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ISSN 1462 2815

# RISK OF FACIAL PRESSURE ULCER IN FIXATION OF TWILL TAPE VERSUS DYNA PLASTER IN PATIENTS WITH ENDOTRACHEAL TUBE: A COMPARATIVE STUDY

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**DOI: 10.5281/zenodo.10991854**

**Abstract**

**Introduction:** Intensive care unit (ICU) patients, especially those who are intubated with endotracheal tube and on a mechanical ventilator, are more likely to develop facial pressure ulcers. **Aim:** The aim of the current study was to compare the risk of facial pressure ulcers in patients who had endotracheal intubation fixed with twill tape versus dyna plaster. **Materials and Methods**: A descriptive research design was employed to conduct the study with 60 samples who met the inclusion criteria and were selected by a convenience sampling technique for the study. Thirty samples fixed with Twill tape were assigned to Group A, and 30 samples fixed with dyna plaster were assigned to Group B. From the first day to the fifth day, repositioning the tube and changing the fixation were done in both groups once every 24 hours. On the fifth day of intubation care, pressure ulcer risk assessment was done using the Braden Scale for predicting Pressure Sore Risk in both groups. Data were analyzed using descriptive and inferential statistics. **Result:** The calculated independent t-test value of 9.397 was found to be statistically significant at $p < 0.05$ level, which clearly infers that there was a statistically significant difference between the two fixations by Twill Tape and Dyna Plaster, with fixation by Twill Tape having a lower level of risk than the fixation by Dyna plaster. **Conclusion:** The study's findings conclude that there was a lower risk of developing pressure ulcers with Twill tape compared to Dyna plaster when the endotracheal tube is secured with twill tape.

**Keywords**: Twill tape, Dyna plaster, endotracheal tube fixation, facial pressure ulcer.

## INTRODUCTION

The use of numerous external devices and fixators is a risk factor that predisposes hospitalized patients to pressure ulcers related to medical devices[1]. Up to one-third of hospitalized patients may experience medical device-related ulcers that could have been prevented[2]. A pressure ulcer, also known as a pressure injury, is a localized injury to the skin and soft tissues caused by an elevated mechanical load, which can arise from any medical device or the body's own weight. Pressure ulcers resulting from medical devices are frequently observed in intensive care units (ICUs)[5], with feeding tubes and equipment being the most often implicated devices in face and oral mucosa-related pressure ulcers[3]. Studies have noted an increased risk of medical device-related ulcers in men, individuals who are overweight, and patients with prolonged ICU stays[6]. In ICUs, especially among intubated and mechanically ventilated patients, the likelihood of developing face pressure ulcers is higher. Tubes are typically secured using commercial or non-commercial methods, such as adhesive tapes, strings, or attachment devices, to prevent unintentional extubation[4]. Securing the airway is

crucial to avoid unintentional extubation or tube dislodgment, and various medical devices serve this purpose[7]. An ideal device for securing an endotracheal tube is one that effectively prevents both slippage or displacement of the tube and unplanned tracheal extubations, while also mitigating the risk of pressure ulcers in the skin and neck region[8].14 Patients with perioral pressure ulcer patterns showed variations related to two types of medical devices: the anchorfast device and the endotracheal tube holder set[9]. In recent years, the Center for Medicare and Medicaid Services has imposed reimbursement penalties for hospital-acquired pressure injuries, emphasizing the importance of preventive measures[10]. The study was conducted to evaluate a novel device, the Haider Tube-Guard, in reducing endotracheal tube movement and preventing unplanned extubation compared to adhesive tape and found that the Haider Tube-Guard significantly reduced ET tube mobility[11]. Despite advancements, unresolved conflicts of opinion about the optimum technique of endotracheal tube securement contribute to an increase in accidental extubations and variability in practice in the ICU[12]. Although various endotracheal tube holders are available, bandages or tape remain the most widely used techniques. Therefore, the present study was conducted to compare the risk of facial pressure ulcers in the fixation of twill tape versus dyna plaster among patients with an endotracheal tube in the intensive care unit.

## MATERIALS AND METHODS

A descriptive research design was employed to conduct a study in the Intensive Care Unit of Saveetha Medical College and Hospital from 20th May 2023 to 20th June 2023. A total of 60 samples that met the inclusion criteria were selected using the convenience sampling technique. Thirty samples fixed with Twill tape were assigned to Group A, and 30 samples fixed with dyna plaster were assigned to Group B. Informed consent was obtained from participants after explaining the purpose of the study. Demographic and clinical variables were collected using a structured questionnaire. Repositioning the tube and changing the fixation were performed in both groups once every 24 hours from the first day to the fifth day. On the fifth day of intubation care, pressure ulcer risk assessment was conducted using the Braden Scale for predicting Pressure Sore Risk in both groups. Confidentiality was assured throughout the procedure. The data were tabulated and analyzed using descriptive and inferential statistical methods with IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). Background variables of the participants were described in terms of percentage, mean, and standard deviation. The comparison between twill tape and dyna plaster was calculated using an unpaired t-test, and $p<0.05$ or less was considered statistically significant.

## RESULT

**Table 1: Background variables of participants in Group A and Group B**

| Demographic Variables | Group A | | Group B | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| **Age in years** | | | | |
| a. 21 – 30 | 5 | 16.7 | 5 | 16.7 |
| b. 31 – 40 | 5 | 16.7 | 5 | 16.7 |
| c. 41 – 50 | 10 | 33.3 | 10 | 33.3 |
| d. 51 – 60 | 10 | 33.3 | 10 | 33.3 |
| **Gender** | | | | |

| | | | | |
|---|---|---|---|---|
| a. Male | 17 | 56.7 | 17 | 56.7 |
| b. Female | 13 | 43.3 | 13 | 43.3 |
| **Hydration status** | | | | |
| a. Fluid intake >200 ml/ day | 5 | 16.7 | 5 | 16.7 |
| b. Fluid intake 2000-3000 ml/day | 7 | 23.3 | 7 | 23.3 |
| c. Fluid intake 1000-2000 ml/day | 11 | 36.7 | 11 | 36.7 |
| d. Fluid intake 750-1000 ml/day | 7 | 23.3 | 7 | 23.3 |
| **Route of feeding** | | | | |
| a. Nasogastric tube | 26 | 86.7 | 26 | 86.7 |
| b. Oral feed | 4 | 13.3 | 4 | 13.3 |
| **Duration of ICU days** | | | | |
| a. 2 days to 7 days | 17 | 56.7 | 17 | 56.7 |
| b. 7 days to 15 days | 13 | 43.3 | 13 | 43.3 |
| **BMI of the patient** | | | | |
| a. 16 – 20 | 12 | 40.0 | 11 | 36.7 |
| b. 20 – 25 | 9 | 30.0 | 10 | 33.3 |
| c. 25 – 30 | 9 | 30.0 | 9 | 30.0 |
| **Comorbidity** | | | | |
| a. Hypertension | 3 | 10.0 | 4 | 13.3 |
| b. Diabetes mellitus | 10 | 33.3 | 17 | 56.7 |
| c. Chronic kidney disease | 7 | 23.4 | 3 | 10.0 |
| d. No comorbidity | 10 | 33.3 | 6 | 20.0 |
| **Previous history of pressure ulcer** | | | | |
| a. Yes | 12 | 40.0 | 11 | 36.7 |
| c. No | 18 | 60.0 | 19 | 63.3 |
| **Glasgow COMA Scale score** | | | | |
| a. <5 | 20 | 66.7 | 19 | 63.3 |
| b. 5 – 9 | 10 | 33.3 | 11 | 36.7 |
| **Sensory impairment** | | | | |
| a. Present | 10 | 33.3 | 11 | 36.7 |
| b. Absent | 20 | 66.7 | 19 | 63.3 |
| **Size of the ET tube used** | | | | |
| a. 7.0 – 7.5 | 18 | 60.0 | 17 | 56.7 |
| b. 8.0 – 8.5 | 12 | 40.0 | 13 | 43.3 |
| **Pressure on Airway** | | | | |
| a. 90 – 100 | 16 | 53.3 | 18 | 60.0 |
| b. 70 – 89 | 14 | 46.7 | 12 | 40.0 |

The table 1 shows that, most of the 10(33.3%) in the Group A and in Group B were aged between 41 – 50 years and 51 – 60 years, 17(56.7%) in Group A and Group B were male, 11(36.7%) in Group A and Group B had fluid intake of 1000 – 2000 ml/day, 26(86.7%) in Group A and Group B were fed by nasogastric tube and 17(56.7%) in Group A and Group B were stayed in ICU for 2 days to 7 days. 12(40%) in Group A and 11(36.7%) in Group B had BMI in the range of 16-20, 10(33.3%) in Group A had diabetes mellitus as comorbid and no comorbidity and 17(56.7%) in Group B had diabetes mellitus as comorbid. 18(60%) in Group A and 19(63.3%) in Group B had no previous history of pressure ulcer, 20(66.7%) in Group A and 19(63.3%) in Group B had Glasgow coma scale score of <5, sensory impairment was absent among 20(66.7%) in Group A and 19(63.3%) in Group B.

**Table 2: level of risk facial pressure ulcer infixation of Twill Tape Versus Dyna Plaster**

| Level of Risk FacialPressure Ulcer | Group A (Twill Tape) | | Group B (Dyna Plaster) | |
|---|---|---|---|---|
| | F | % | F | % |
| Low (15 – 18) | 11 | 36.6 | 7 | 23.3 |
| Moderate (13 – 14) | 15 | 50.0 | 8 | 26.7 |
| High (10 – 12) | 2 | 6.7 | 7 | 23.3 |
| ≤9 (Very high) | 2 | 6.7 | 8 | 26.7 |

The Table 2 depicts that in Group A, 15(50%) had moderate level of risk, 11(36.6%) had low level of risk and 2(6.7%) had high and very high level of risk facial pressure ulcer whereas in Group B, 8(26.7%) had moderate and very high level of risk and 7(23.3%) had low and high level of risk facial pressure ulcer.

**Table 3: Comparison of risk of facial pressure ulcer in fixation of Twilltape versus Dyna plaster**

| | Mean | S.D | Mean Difference | Student Independent 't' test value |
|---|---|---|---|---|
| Twill Tape | 14.16 | 2.54 | 2.06 | t=2.551<br>p=0.014<br>S*** |
| Dyna Plaster | 12.10 | 3.63 | | |

***p<0.001, S – Significant

The table 2 shows that the mean score of risk assessed by Twill Tape was 14.16±2.54 and the mean score of risk assessed by Dyna Plaster was 12.10±3.63. The mean difference score was 2.06. The calculated student independent t test value of t = 2.551 was statistically significant at p<0.05 level. This clearly shows that there was significant difference between the assessment by Twill tape and Dyna plaster in which Twill tape assessment was better thanthe Dyna plaster.

## DISCUSSION

Endotracheal tubes are commonly employed in critical care medicine to establish and safeguard a patent airway, facilitating mechanical ventilation. This is a primary factor contributing to the occurrence of face pressure ulcers, primarily due to the fixation of the endotracheal tube to secure it in the proper placement. The incidence of pressure ulcers may vary depending on the type of Endotracheal Tube Fixators.[12] The findings of the current study revealed that the risk of developing facial pressure ulcers was observed in both the twill tape and dyna plaster groups. However, the occurrence was less frequent with Twill tape fixation to secure the ET tube. This finding is supported by a study conducted by Michael Kuniavsky et al. 2019, who reported that the incidence of pressure ulcers related to Endotracheal Tube Fixators may be as high as 58% when using standard cloth tape Endotracheal Tube Fixatorss[1]. In another study, Garrubba M. 2017 reported that the incidence of pressure injuries ranges from 12.4% to 18.7%, with a higher incidence of Grade 1–2 pressure injuries than Grade 3–4. Among the reported pressure injuries, 29% were attributed to medical devices and the most commonly associated devices were ETT tapes (21-29%) and nasogastric tubes (14-16%).[13] Similarly, Rehab Fadel Ali et al, 2022 also reported that 5.4% of the participants in the Twill group had severe oral mucositis, compared with 27% of the participants in the adhesive tape group with statistically significant differences between the two groups.[12] In contrast, Aseel Sleiwah et al, 2020 conducted a retrospective study to assess perioral pressure ulcers in patients undergoing endotracheal

intubation and concluded that the findings negatively illustrate that the length of intubation is associated with a high risk of facial pressure ulcers[14]. Constance C. Mussa et al, 2018 conducted a study to assess the factors associated with endotracheal tube (ETT) related pressure injury in mechanically ventilated patients and found that patients who receive vasopressor infusion may be at an increased risk of developing ETT-related pressure injuries, indicating a need for heightened vigilance in performing skin and mucosal membrane assessments in this population.[15] Landsperger et al, 2019 found that the use of the endotracheal tube fastener to secure the endotracheal tubes reduces the rate of a composite outcome that included lip ulcers, facial skin tears, or endotracheal tube dislodgement compared to adhesive tape[16]. However, the current study lacks an assessment of this risk factor. Therefore, the current study recommends using Twill tape to secure the ETT, and further research may be conducted with other advanced devices to prevent pressure ulcers.

## CONCLUSION

There was a significant advantage of Twill tape over Dyna plaster fixation among patients with an endotracheal tube in the development of pressure ulcers. Twill tape fixation for securing the endotracheal intubation tube was found to be more effective in reducing the risk of facial pressure ulcers compared to Dyna plaster fixation for securing the endotracheal intubation tube

### Conflict of Interest

The authors have no conflict of interest

### Acknowledgment

We express our gratitude to all patients and their families for participating in the study and for their valuable support during entire period of the study.

### References

1) Kuniavsky, M., Vilenchik, E., & Lubanetz, A. (2020). Under (less) pressure–facial pressure ulcer development in ventilated ICU patients: a prospective comparative study comparing two types of endotracheal tube fixations. Intensive and Critical Care Nursing, 58, 102804.

2) Black JM, Cuddigan JE, Walko MA, Didier LA, Lander MJ, Kelpe MR. Medical device related pressure ulcers in hospitalized patients. Int Wound J. 2010;7:358–365.

3) Gorecki C, Brown JM, Nelson EA, et al.: Impact of pressure ulcers on quality of life in older patients: a systematic review. J Am Geriatr Soc. 2009, 57:1175-83.

4) Barakat-Johnson M, Barnett C, Wand T, White K. Medical device-related pressure injuries: an exploratory descriptive study in an acute tertiary hospital in Australia. J Tissue Viability. 2017; 26(4): 246-253.

5) Coyer FM, Stotts NA, Blackman VS: A prospective window into medical device-related pressure ulcers in intensive care. Int Wound J. 2014, 11:656-64.

6) Kim CH, Kim MS, Kang MJ, Kim HH, Park NJ, Jung HK. Oral mucosa pressure ulcers in intensive care unit patients: a preliminary observational study of incidence and risk factors. J Tissue Viability. 2019; 28(1): 27-34.

7) Fisher DF, Chenelle CT, Marchese AD, Kratohvil JP, Kacmarek RM (2014) Comparison of commercial and noncommercial endotracheal tube-securing devices. Respir Care 59(9):1315–1323. PMID: 24368866.

8) Sleiwah, A., Nair, G., Mughal, M., Lancaster, K., & Ahmad, I. (2020). Perioral pressure ulcers in patients with COVID-19 requiring invasive mechanical ventilation. European journal of plastic surgery, 43, 727-732.

9) Leung K, Wu JT, Liu D, Leung GM (2020) First-wave COVID-19 transmissibility and severity in China outside Hubei after control measures, and second-wave scenario planning: a modelling impact assessment. Lancet. 395(10233):1382–1393.

10) Padula WV, Valuck RJ, Makic MB. Factors influencing adoption of hospitalacquired pressure ulcer prevention programs in us academic medical centers. Journal of wound, ostomy and continence nursing. 2015; 42: 327-330.

11) Buckley, J. C., Brown, A. P., Shin, J. S., Rogers, K. M., & Hoftman, N. N. (2016). A comparison of the haider tube-guard® endotracheal tube holder versus adhesive tape to determine if this novel device can reduce endotracheal tube movement and prevent unplanned extubation. Anesthesia and analgesia, 122(5), 1439.

12) Ali, R. F., Fathallah, M., & Kandeel, N. A. (2022). Comparing Between the Effectiveness of Twill and Adhesive Tape Techniques in Securing the Endotracheal Tube and Maintaining the Integrity of Oral Mucous Membrane among Critically Ill Patients. Mansoura Nursing Journal, 9(1), 9-21.

13) Seyedhosseini, J., Ahmadi, M., Nejati, A., Ardalan, A., Ghafari, M., & Vahidi, E. (2017). Two Different Endotracheal Tube Securing Techniques: Fixing Bandage vs. Adhesive Tape. Advanced Journal of Emergency Medicine, 1(1).

14) Garrubba, M. (2017). Preventing pressure injuries in intubated patients in ICU: Systematic Review. Centre for Clinical Effectiveness, Monash Innovation and Quality, Monash Health, Melbourne, Australia.

15) Mussa, C. C., Meksraityte, E., Li, J., Gulczynski, B., Liu, J., & Kuruc, A. (2018). Factors associated with endotracheal tube related pressure injury. SM J Nurs, 4(1),1-6.

16) Landsperger JS, Byram,JM, Lloyd BD, et al. (2019). The effect of adhesive tape versus endotracheal tube fastener in critically ill adults: the endotracheal tube securement (ETTS) randomized controlled trial. Crit Care, 23, 161.