

Role of dexamethasone in prevention of post extubation upper airway complications in paediatric patients in an intensive care unit

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Citation

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Abstract

This prospective, randomized, double blind, placebo controlled study was undertaken to evaluate the role of dexamethasone in prevention of upper airway complications like laryngeal edema, stridor etc. A total of 60 children who were ventilated for more than 24 hours were included in the study. Patients were divided into two groups of 30 each. Group 1 received 0.5 mg/kg per dose of dexamethasone for 4 doses; 4 hours prior to extubation, at extubation, 6 and 12 hours after extubation respectively. There was statistically significant difference ($p=0.019$) between the two groups in relation to incidence of failed extubation. Laryngeal edema was more in group 2(63.33%) as compared to group 1(26.67%), the difference was statistically significant ($P = 0.012$). Thus it was concluded that use of dexamethasone was useful in preventing post extubation laryngeal edema/stridor in children and prophylactic use of dexamethasone also helps in reducing the incidence of failed extubation following prolonged ventilation.

INTRODUCTION

Endotracheal intubation is a routine maneuver in intensive care unit to provide a patent airway and various modes of positive pressure ventilation ¹. Presence of an endotracheal tube in contact with the delicate airway mucosa acts as a foreign body and may lead to damage ². As a consequence, the patient may land up in respiratory distress and inadequate ventilation requiring reintubation.

Factors that may increase the likelihood of airway damage include repeated passage of endotracheal tube, prolonged intubation for more than 24 hours and a large endotracheal tube in relation to the size of the glottis.

Principle complications occurring in the first 24 hours of extubation are airway obstruction due to laryngospasm and laryngeal edema. Reactive subglottic edema in children at the cricoid ring can lead to post extubation stridor ³.

The effectiveness of dexamethasone in alleviating airway obstruction caused by trauma induced swelling has been demonstrated and a dose of 2.5 mg/kg has been shown to be clinically effective ⁴.

The present study was intended to define such groups at risk

in children who were receiving more of dexamethasone to prevent upper airway obstruction in patient's extubated after being ventilated for more than 24 hours in intensive care unit.

MATERIAL AND METHODS

This prospective, randomized double blind placebo controlled study was conducted on a total of 60 pediatric patients after approval by local ethical committee, in a tertiary care hospital setting. Informed consent was taken from the parents of the patients.

The patients who were on ventilator for more than 24 hours were studied. All intubations were performed by an experienced anesthetist in the operating room or in accident and emergency ward.

The patients were intubated with portex endotracheal tube of appropriate size. Children less than 8 years were intubated with uncuffed endotracheal tubes. All patients requiring prolonged mechanical ventilation were sedated, and or paralyzed according to individual need. Patients having upper airway disease, any anatomical deformity of upper airway and patient's already on steroids were excluded from the study.

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The patients were randomly assigned to either of the two groups. Group 1 comprised of 30 children and they received inj. Dexamethasone 0.5 mgs/kg given 4 hours prior to extubation, at extubation and at 6 and 12 hours after extubation. Group 2 comprised of 30 patients, acted as control and received placebo / saline at similar intervals. The study and placebo drugs were prepared in identical volume in a syringe to ensure double blind fashion. Neither the intensivist ordering the drug nor the person administering them was aware of the drugs being given to patients. Endotracheal extubation were followed according to standard ICU weaning protocol.

All patients were clinically assessed for stridor, laryngeal edema or airway obstruction after extubation for up to 24 hours. The person assessing the parameters was unaware of the drug the patient had received. Laryngeal stridor was defined as occurrence of signs of upper airway obstruction i.e.; prolonged inspiratory phase associated with recruitment of accessory muscles. Laryngeal stridor was defined as crowing sound present with inspiration.

Scoring for stridor in children was done as:-

- No stridor.
- Stridor while crying.
- Stridor at rest.
- Severe biphasic chest retractions.

Finally all the study observations were documented and then statistically analyzed.

RESULTS

There was no statistical difference between the two groups with regards to the age, sex, admitting diagnosis, intubation type and duration of intubation. In group 1, the ICU stay of the patients was ranging from 2-12 days were as in group 2 the range was 3-12 days. Number of patients ventilated in ICU in relation to duration of intubation in group 1 was 60% who had duration less than 72 hours. Patients in the same group who were ventilated for more than 72 hours were 40%. In group 2 no. of patients having duration of intubation less than 72 hours were 50% and more than 72 hours were 50%. In group 1, the incidence of failed extubation was 30% and in group 2 was 63.33% respectively which was statistically significant ($p=0.019$). In group 1, laryngeal stridor, laryngeal dyspnea and laryngeal edema (on

laryngoscopy) were present in 8(26.67) patients while laryngeal edema was present in 19(63.33) patients in group 2. There was a statistically significant difference ($p=0.004$) between the two groups.

Figure 1

Table 1: Comparison of failed extubation in Group 1 and Group 2

Group N=30	Total Cases	Failed Extubation (%)	P value	Remarks
Group 1 (Dexamethasone)	30	9(30%)	0.019	Significant
Group 2 (control)	30	19(63.33%)		

Figure 2

Figure 1: Bar diagram showing comparison of failed extubation in two groups

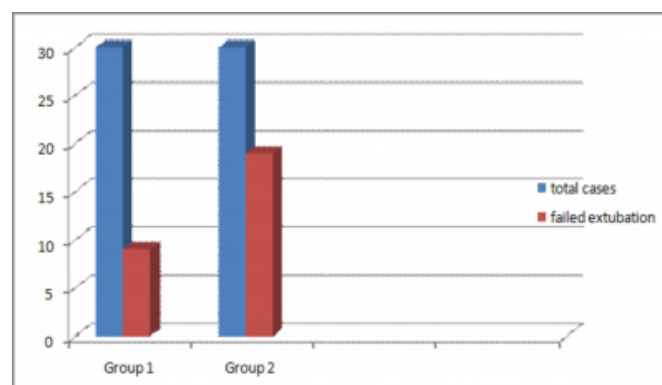


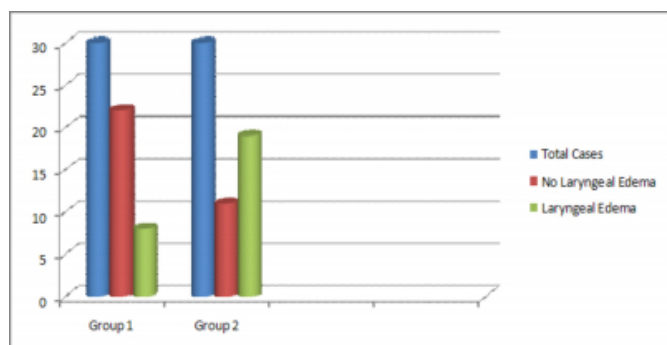
Figure 3

Table 2: Airway assessment in Group 1 and Group 2

Group N=30	No laryngeal Edema (%)	Laryngeal Edema (%)	P value	Remarks
Group 1 (Dexamethasone)	22(73.33%)	8(26.67%)	0.004	Significant
Group 2 (control)	11(36.67)	19(63.33%)		

Figure 4

Figure 2: Bar diagram showing Airway assessment (complications) in two groups



DISCUSSION

The laryngeal and tracheal injury resulting from endotracheal intubation is characterized by polymorphonuclear cell infiltration, epithelial denudation, mucosal ulceration, edema and an increase in interstitial acid mucopolysaccharides⁵. These lesions lead to laryngeal edema and stridor. Cricoid ring is the narrowest part in the pediatric airway which is more susceptible to obstruction after endotracheal tube induced trauma.

Several studies have substantiated in a variety of clinical models of inflammatory edema that corticosteroids through their wide targeted anti inflammatory actions, inhibit cytokine release, vascular permeability and hence the pathological effects of laryngeal edema⁶.

Our study has shown that dexamethasone is effective in reducing the rate of failed extubation in children with statistically significant variation. More ever, duration of intubation has direct relationship with incidence of failed extubation. Although the incidence of failed extubation was high (73.33%) with the duration of intubation more than 72 hours, but did not reach a statistically significant difference. Our results are similar to those obtained by James et al (1992) who demonstrated that dexamethasone therapy reduces the duration of intubation and the need for reintubation in children intubated for croup⁷.

Our results also go in confirmation with the study conducted by Markovitz BP, Randolph AG et al (2002), who concluded that post extubation stridor was reduced in children with prophylactic administration of dexamethasone. Our results are comparable with study of Darmon JY, Rauss A, et al

(1992) who demonstrated that over all incidence of laryngeal edema was significantly decreased in dexamethasone treated patients.

Our results are contradictory to studies done by Courtney SE, Weber KR, et al (1989)⁸, who demonstrated that incidence of laryngeal edema/ stridor was not modified by dexamethasone. Like wise Tellez et al found that dexamethasone 0.5 mg/kg given i.v 6 hourly before extubation and continuing every 6 hours for a total of 6 doses was in effective in preventing laryngeal edema.

Thus it is concluded that prophylactic use of intravenous dexamethasone is useful in preventing post extubation laryngeal edema/stridor in children and also helps in reducing incidence of failed extubation as a result of airway obstruction following prolonged intubation for more than 24 hours in children. Also prolonged intubation more than 72 hours is found to be a risk factor for failed extubation.

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