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A Comparison of Endotracheal Tube Securing Methods

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ABSTRACT:

Securing the uncuffed endotracheal tubes of infants requiring mechanical ventilation is imperative to avoid the complications that often accompany unplanned extubation. The literature suggests that endotracheal tube securing methods affect the rate of spontaneous extubations in orally intubated infants. The purpose of this study is to evaluate spontaneous extubation rates using two different endotracheal tube-securing methods. We hypothesized that the use of the Neotech endotracheal tube holder would reduce the incidence of spontaneous extubations in orally intubated infants compared to a conventional taping method.

BACKGROUND

Successful management of mechanically ventilated infants depends on the caregivers' ability to secure and maintain an artificial airway. Accidental or spontaneous extubation interrupts airway patency and may complicate the patient's course.

Factors associated with spontaneous extubation are varied. Numerous conditions accompanying unplanned extubations include airway anatomic structure, time of day, bedside care, patient position, use of limb restraints, sedation, infant's size and activity level and amount of oral secretions, and type and integrity of the securing device.

The objective of this study is to evaluate the effect of two endotracheal tube (ET)-securing methods, the Neotech endotracheal tube holder (Neo Bar) and traditional taping method, on the incidence of spontaneous extubations. The secondary aim of the study was to determine if skin integrity is affected by the ET securing method.

METHODS

This pilot study enrolled infants from our Level III Neonatal Intensive Care Unit requiring intubation and mechanical ventilation. Infants with limb restraints, sedation or paralytic drugs that inhibited activity, along with those who had neurological impairment that prevented purposeful movement, and/or those whose positive pressure ventilation requirements were less than one day (24+ 1 hours) or greater than 30 days were excluded from the study. The infants were randomized to either NeoBar or conventional tape. If a patient accidentally extubated with one method, upon reintubation the ETT was secured by the other method. Prior to the application of either device, the infant's skin was cleaned and dried thoroughly. Sterile water was used to clean the skin of infant < 32 weeks gestation or 1 month adjusted age. Baby Magic bath soap was used only if the skin cannot be adequately cleansed with sterile water.

alone (i.e. to remove the vermex). Infants < 32 weeks gestation but > 1 month adjusted age and infants > 32 weeks gestation had their skin cleansed with dial soap and sterile water. The skin was then thoroughly dried.

The hydrocolloid adhesive, on the cheek pads of the NeoBar, was applied to dry skin without additional fixatives (Figure 1). A piece of adhesive tape was used to secure the ET to a vertical bar on the arch. The conventional taping method required the application of tincture of benzoin to the area of the upper lip prior to the application of a piece of Elastoplast. One piece of cloth tape, about five inches long was applied to the ET by wrapping it around the tube twice and anchoring it to the opposite side of the face, over the Elastoplast. This procedure was repeated with a second piece of tape, which started at the opposite side of the face (Figure 2). A survey was completed by the bedside respiratory therapist or nurse ranking the following categories; ease of use, ability to hold, mouth care ease, placement verification and skin integrity, on an ordinal scale (good, fair or poor). The higher score yielded a better condition. Skin integrity was documented upon extubation using an ordinal scale (normal, red, rash, broken, and blistered). Distributions of extubations per 100 ventilator days and survey scores were compared with a Mann-Whitney U test. Significance was set at $p < 0.05$.

RESULTS

Demographic data are listed in Table 1. Outcome data, individual survey components and total survey score mean values + standard deviation, are found in Table 2.

TABLE 1

Demographics	NeoBar	Tape	p value
Sample Size	27	40	-
Gender: Male:	20	25	-
Female:	7	15	-

TABLE 2

Outcomes	NeoBar	Tape	p value
Extubations/100 ventilator days ($\pm$ SD)	22 $\pm$ 0.4	81 $\pm$ 0.5	0.001
Total mean survey score (+ SD)	15.9 $\pm$ 1.1	14.2 $\pm$ 1.6	0.001
Ease of use	2.7 $\pm$ 0.57	14.1 $\pm$ 1.8	0.001
Ability to hold	2.5 $\pm$ 0.6	2.5 $\pm$ 0.7	0.986
Ease of performing mouth care	2.9 $\pm$ 0.3	2.3 $\pm$ 0.5	0.001
Placement verification	3.0 $\pm$ 0.2	2.5 $\pm$ 0.6	0.009
Skin integrity	4.1 $\pm$ 3.2	4.0 $\pm$ 1.0	0.006

CONCLUSIONS

Overall, the practitioner's felt the methods were equal in their ability to hold and ease of application, as demonstrated by the survey scores. However, a statistically significant difference was detected in extubations per 100 ventilators when the devices were compared. The NeoBar was able to reduce the incidence of accidental extubations, when compared to a conventional taping method. Clinical data from the survey showed that the NeoBar was superior to tape, particularly in the categories of skin condition, ease of verifying ET placement and ability to perform mouth care.