

Original Article

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Two Different Endotracheal Tube Securing Techniques: Fixing Bandage vs. Adhesive Tape

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Abstract

Introduction: Emergency physicians should secure Endotracheal tubes (ETT) properly in order to prevent unplanned extubation (UE) and its complications. Despite various available endotracheal tube holders, using bandages or tape are still the most common methods used in this regards.

Objective: This study aimed to compare adhesive tape (AT) versus fixing bandage (FB) method in terms of properly securing ETT.

Methods: This was an observational longitudinal trial. All patients older than 15-years-old admitted to the ED who had indication for ETT insertion were eligible. Patients were randomly assigned to one of the two groups in which AT or FB was applied. All patients were observed thoroughly in the first 24 hours after intubation. Using a pre-prepared checklist, encountered UE rate and other data were recorded.

Results: Seventy-two patients with the mean age of 55.98 ± 18.39 years were finally evaluated of which 38 cases (52.8%) were male. In total, 12% of patients in our study experienced unplanned extubation. Less than 12% of the patients experienced complete UE; there was no statistically significant difference between the two groups ($p = 0.24$). Comparison of UE with age showed no significant difference ($p = 0.89$). Male patients experienced more UE, but this was not statistically significant ($p = 0.44$).

Conclusion: It is likely that whether the AT method or FB was applied for securing the ETT in emergency departments, there was no significant difference in rates of unplanned extubation.

Key words: Airway extubation; Bandages; Intubation, intratracheal; Patient safety; Surgical tape

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INTRODUCTION

Tracheal intubation is one of the most common procedures underwent in emergency departments (ED). It is indicated for airway protection in those with failure to maintain airway, oxygenation or ventilation (1-4). One of the most important and common complications after Endotracheal tube (ETT) insertion is unplanned extubation (UE) with wide range prevalence in various reports from 1.6% to 22% (5). It is categorized in two types, including complete and partial. Complete UE is when the ETT tip is removed above vocal cords, and partial extubation is when ETT is dislodged more than 2 cm but its tip is still within vocal cords. UE could also be categorized as either patient initiated or practitioner related. UE in critically ill patients would threaten their stability and could result in higher mortality and morbidity rates. As well, re-intubation can pose a great risk to these patients (5-7). Predisposing factors of UE are not well studied, but securing methods are important

(8, 9). Emergency physicians should secure ETT properly in order to prevent UE and its complications. Despite available various endotracheal tube holders, using bandage or tapes are still the most common methods used in this regard (10). Considering what mentioned above, this study aims to compare fixing bandage versus adhesive tape method in terms of proper securing ETT in patients need airway management in ED.

METHODS

Study design

This was an observational longitudinal trial conducted during 2009 in Imam Khomeini Complex and Shariati Hospitals, Tehran, Iran. The study protocol was approved by the Emergency Medicine Department Research Council and Ethics Committee of Tehran University of Medical Sciences. The researchers were adhered to the tenets of the Declaration of Helsinki throughout the



Figure 1: Adhesive tape technique for securing endotracheal tube



Figure 2: Bandage technique for securing endotracheal tube

study. Informed consent was obtained from the participant relatives.

Study population

All patients older than 15-year-old admitted to the ED with indication for ETT insertion, whether crash or rapid sequence intubation, were eligible. Those who had any contraindication for oropharyngeal intubation were excluded. Patients were randomly assigned to one of the two groups. In one group, ETT was fixed with adhesive tape (AT) and in other group, ETT was fixed with fixing bandage (FB). Sample size was calculated based on Barnason study (2). They reported that the prevalence of UE in AT and FB techniques were 12 and 21% respectively. Ratio comparison formula was used between the two groups (with $\alpha = 0.05$ and $\beta = 0.20$) thus the sample size was estimated to be at least 40 patients in each group. All patients were observed thoroughly in the first 24 hours of intubation. Baseline data were gathered using a pre-prepared checklist including all demographic data, patients' Glasgow coma scale (GCS), encountered UE rate, applied restrain technique (chemical or physical), drugs used for sedation. The checklists were fulfilled by an ED nurse who was unaware to the aim of study. The emergency physician responsible for patient treatment, did all

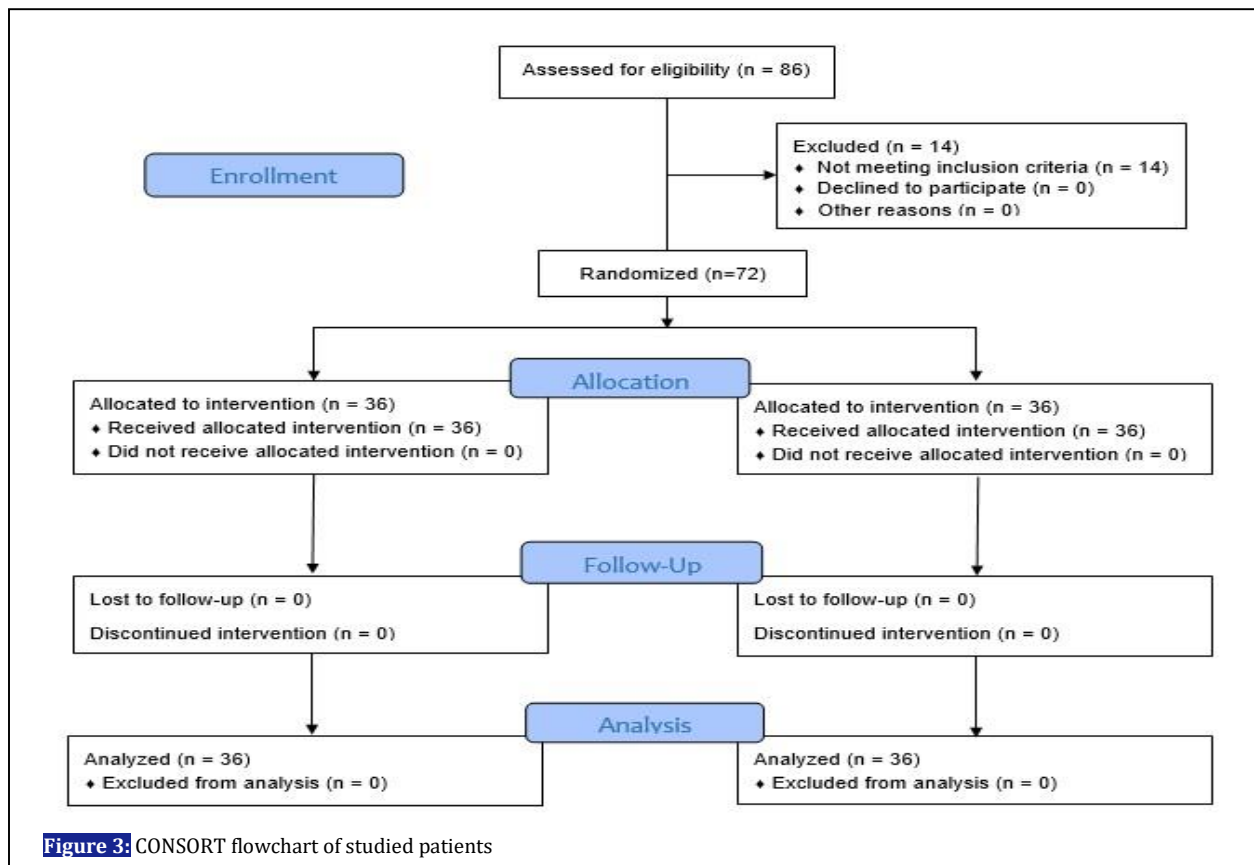


Figure 3: CONSORT flowchart of studied patients

Table 1: Demographic variables and baseline characteristics of studied patients in two groups

Variable	Adhesive tape (n = 36)	Fixing bandage (n = 36)	p
	Number (%)		
Gender			
Male	18 (50.0)	20 (55.6)	0.06
Female	18 (50.0)	16 (45.6)	0.05
Admitting diagnosis			
Sepsis	10 (27.8)	14 (38.9)	0.06
Stroke	5 (13.9)	3 (8.3)	0.07
Pulmonary edema	6 (16.7)	9 (25.0)	0.42
Cardiac arrest	8 (22.2)	6 (16.7)	0.51
Pneumonia	6 (16.7)	1 (2.8)	0.05
Other	1 (2.8)	3 (8.3)	0.07
Reason for intubation			
Loss of consciousness	17 (47.2)	15 (41.7)	0.34
Unprotected airway	8 (22.2)	5 (13.9)	0.07
Hypercarbic or hypoxemic respiratory failure	3 (8.3)	6 (16.7)	0.05
Clinical evidence of respiratory distress	8 (22.2)	10 (27.8)	0.43
Intubation condition			
Crash	34 (94.4)	33 (91.7)	0.52
Rapid sequence	2 (5.6)	3 (8.3)	0.61

Table 2: Comparison of unplanned extubation in two studied groups

Unplanned extubation	Adhesive tape (n = 36)	Fixing bandage (n = 36)	p
Yes	6 (16.7)	2 (5.6)	0.24
No	30 (83.3)	34 (94.4)	

the procedures and confirmed correct placement of ETT by both chest auscultation and capnography.

Intervention

Methods of fixation in group 1 and 2 were based on Tape Lillihe technique of Kersten and Band technique of Dunleap (11, 12). In the AT group, we cut two strips of tape, one approximately 90 cm² and the other 30 cm² long. Then, we centered the shorter strip on the top of the longer strip, sticky sides together. We folded sticky ends over and clipped approximately 1 cm². After drying and formation of a firm grip, AT was encircled around the ETT and was fixed to the maxilla above the upper lip and down the lower lip portion (figure 1). In the FB group, we passed the FB underneath patients' neck and rapped the two ends in front of their neck. We then made a knot around ETT at the desired depth between the incisors and fixed the two ends on patients' forehead (figure 2).

Statistical analysis

SPSS for Windows software (version 22) was used for all data analysis. The data are presented as mean values or proportions, and differences in these values are presented with accompanying 95% confidence intervals (95% CIs). Variables were tested for normality (Kolmogorov-Smirnov test) before analysis. Analytical statistical tests included the unpaired, two-tailed t-test for continuous normally distributed data and the

Mann-Whitney U test for non-normal and ordinal data. The chi-square and Fisher's exact tests were used to compare proportions of the qualitative variables. The level of significance was 0.05.

RESULTS

The CONSORT flowchart of the patients' flow was shown in figure 3. Fourteen patients were excluded because of the presence of facial soft tissue deformity, burn or too much beard and mustache or laceration. Seventy-two patients with the mean age of 55.98 ± 18.39 were finally evaluated of which 38 cases (52.8%) were male. Demographic variables and baseline characteristics of studied patients in two groups were reported in table 1. The mean age of patients in AT and FB groups were 55.76 ± 16.99 and 56.21 ± 19.80 respectively (p = 0.31). Distribution pattern of age and gender were normal in the two groups and no significant statistical differences were observed between them.

The mean Glasgow coma scale (GCS) in groups 1 and 2 were 6.08 ± 1.93 and 6.57 ± 1.52 respectively (p = 0.40). This score was calculated out of 10 because all patients were intubated. We compared patients' GCS with demographic variables. It was found that there was no significant difference between GCS and age (p = 0.88). The mean GCS score of female was significantly lower than male

patients; 5.66 ± 1.57 versus 6.74 ± 2.41 respectively ($p = 0.03$).

The main aim in this study was comparison of the number of UE events in both groups. Less than 12% of the patients experienced complete UE and this number had no statistically significant difference between the two groups ($p = 0.24$). Comparison of UE in two studied groups summarized in table 2. Comparison of UE with age showed no significant difference ($p = 0.89$). Male patients experienced more UE but this was not statistically significant ($p = 0.44$).

The main reason of UE was self-extubation in five patients and accidental extubation in three, but this difference was not significant ($p > 0.99$). Most of UE occurred during morning shifts but this was not of significant importance ($p = 0.14$). The mean GCS score in patients with UE was 8.29 ± 2.21 and in patients without UE was 6.03 ± 2.02 . Evaluation of patients' GCS score showed that UE occurred significantly more, in patients with high GCS ($p = 0.00$). Figure 4 shows the comparison of applied restraint methods in two studied groups. All patients were chemically sedated with midazolam + fentanyl. The number of patients who needed physical restraint besides chemical restraint, was also recorded. The frequency of physical restraint had no significant difference between the two groups ($p = 0.18$). Of all UE, physical restraint was used only in one patient in AT group ($p = 0.41$).

DISCUSSION

Less than 12 percent of the studied population experienced UE and this unpleasant event had no significant difference between the two studied groups; thus the method of ETT fixation was not an important issue.

This number might be more than the rate seen in most intensive care unit (ICU) settings. We supposed that this high rate was due to the more crowded environment in an ED. Carlson et al evaluated the force required for extubation. They compared AT with different types of ETT holders in corps and concluded that that AT required greater force to extubate and was cheaper than when compared with the commercially available devices (13). Levy et al compared four different methods of securing ETT, and they showed that AT and FB were followed by less UE (14). The study of Barnason et al found the same results as ours. They evaluated 52 intubated patients, and they found no significant difference between AT and FB groups (2). There are different studies reporting the time of UE. Some showed that most UE occurred during morning shifts and some said that UE was more

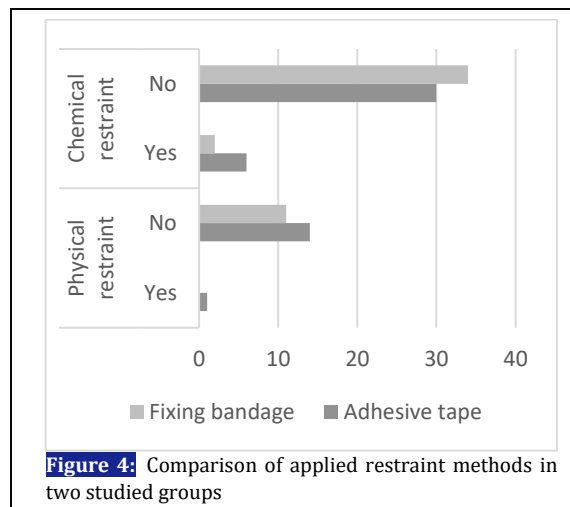


Figure 4: Comparison of applied restraint methods in two studied groups

prevalent during night shifts. These studies estimated that the mean time before extubation was from 5.5 hours to 7 days (2, 15, 16). Risk factors predisposing patients to UE are mentioned in different studies. These included inappropriate sedation, not using physical restraint, incorrect securing methods, incorrect depth of ETT insertion, prolonged intubation and insufficient ETT cuff inflation (2, 8, 17).

Limitations

We did not observe correctness of the securing method used during intubation. We could not estimate incomplete extubation or the rate of ETT displacement, because most of the time physicians were not present during the time of extubation.

CONCLUSIONS

It is likely that whether AT method or FB one was applied for securing the ETT in EDs, the rate of unplanned extubation has no significant difference.

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AUTHORS' CONTRIBUTION

All authors made an individual contribution to the writing of the article including: conception and design, acquisition of data or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version published.

CONFLICT OF INTEREST

None declared.

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