficulty swallowing at various points in time. This implies that in pediatric adenotonsillectomy, magnesium sulphate, dexamethasone, and lidocaine can have similar analgesic effects.

Heidari et al. [14] found that individuals who received dexamethasone experienced the least amount of discomfort and required the fewest postoperative analgesic doses.

Hashemian et al. [26] demonstrated that administering lidocaine intravenously could considerably reduce discomfort.

El-Anwar et al. [27] and **Sun et al. [28]** discovered that the magnesium group had a lower pain score within the first few hours after surgery, but this difference was not statistically significant.

Adults' postoperative pain has not been shown to be effectively reduced by a single magnesium bolus dosage for systemic magnesium usage**[29]**.

Though **Xie et al.** did not discover magnesium's impact on pain management; nevertheless, their meta-analysis revealed that the magnesium group had a much reduced incidence of emergence agitation and a lower utilization of rescue analgesia compared to the control group**[1]**.

Abdulatif et al. showed that in children undergoing adenotonsillectomy under sevoflurane anesthesia, a bolus dose followed by an intravenous magnesium sulphate infusion intraoperatively significantly reduced the incidence and severity of emergence agitation and the need for postoperative rescue doses of analgesia. The control and magnesium sulphate groups' postoperative pain levels did not differ significantly, according to their findings**[17]**.

Cho et al. found that the magnesium groups' duration for first analgesic demand was substantially longer (P =.0079) than that of the control group**[19]**.

While, **O'Flaherty and Lin**, found that magnesium sulphate, either by alone or in combination, had no postoperative analgesic effect on children having tonsillectomy**[30]**.

In a prior investigation, the incidence of emerging agitation in pediatric patients having adenotonsillectomy under sevoflurane anesthesia was shown to be unaffected by a single intraoperative 30 mg.kg−1 bolus dose of magnesium sulphate**[31]**.

The Children and Infants Postoperative Pain Scale (ChIPPS), modified Aldrete scores, and emerging agitation did not significantly differ across groups in our study. This suggests that the recovery features offered by the three therapies were comparable.

According to our study, the magnesium sulphate group experienced a considerable delay in recovery compared to the dexamethasone and lidocaine groups, but the recovery times for these groups were comparable.

This finding was agreement with **Mraovic et al.,** they found that as compared to administering a placebo (5 milliliters of normal saline), intravenous injection of 1.5 milligrams per kilogram of lidocaine at the end of sevoflurane had no effect on the recovery from anesthesia **[32]**.

In accordance, **Abdulatif et al. [17]** stated that there was no correlation between the usage of magnesium sulphate and a higher incidence of postoperative side effects or a slower rate of recovery.

Heidari et al. found that there were no appreciable variations in the four treatment groups' recovery times**[14]**.

Limitations:

The effectiveness of intravenous magnesium sulphate, lidocaine, or dexamethasone on the

occurrence and severity of laryngospasm and postoperative pain in pediatric patients following adenotonsillectomy is usefully provided by this study. There are a few restrictions to take into account. Future studies could employ a larger sample size to increase the power of the findings, even if the sample size was adequate to detect significant changes. Our study lacked a control group.

Conclusion:

The present study indicate that intravenous magnesium sulfate is more effective than intravenous lidocaine and dexamethasone in reducing the incidence and severity of laryngospasm. However, it is associated with a relatively prolonged recovery time compared with lidocaine and dexamethasone.

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REFERENCES

1-Xie M, Li XK, Peng Y. Magnesium sulfate for postoperative complications in children undergoing tonsillectomies: a systematic review and meta-analysis. J Evid Based Med. 2017 Feb;10(1):16-25.

2- Manouchehrian N, Abbasi R, Jiryaee N, Beigi RM. Comparison of intravenous injection of magnesium sulfate and lidocaine effectiveness on the prevention of laryngospasm and analgesic requirement in tonsillectomy. Eur J Transl Myol. 2022 Sep 26;32(4):10732.

3- Marzban S, Haddadi S, Naghipour MR, Varg ZS, Nabi BN. The effect of intravenous magnesium sulfate on laryngospasm after elective adenotonsillectomy surgery in children. Anesth Pain Med. 2014 Feb 28;4(1):e15960.

4- Sanikop CS, Bhat S. Efficacy of intravenous lidocaine in prevention of post extubation laryngospasm in children undergoing cleft palate surgeries. Indian J Anaesth. 2010 Mar 1;54(2):132-6.

5- Batra YK, Ivanova M, Ali SS, Shamsah M, Qattan AR, Belani KG. The efficacy of a subhypnotic dose of propofol in preventing laryngospasm following tonsillectomy and adenoidectomy in children. Paediatr Anaesth. 2005 Dec;15(12):1094-7.

6- Hamed MA, Al-Saeed MA. The efficacy of intravenous magnesium sulfate versus intravenous paracetamol on children posttonsillectomy pain and analgesic requirement: a randomized controlled study. Anesth Essays Res. 2018 Jul 1;12(3):724-8.

7- Soleimanpour H, Imani F, Dolati S, Soleimanpour M, Shahsavarinia K. Management of pain using magnesium sulphate: a narrative review. Postgrad Med. 2022 Apr 3; 134(3): 260-6.

8- Karnina R, Arif SK, Hatta M, Bukhari A. Molecular mechanisms of lidocaine. Ann Med Surg. 2021 Sep 1;69:102733.

9- Jaafarpour M, Khani A, Khajavikhan J. The Effect of Dexamethasone on the incidence of laryngospasm in pediatric patients after Tonsillectomy. Epidemiol and Health System J. 2015 Sep 1;2(3):113-7.

10- Michelet D, Truchot J, Piot MA, Drummond D, Ceccaldi PF, Plaisance P et al. Perioperative laryngospasm management in paediatrics: a high-fidelity simulation study. BMJ Simul Technol Enhanc Learn. 2018 Sep 26; 5(3): 161.

11- Bajwa SA, Costi D, Cyna AM. A comparison of emergence delirium scales following general anesthesia in children. Paediatr Anaesth. 2010 Aug; 20(8):704-11.

12- Büttner W, Finke W. Analysis of behavioural and physiological parameters for the assessment of postoperative analgesic demand in newborns, infants and young children: a comprehensive report on seven consecutive studies. Paediatr Anaesth. 2000 May; 10(3): 303-18.

13- Lee YS, Kim WY, Choi JH, Son JH, Kim JH, Park YC. The effect of ketamine on the incidence of emergence agitation in children undergoing tonsillectomy and adenoidectomy under sevoflurane general anesthesia. Korean J Anesthesiol. 2010 May 29;58(5):440.

14- Heidari M, Shetebi H, Golshiri P, Hoghughi S. Lidocaine and Dexamethasone, Ketamine and Dexamethasone, and Dexamethasone Alone in Tonsillectomy Complications. Adv Biomed Res. 2024 May 1;13(1):40.

15- Waldron NH, Jones CA, Gan TJ, Allen TK, Habib A. Impact of perioperative dexamethasone on postoperative analgesia and side-effects: systematic review and meta-analysis. Br J Anaesth. 2013 Feb 1;110(2):191-200.

16- Ertiame MT, Elsayed AS, Farag NM, Botros AR. The effect of intravenous lidocaine versus midazolam on the incidence and severity of post-extubation laryngospam in children undergoing

adenotonsillectomy: A randomized control clinical trial. Zagazig Univers Med J. 2023 Sep 1;29(5):1260-7.

17- Abdulatif M, Ahmed A, Mukhtar A, Badawy S. The effect of magnesium sulphate infusion on the incidence and severity of emergence agitation in children undergoing adenotonsillectomy using sevoflurane anaesthesia. Anaesth. 2013 Oct;68(10):1045-52.

19- Cho HK, Park IJ, Yoon HY, Hwang SH. Efficacy of adjuvant magnesium for posttonsillectomy morbidity in children: a meta-analysis. Otolaryngol Head Neck Surg. 2018 Jan;158(1):27-35.

20- Sotiriadis A, Makrydimas G, Papatheodorou S, Ioannidis JP, McGoldrick E. Corticosteroids for preventing neonatal respiratory morbidity after elective caesarean section at term. Cochrane Database Syst Rev. 2018(8).

21- Lim MA, Pranata R. Worrying situation regarding the use of dexamethasone for COVID-19. Ther Adv Respir Dis. 2020 Jul; 14: 1753466620942131.

22- Baraka A. Intravenous lidocaine controls extubation laryngospasm in children. Anesth Analg. 1978**;** 57(4), 506-507.

23- Malik A, Butt TA, Akhtar N, Ashraf Z. Efficacy of intravenous lidocaine in preventing laryngospasm in children undergoing Tonsillectomy. Pakistan J Med Health Sci. 2016 Oct 1; 10(4): 1182-6.

24- Qi X, Lai Z, Li S, Liu X, Wang Z, Tan W. The efficacy of lidocaine in laryngospasm prevention in pediatric surgery: a network meta-analysis. Sci Rep. 2016 Sep 2; 6(1): 32308.

25- Aljonaieh KI. Effect of intravenous lidocaine on the incidence of postextubation laryngospasm: a double-blind, placebo-controlled randomized trial. Saudi J Anaesth. 2018 Jan 1;12(1):3-9.

26- Hashemian AM, Doloo HZ, Saadatfar M, Moallem R, Moradifar M, Faramarzi R et al. Effects of intravenous administration of fentanyl and lidocaine on hemodynamic responses following endotracheal intubation. Am J Emerg Med. 2018 Feb 1; 36(2):197-201.

27- El-Anwar MW, Mostafa T, Abd-Elsamad A. Levobupivacaine alone versus levobupivacaine plus magnesium infiltration for post-tonsillectomy analgesia. Inter J Pharmacol. 2015 Jan 1;11(5):490-5.

28- Sun J, Wu X, Zhao X, Chen F, Wang W. Pre-emptive peritonsillar infiltration of magnesium sulphate and ropivacaine vs. ropivacaine or magnesium alone for relief of post-adenotonsillectomy pain in children. Int J Pediatr Otorhinolaryngol. 2015 Apr 1; 79(4): 499-503.

29- Tramer MR, Glynn CJ. An evaluation of a single dose of magnesium to supplement analgesia after ambulatory surgery: randomized controlled trial. Anesth Analg. 2007 Jun 1; 104(6): 1374-9.

30- O'Flaherty JE, Lin CX. Does ketamine or magnesium affect posttonsillectomy pain in children?. Pediatr Anesth. 2003 Jun;13(5):413-21.

31- Apan A, Aykaç E, Kazkayasi M, Doganci N, Tahran FD. Magnesium sulphate infusion is not effective on discomfort or emergence phenomenon in paediatric adenoidectomy/tonsillectomy. Int J Pediatr Otorhinolaryngol. 2010 Dec 1;74(12):1367-71.

32- Mraovic B, Simurina T, Mikulandra S, Seric J, Sonicki Z. Effects of IV lidocaine administered prior to extubation on early and late recovery after breast surgery: 1AP1–5. Eur J Anaesthesiol EJA. 2010Jun12;27(47):8.

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