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Effect of Twill Technique vs Endotracheal Tube Holder on Endotracheal Tube Securement [ETTS] Outcomes among Orally Intubated Patients Admitted in Intensive Care Units

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Abstract

Endotracheal intubation is often an emergency procedure that is performed on people who are unconscious or who can't breathe on their own. Endotracheal Intubation maintains an open airway and helps to prevent suffocation. Once the patient is intubated, maintenance of the endotracheal tube placement is essential. When Endotracheal Tube is not secured, even basic nursing management can cause tube slippage which is a major factor in causing airway trauma.

Aim: To assess the effect of Twill Technique vs Endotracheal Tube Holder on Endotracheal Tube Securement [ETTS] Outcomes among orally intubated patients admitted in ICUs.

Methodology: A post-test only control group design (two experimental groups) was used to assess the effect of Twill Technique vs Endotracheal Tube Holder on Endotracheal Tube Securement [ETTS] Outcomes among orally intubated patients.

Results: The findings revealed that for General Assessment, it was concluded that statistical significant result was found between experimental group1 and experimental group2 ($p<0.05$) in GCS on day2 ($p=0.017$), in P/F ratio on day 1 ($p=0.004$). But most of the observations were statistically non-significant. Conclusion: Hence, Endotracheal Tube Holder can be recommended for Endotracheal Tube securement in clinical practice.

Keywords: Twill Technique; Endotracheal Tube Holder; Endotracheal Tube Securement [ETTS] Outcomes; Orally Intubated Patients

Abbreviations

ETTS: Endotracheal Tube Securement; OAG: Oral Assessment Guide.

Introduction

It is vitally important that the position of ETT remains stable for several reasons to ensure optimal ventilation and constant supply of oxygen and Endotracheal tube movement within the trachea may cause local trauma [1,2], which is a significant source of discomfort for the patients added several clinical concerns with respect to patient safety when attempting to achieve a stable Endotracheal tube. These include avoiding the Endotracheal tube from slipping, avoiding an unintended extubation, and preserving the integrity of the skin on the face and neck. Endotracheal tubes should be placed between 2.5 and 4 cm above carina when assessed fiberoptically

[3]. Slippage is the extent of endotracheal tube movement within the stabilization technique. If the ETT migrate or shift more than 1 cm, the endotracheal tube fixation needs to be replaced. To ensure Endotracheal tube stabilization and retain a clear airway and avoid complications, intensive care doctors have employed a variety of techniques. One of the biggest concerns is consequently to avoid endotracheal tube movement. There are numerous methods available to fix endotracheal tubes. The traditional methods are those using cloth tape or adhesive tape with several techniques existing for each. Endotracheal tube retaining devices available in stores are used much less frequently [4-6]. Commercial fixation devices are recommended by the American Heart Association's 2005 guidelines as a solution that is as effective as taping or tying. It is recommended that unlike adhesive tape, the use of endotracheal tube fasteners to keep the tubes in place lowers the risk of outcomes that involves lip ulcers, facial skin tears, or ETT dislodgement. Several studies have given the evidence that Endotracheal Tube Holder is very effective in the prevention of endotracheal tube dislodgement, lip ulcers and skin tears as compared to conventional method [7].

Materials and Methodology

In the present study quantitative research approach and Experimental design was used. The study was conducted in the critical care areas (Pulmonary, Medical, Stroke, Trauma, Surgery and Neurosurgery Intensive Care Units) [8,9]. The total sample was 20 orally intubated patients admitted in Intensive Care Units, out of which 10 were in experimental group 1 and 10 were in experimental group2. Simple random sampling technique was used for data collection.

Description of Research Tool

Tool was divided into three parts:

Part A: Patient's Profile: Which is further divided into two sections:

- **Section-I: Socio-demographic Profile:** It includes 9 items to obtain information about age (in years), gender, habitat, educational status, religion, marital status, dietary habits, occupation and socio-economic status.
- **Section-II: Clinical Profile:** It includes 8 items to obtain information about diagnosis of the patient, day of hospitalization, indication for intubation , previous history of being intubated, way of admission of the patient in the hospital, Co-morbidities, height (in cm), weight (in kg).

Part B: General Assessment: It includes three items

- **GCS**

Best response	Sep-15
Comatose client	04-Aug
Totally unresponsive	3

ETT cuff pressure

Normal 22-32 mmHg

- **P/F ratio**

Normal ≥400

Part C: Endotracheal Tube Securement [ETTS] Outcomes: Which is further divided into three sections:

Section-I: Modified Endotracheal Tube [ETT] Slippage Scale and number of resecurements

It includes

- Endotracheal Tube [ETT] depth at the lip line(in cm)
- Endotracheal Tube [ETT] slippage in outward direction (in cm)

Which is divided into4 categories

Slippage Range (in cm)

No slippage 0-0.5cm

Mild slippage 0.6-1cm

Moderate slippage 1.1-cm

Severe slippage 2.1-5cm

- Endotracheal Tube [ETT] position in mouth (Right side, Left side and middle)
- Number of re-securement (in a day)

Section-II: Modified Oral Assessment Guide (OAG) Scale for lip ulcers and oral mucosa

It includes two subscales i.e. for lip ulcers and for oral mucosa

- **For lip ulcers**

Score 1: smooth, pink

Score 2: dry or Cracked

Score 3: ulcerated or bleeding

- **For oral mucosa**

Score 1: pink and moist

Score 2: reddened or coated, no ulcers

Score 3: ulcers with or without bleeding

Two sub scale scores of Modified Oral Assessment Guide (OAG) Scale are summed to obtain overall assessment score 2 to 6

2-normal

3 to 4- moderate alterations

5 to 6- severe alterations

Section-III: Modified Facial Skin Integrity Score Tool

It includes 3subscalesi.e. For dryness, for redness and for breakdown of facial skin

- **For Dryness**

Score 1: no dryness

Score 2: dry skin and visible scaling score 3- cracked

- **For Redness**

Score 1: not present

Score 2: visible redness (<50% of face surface) score

3-visible redness (≥50% of face surface)

➢ **For Breakdown**

Score 1: not present

Score 2: confined to small area Score 3-confined to large area Three sub scale scores of Modified Facial Skin Integrity Score tool are summed to obtain overall assessment score 3 to 9

3- Healthy skin condition

4 to 6- Moderate skin reaction

7 to 9- Severe skin reaction

Results

- As per Socio- demographic profile, the two groups i.e. experimental group 1 and experimental group 2 were statistically identical (p>0.05) age, gender, habitat, educational status, religion, marital status, dietary habits, occupation and socio-economic status of the orally intubated patients [10-13].
- Mean age±SD of experimental group 1 was 40.70±19.95, and in experimental group 2 was 57.10±14.24 and majorities were males.
- As per their Clinical Profile, the two groups i.e. experimental group 1 and experimental group 2 were statistically identical (p>0.05) as per their clinical profile which includes days of hospitalization, indication of intubation, previous history of being intubated, way of admission in hospital, co- morbidities, height (cm) and weight (kg) of the orally intubated patients [14].
- In experimental group 1, maximum patients (20%) each were having nephrological problem, neurological problem, respiratory problem and metabolic and endocrine problem and in experimental group 2, maximum patients (30%) were having neurological problem [15].
- In both groups i.e. in experimental group 1 and experimental group 2 maximum patients (70%) were having day of hospitalization between 1-5 days.
- In both experimental group 1 and experimental group 2, in majority of patients indication of intubation was respiratory distress 70% and 80% respectively [16,17].
- In both groups i.e. in experimental group 1 and experimental group 2 maximum patients (90%) were not previously intubated and in experimental group1 50% patients were having co-morbidities and in experimental group 2 maximum patients (90%) were having co-morbidities [18].

ETT position	Experimental group$_1$ n_1=10 f (%)	Experimental group$_2$ n_2=10 f (%)	X^2 Statistics
Day 1			
Right side	8 (80.0)	8 (80.0)	4 df = 2 p=0.135^{NS}
Left side	2 (20.0)	0 (00.0)	
Middle	0 (00.0)	2 (20.0)	
Day 2			
Right side	8 (80.0)	8 (80.0)	4 df = 2 p=0.135^{NS}
Left side	2 (20.0)	0 (00.0)	
Middle	0 (00.0)	2 (20.0)	
Day 3			
Right side	9 (90.0)	8 (80.0)	3.059 df = 2 p=0.217^{NS}
Left side	1 (10.0)	0 (00.0)	
Middle	0 (00.0	2 (20.0)	
Day 4			
Right side	8 (80.0)	8 (80.0)	4 df = 2 p=0.135^{NS}
Left side	2 (20.0)	0 (00.0)	
Middle	0 (00.0)	2 (20.0)	
Day 5			
Right side	8 (80.0)	8 (80.0)	4 df = 2 p=0.135^{NS}
Left side	2 (20.0)	0 (00.0)	
Middle	0 (00.0)	2 (20.0)	

Day 6			4 df = 2 p=0.135^{NS}
Right side	8 (80.0)	8 (80.0)	
Left side	2 (20.0)	0 (00.0)	
Middle	0 (00.0)	2 (20.0)	

Table 1: Comparison of orally intubated patients among experimental group 1 and experimental group 2 according to ETT position from day 1 to day 6.
*significant, NS=Non-Significant, N=20.

Table 1 depicts frequency and percentage distribution of orally intubated patients among experimental group 1 and experimental group 2 according to ETT position from day 1 to day 6.

- As per General Assessment, statistically significant result was found between experiment group 1 and experiment group 2 in GCS on day 2 (p=0.017) and there was no statistically significant difference in GCS on day 1 (p= 0.270), day 3 (0.270), day 4 (0.214), day 5 (0.819) and day 6 (0.717).
- There was no statistical difference between the experimental group 1 and experimental group 2 in all observations from day 1 to day 6 in ETT cuff pressure (p>0.05).
- There was statistical difference between the experimental group 1 and experimental group 2 in P/F ratio on day 1 (p=0.004) and there was no statistical difference between the experimental group 1 and experimental group 2 in P/F ratio in observations from day 2 to day 3 (p>0.05).
- On day 1,in experimental group 1, Mean ± SD of ETT depth at lip line in cm was 22.05 ± 1.46 and in experimental group 2, Mean ± SD was 22.20 ± 0.79.On day2, in experimentally group 1, Mean ± SD was 22.50 ± 0.82 and in experimental group 2, Mean ± SD was 22.20 ± 0.79.On day 3, in experimental group 1, Mean ± SD was 22.40 ± 1.07 and in experimental group 2, Mean ± SD was 22.25 ± 0.86.On day 4, in experimental group 1, Mean ± SD was 22.30±1.49 and in experimental group 2, Mean ± SD was 22.30 ± 0.67. On day 5, in experimental group 1, Mean ± SD was 22.10 ± 0.99 and in experimental group 2, Mean ± SD was 22.36 ± 0.80.On day 6, in experimental group 1, Mean ± SD was 22.20 ± 1.03 and in experimental group 2, Mean ± SD was 22.40 ± 0.81.

No. of Resecurements	Experimental group$_1$ n_1=10 f (%)	Experimental group$_2$ n_2=10 f (%)	X^2 Statistics
Day 1			20 df=2 p=0.000*
No resecurement	0 (00.0)	10 (100.0)	
1 time	4 (40.0)	0 (00.0)	
2 times	6 (60.0)	0 (00.0)	
3 times	0 (00.0)	0 (00.0)	
Day 2			17.333 df=3 p=0.001*
No resecurement	0 (00.0)	9 (90.0)	
1 time	2 (20.0)	1 (10.0)	
2 times	3 (30.0)	0 (00.0)	
3 times	5 (50.0)	0 (00.0)	
Day 3			17.333 df=3 p=0.001*
No resecurement	0 (00.0)	9 (90.0)	
1 time	2 (20.0)	1 (10.0)	
2 times	4 (40.0)	0 (00.0)	
3 times	4 (40.0)	0 (00.0)	

Day 4			
No resecurement	0 (00.0)	9 (90.0)	17.333 df=3 p=0.001*
1 time	2 (20.0)	1 (10.0)	
2 times	5 (50.0)	0 (00.0)	
3 times	3 (30.0)	0 (00.0)	
Day 5			
No resecurement	0 (00.0)	6 (60.0)	13.143 df=3 p=0.004*
1 time	3 (30.0)	4 (40.0)	
2 times	5 (50.0)	0 (00.0)	
3 times	2 (20.0)	0 (00.0)	
Day 6			
No resecurement	0 (00.0)	8 (80.0)	16 df=2 p=0.000*
1 time	2 (20.0)	2 (20.0)	
2 times	8 (80.0)	0 (00.0)	
3 times	0 (00.0)	0 (00.0)	

Table 2: Comparison of orally intubated patients among experimental group 1 and experimental group 2 according no. of resecurements of ETT from day 1 to day 6.
*significant, NS =Non-Significant, N=20.

Table 2 depicts frequency and percentage distribution of orally intubated patients among experimental group 1 and experimental group 2 according No. of resecurements of ETT from day1 today 6.

- In experimental group 1, maximum patients were having ETT slippage in outward direction (in cm) between 0-0.5 cm in all observations from day 1 to day 6 and in experimental group 2, majority of patients were having ETT slippage in outward direction (in cm) between 0-0.5 cm on day 1 and day 4.On day 2, 40% of the patients were having ETT slippage between 0-0.5 cm and 40% were having ETT slippage between 0.6-1cm. On day 3, maximum patients were having ETT slippage between 0.6-1cm. On day 5 and day 6, 50% each patients were having ETT slippage between 0-0.5cm and 50% each were having ETT slippage between 0.6-1cm.

Lip Ulcers and Oral Mucosa Ulcers	Experimental group$_1$ n_1=10 f (%)	Experimental group$_2$ n_2=10 f (%)	X^2 Statistics
Day 1			
Normal	9 (90.0)	10 (100.0)	1.053 df = 1 $p=0.305^{NS}$
Moderate alteration	1 (10.0)	0 (00.0)	
Severe alteration	0 (00.0)	0 (00.0)	
Day 2			
Normal	9 (90.0)	10 (100.0)	1.053 df = 1 $p=0.305^{NS}$
Moderate alteration	1 (10.0)	0 (00.0)	
Severe alteration	0 (00.0)	0 (00.0)	
Day 3			
Normal	5 (50.0)	9 (90.0)	3.81 df = 1 $p=0.051^{NS}$
Moderate alteration	5 (50.0)	1 (10.0)	
Severe alteration	0 (00.0)	0 (00).0	

Day 4			
Normal	4 (40.0)	7 (70.0)	1.818 df = 1 p=0.178^{NS}
Moderate alteration	6 (60.0)	3 (30.0)	
Severe alteration	0 (00.0)	0 (00.0)	
Day 5			
Normal	1 (10.0)	5 (50.0)	4.359 df = 2 p=0.113^{NS}
Moderate alteration	8 (80.0)	5 (50.0)	
Severe alteration	1 (10.0)	0 (00.0)	
Day 6			
Normal	1 (10.0)	4 (40.0)	3.086 df = 2 p=0.214^{NS}
Moderate alteration	8 (80.0)	6 (60.0)	
Severe alteration	1 (10.0)	0 (00.0)	

Table 3: Comparison of orally intubated patients among experimental group 1 and experimental group 2 according to Lip ulcers and oral mucosa ulcers from day 1 to day 6.
*significant, NS=Non-Significant, N=20.

Table 3 depicts frequency and percentage distribution of orally intubated patients among experimental group 1 and experimental group 2 according to Lip ulcers and oral mucosa ulcers from day 1 to day 6.

- There was no statistically significant difference between the experimental group 1 and experimental group 2 in ETT position in all observations from day 1 to day 6 ($p>0.05$).

Facial skin integrity	Experimental group$_1$ n_1=10 f (%)	Experimental group$_2$ n_2=10 f (%)	X^2 Statistics
Day 1			
Healthy skin condition	10 (100.0)	10 (100.0)	NA
Moderate skin condition	0 (00.0)	0 (00.0)	
Severe skin condition	0 (00.0)	0 (00.0)	
Day 2			
Healthy skin condition	10 (100.0)	10 (100.0)	NA
Moderate skin condition	0 (00.0)	0 (00.0)	
Severe skin condition	0 (00.0)	0 (00.0)	
Day 3			
Healthy skin condition	10 (100.0)	10 (100.0)	NA
Moderate skin condition	0 (00.0)	0 (00.0)	
Severe skin condition	0 (00.0)	0 (00.0)	
Day 4			
Healthy skin condition	7 (70.0)	10 (100.0)	3.529 df = 1 p=0.060^{NS}
Moderate skin condition	3 (30.0)	0 (00.0)	
Severe skin condition	0 (00.0)	0 (00.0)	

Day 5			
Healthy skin condition	4 (40.0)	8 (80.0)	3.333 df = 1 p=0.068^{NS}
Moderate skin condition	6 (60.0)	2 (20.0)	
Severe skin condition	0 (00.0)	0 (00.0)	
Day 6			
Healthy skin condition	3 (30.0)	7 (70.0)	3.2 df = 1 p=0.074^{NS}
Moderate skin condition	7 (70.0)	3 (30.0)	
Severe skin condition	0 (00.0)	0 (00.0)	

Table 4: Comparison of orally intubated patients among experimental group 1 and experimental group 2 according to Facial skin integrity from day 1 to day 6.
*significant, NS=Non-Significant, N=20.

Table 4 depicts frequency and percentage distribution of orally intubated patients among experimental group 1 and experimental group 2 according to Facial skin integrity from day 1 to day 6.There was statistically significant difference found between experimental group 1 and experimental group 2 (p>0.05) in number of resecurements in all observations from day 1 to day 6. Day 1 (p=0.000), day 2 (p=0.001), day 3 (p=0.001), day 4 (p=0.001), day 5 (p=0.004) and day 6 (p=0.000).

- There was no statistically significant difference found between experimental group 1 and experimental group 2 (p>0.05) in lip ulcers and oral mucosa in all observations from day 1 to day 6. There was no statistically significant difference found between experimental group 1 and experimental group 2 (p>0.05) in facial skin integrity in all observations from day 1 to day 6.

Discussion

Endotracheal intubation is frequently a life-saving treatment used on persons who are comatose or unable to breathe [19]. Endotracheal Intubation keeps the airway patent and helps to prevent suffocation. Once the patient has been intubated, it is crucial to keep the endotracheal tube in position. Even routine nursing care can result in tube slippage when endotracheal tubes are improperly secured, which is a primary contributor in developing airway trauma [20]. Thus, avoiding Endotracheal Tube Movement is of the utmost priority. There is convincing evidence that immobilization of head is important, other measures that are important are the vigilance of medical staff, adequate sedation of the patient and strong fixation of endotracheal tube [21]. So there are numerous methods available to secure endotracheal tubes. The traditional methods are those using cloth tape or adhesive tape with several techniques existing for each and commercially made endotracheal tube holding devices for Endotracheal Tube Securement in critical care areas.

Conclusion

The findings revealed that for General Assessment, it was concluded that statistical significant result was found between experimental group 1 and experimental group 2 (p<0.05) in GCS on day 2 (p=0.017), in P/F ratio on day1 (p=0.004). But most of the observations were statistically non-significant. Also, statistical non-significant result was found in ETT cuff pressure in all observations from day 1 to day 6 (p>0.05). Thus, null hypothesis was accepted. Also, for Endotracheal Tube Securement [ETTS] Outcomes, statistical significant result was found between experimental group 1 and experimental group 2 in number of resecurements in all observations from day 1 to day 6 (p<0.05). Hence, Endotracheal Tube Holder can be recommended for Endotracheal Tube securement in clinical practice.

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