

# Nebulized I- epinephrine in post - bronchoscopy croup



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## Safety and Efficacy of Nebulized L-epinephrine in Post -Bronchoscopy Croup in Children, Anesthesia Consideration

- Dr Asma Aref Idamat, Pharmacist
- Dr Hussein Khraysha, Senior Specialist Anesthetist
- Dr Najeh Alomari, Consultant Pediatric Surgeon
- Amman-Jordan

### ABSTRACT

*OBJECTIVE* : To assess the value of bronchodilator effect of nebulized epinephrine post bronchoscopy in children and to compare the effectiveness and side effects of nebulized L-epinephrine (NLE) 1/1000 at a dose of 0. 1 mL/kg versus 0. 5 mL/kg in the treatment of post-bronchoscopy croup and upper airway obstruction .

*MATERIAL AND METHOD* : Between April1998 and April 2002, 120 children, who developed signs and symptoms of upper airway obstruction (UAO) after bronchoscopy, were randomized to receive either 0. 1 mL/kg or 0. 5 mL/kg of nebulized L-epinephrine (NLE). Age group ranged from 4months to 14 years, mean of 4. 6 years, male /female ratio 4: 1. UAO scores, vital signs (VS) , oxygen saturation (O<sub>2</sub> Sat)and side effects if present were recorded before , at 15 minutes , 35 minutes and 45 minutes after the treatment. The treatment was accomplished in the recovery room under the care of the anesthetist and pediatric surgeon. All patients were reviewed carefully prior to discharge from recovery room.

*RESULTS* : Sixty children were allocated to the 0. 1mL/kg (NLE) and sixty children to the 0. 5 mL/kg (NLE).. The (NLE) was mixed with 2ml of normal  
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saline. Both groups showed improvements in UAO scores and Oxygen saturation over time. There were no significant differences in UAO scores and VS between the groups at all time points. There were no side effects of epinephrine during the observation.

*CONCLUSION* : The administration of nebulized L-epinephrine is safe and effective in relieving croup and upper airway obstruction (UAO) post-bronchoscopy in children. NLE at the dose of 0. 1 mL/kg results in similar improvements in the UAO scores, compared with the dose of 0. 5 mL/kg. No complications were seen in either dose and we recommend the routine use of 0. 1ml/kg (NLE) post -bronchoscopy in children.

Key words: Bronchoscopy, Bronchodilators, L-adrenaline, croup, children

## Introduction

Croup or subglottic edema post bronchoscopy and post intubation is a well known entity. Children are more vulnerable to develop croup after such procedures than adults due to well known differences in the anatomy of upper airway and tracheo-bronchial tree with narrower laryngeal and tracheal lumens with the result of obstruction more readily by to mucosal edema due to different causes, like viral and bacterial infections as well as allergic manifestations. The narrowest part of upper airway is that at the level of cricoid cartilage which makes the internal tracheal injury by endo tracheal tube or bronchoscope sheath more prone at the narrow subglottic area even after easily passage through the vocal cords. Bronchoscopic removal of aspirated foreign bodies in children is a common procedure in Jordan and many other countries worldwide. The procedure is performed <https://assignbuster.com/nebulized-l-epinephrine-in-post-bronchoscopy-croup/>

under general anesthesia using rigid bronchoscopic device through which the ventilation is maintained. Foreign bodies are usually successfully removed using forceps, wash out with saline and suction tube. In many cases repeated bronchoscopic intubation may be necessary to assure complete removal of foreign bodies with the result of significant irritation and edema to the tracheo-bronchial tree with the sequel of croup, wheezy chest and features of upper airway obstruction (UAO) which may lead to significant morbidity and prolonged hospitalization. The incidence of post intubation croup in children was reported to be between 1 to 6 % (1, 2). The medical treatment of postintubation croup is the same as that for infectious croup, including corticosteroids and nebulized epinephrine. The vasoconstrictive effect of epinephrine decreases the degree of subglottic edema, resulting in clinical improvement. Traditionally racemic epinephrine has been used as a non-selective adrenergic agonist of choice in children due to its supposedly fewer side effects than the more active and more readily available natural laevorotatory form of epinephrine. However, there seems to be no pharmacological basis for this belief (3-5) and subsequent trials have shown the L-epinephrine which we use for resuscitation, to be safe and effective in both infectious and postintubation croup(6, 7). In addition, L-epinephrine is readily available in all countries while racemic epinephrine is not. Even in countries where both forms are available the racemic form is much more expensive(8 ). It was noted that the doses of L-epinephrine used in those trials were 2.5 and 5 mL of 1: 1000 solution for all recruited children, regardless of weight. As a result, the dose of L-epinephrine in the treatment of croup has been suggested to be 0.5 mL/kg, with a maximum dose of 2.5 mL and 5 mL for children younger and older than 4 years, respectively (9).

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So far there have been very few reports that have studied the efficacy L-epinephrine in the management of post bronchoscopy croup and (UAO) in children. This study was designed for two purposes of: (a) ascertaining the effectiveness of L-epinephrine in the management of croup and wheezy chest post bronchoscopy in children or not; and ( b ) comparing the efficacy of a nebulized L-epinephrine at the dose of 0. 1ml/kg versus 0. 5ml/kg for the treatment of the above conditions and finally to recommend the routine use of L-epinephrine at the dose of 0. 1ml/kg as protocol for the management croup and (UAO) post bronchoscopy in Children

### Material and Methods

Between April 1998 and April 2002, 120 children, who developed signs and symptoms of upper airway obstruction (UAO) after bronchoscopy such as severe irritative cough, wheezy chest, stridor and hoarseness of voice were randomized to receive either 0. 1 mL/kg or 0. 5 mL/kg of nebulized L-epinephrine (NLE) with maximum of 2mL for patients below 5 years of age and 4mL for patients above 5 years of age. Two mL of normal saline were added to the dose of L-epinephrine. Age group ranged from 4 months to 14 years, mean of 4. 6 years, male /female ratio 4: 1. We used L-epinephrine because racemic epinephrine is not available in our hospital and it is expensive. The treatment was accomplished in the recovery room under the care of the anesthetist and pediatric surgeon using facemask with 100% oxygen at 6 liters/minute. The main parameter that was evaluated was the change of the (UAO) scores (Table 1) and the other parameters that were evaluated were changes in the respiratory rate, heart rate, blood pressure and oxygen saturation observed by pulse oxymeter. All parameters were

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evaluated at 15 minutes, 35 minutes and 45 minutes after the treatment, side effects of nebulized epinephrine, if present such as tremor, arrhythmia, and pallor were recorded at the same time. The management was repeated after 2 hours whenever clinically indicated if the results were not satisfactory. All patients were reviewed carefully prior to discharge from recovery room.

## RESULTS

One hundred and twenty children post bronchoscopy for foreign body aspiration (FBA) were enrolled in this study. Sixty children were allocated to the 0. 1mg/kg (NLE) and sixty children to the 0. 5 mL/kg (NLE). The (NLE) was mixed with 2ml of normal saline. Both groups had the same baseline characteristics (Table 2) and both groups had initially moderate upper airway obstruction. Both groups showed clinically significant improvements and reduction in UAO scores and Oxygen saturation at 15, 35 and 45 minutes (Table 3) compared to that prior to (NLE) at time 0. There were no significant differences in UAO scores and VS between the groups at all time points and none required immediate intubation or re-bronchoscopy. Side effects of epinephrine including pallor, arrhythmia and tremor were not observed.

Table 1: Upper airway obstruction score (15)\*\*

Score	0	1	2
Cough	None	Hoarse cry	Bark Inspiratory

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Stridor	Inspirator	+expirator
	y	y
Retracted	None	Suprasternal
on	Suprasternal	al+
Inspiratory	None	substernal
breath	Normal	+intercostal
sounds	None	al
	rhonchi	Delayed
Cyanosis	In room	In 40%
*	air	oxygen

\*Cyanosis was modified and defined as oxygen saturation <90%

\*\* Downes JJ, Raphaely RC. Pediatric intensive care. Anesthesiology 1975; 43: 238-50.

Table 2: Patient characteristics of our study groups

	0.1mL/kg	0.5mL/kg
Number of patients	60	60
Mean age (years)	3.4	5.8
Gender (M/F ratio)	4:1	4:1

UAO score	12	15
immediately after	(20%)	(25%)
bronchoscopy	42	38 (63.
( Mild <4) n, %	(70%)	33%)
( Moderate 4-7) n, %	6	7 (11.
(Severe > 7) n, %	(10%)	66%)

Table 3: The outcome variables in our study groups

Time	Time	15	35
	0	Minutes	Minutes
Nebulized L-epinephrine / Dose	0.1mL/kg	0.1mL/kg	0.1mL/kg
Number of patients	5mL/kg	5mL/kg	5mL/kg
	60	60	60
	60	60	60

Upper airway obstruction score (Mean)	5 (1-8) 5 (1-7)	3 (1-6) 2 (0-5)	2 (0-5) 1.4 (0-5)
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Respiratory rate/minute	28 30	32 33	29 28
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(Mean)

Heart rate

	126	130		
/minute			125	123

	128	128		
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(Mean)

Systolic blood

pressure :	95	102		
			97	103

mmHg	100	106		
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(Mean)

Diastolic

blood

pressure:	55	61	58	63	56	62
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mmHg

(Mean)

Oxygen

saturation %	93	94	96	97	98	98
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(Mean)

Discussion

Post bronchoscopy croup and respiratory distress is know entity in pediatric age group, especially when there is a need for repeated bronchoscopic trials for retrieval of long standing foreign bodies. In such conditions, severe inflammatory process of tracheo-bronchial tree is almost present from certain foreign bodies like peanut and other seeds that elaborate severe

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irritative substances leading to infection and granulation of bronchial tree that aggravate the respiratory distress, bronchospasm and croup post bronchoscopy. The main aim of the clinician in such conditions is to provide relief of respiratory distress by decreasing upper airway irritation and improving air entry. The present study has attempted to verify the safety and efficacy of bronchodilator effect of (NLE) and to prove that a dose of 0.1mL/kg is at least as effective as the dose of 0.5mL/kg in the treatment of croup and (UAO) post bronchoscopy in children. Many studies have tested the value of racemic epinephrine compared to placebo (10) and to nebulized salbutamol (11-13) and the results showed superior value of racemic epinephrine in the treatment of bronchiolitis. It seems no pharmacological basis for the belief that racemic epinephrine is safer than L-epinephrine (3-5) and racemic epinephrine is not available in Jordan and is thus difficult to obtain and expensive, making L-epinephrine a more viable option. Sumboonnanonda (14) used (NLE) at the dose 0.05mL/kg (maximum 0.5mL) in the treatment of infectious croup. They found a clinically significant improvement in (UAO) scores at 24 and 48 hours after admission, even in the placebo group without dexamethasone treatment. The present study found similar results at average 30 minutes in children with post-bronchoscopy croup and wheezy chest. The maximum dose of (NLE) in this study was 2mL for patients less than 5 years of age and 4mL for patients more than 5 years. In our study we confirmed the safety and efficacy of (NLE) in the treatment of post intubation croup (6) and infectious croup (7), when Nutman (6) used 0.25mL of 1% L-epinephrine (2.5mg) regardless the weight, for children post-intubation croup and found significant reduction of stridor score within 20 minutes, the same we observed in our study which <https://assignbuster.com/nebulized-l-epinephrine-in-post-bronchoscopy-croup/>

continued at least over the next 4 hours post -bronchoscopy. Waisman (7) used 5mL of 1/1000 L-epinephrine (5mg), regardless the weight, in children with infectious croup when he found a significant reduction of croup score, reaching its maximum at 30 minutes. The majority of our patients required one session of (NLE) to achieve these results and in very few of them who had long standing foreign bodies and repeated trials of bronchoscopy and bronchial wash out, another session of (NLE) required over 24 hours on 6 hourly interval. The present results suggest that nebulized L-epinephrine, at a minimal dose of 0. 1 mL/kg, is at least as effective as the dose of 0. 5 mL/kg in the treatment of post-bronchoscopy croup. Both doses temporarily alleviated airway obstruction without undesirable side effects. The dose of 0. 1 mL/kg is much less expensive. We would suggest that the dose of 0. 1 mL/kg is also efficacious in the treatment of children with post-bronchoscopy croup. This dose may be adequate to diminish mucosal edema of the upper airway by stimulating alpha-adrenergic receptors and producing vasoconstriction (4).

In conclusion, the presented data suggest that administration (NLE), at the dose of 0. 1 mL/kg is safe and effective and results in a similar reduction in upper airway obstruction scores, compared with the dose of 0. 5 mL/kg, in children with post-bronchoscopy croup. Neither dose was associated with any adverse side effects and we recommend the routine use of 0. 1mL/kg (NLE) post -bronchoscopy in children. Taking in consideration the comparable efficacy of both doses, the use of a small dose in clinical practice would save the medication expense and, theoretically, have a lower risk of developing side effects that are mostly dose dependent. Future studies

should consider the use of (NLE) at the dose of 0.1 mL/kg in children with post bronchoscopy croup, which has a pathophysiology resembling infectious croup. Further studies examining the optimal dose and frequency of (NLE) in children with croup due to different pathologies including post-bronchoscopy croup seem warranted.

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