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Reduced incidence of feeding tube dislodgement and missed feeds in burn patients with nasal bridle securement

Alexander Y. Li [a], *Kristine C. Rustad* [a], *Chao Long* [a], *Emiko Rivera* [b], *Meghan Mendiola* [b], *Maaike Schenone* [b], *Yvonne L. Karanas* [a,b,*]

[a] *Department of Surgery, Division of Plastic and Reconstructive Surgery, Stanford University School of Medicine, Palo Alto, CA, United States*
[b] *Department of Surgery, Division of Plastic and Reconstructive Surgery, Santa Clara Valley Medical Center, San Jose, CA, United States*

ARTICLE INFO

Article history:
Accepted 29 May 2017
Available online xxx

Keywords:
Nutritional support
Nasal bridle
Feeding tube

ABSTRACT

Introduction: Feeding tubes in burn patients are at high risk for becoming dislodged as traditional tape securement does not adhere well to sloughed skin, resulting in nutrition delivery disruption and placing patients at increased risk for iatrogenic injury upon reinsertion.
Methods: Seventy-four patients admitted to our regional burn center requiring nasoenteric nutritional support were prospectively followed. Fourty-one patients received a nasal bridle while thirty-three received traditional tape and elastic dressings. Primary outcomes centered on measuring clinical efficacy of the nasal bridle system.
Results: Conventional tape-secured feeding tubes were dislodged more frequently (0.9±0.2 times per 10 feeding days vs. 0.2±0.1 times per 10 feeding days; p=0.005). Nasal bridle secured tubes showed significantly longer functional life on Kaplan Meier analysis (hazard ratio 0.35; p=0.01). Fewer abdominal x-ray studies were performed to confirm tube placement in nasal bridle patients (1.48±0.13 for nasal bridle vs. 2.21±0.21 for conventional tape-secured; p=0.003). Overall, patients with bridle securement had fewer hours of missed enteric feeds (2.51±0.95 hours vs. 6.72±2.07 hours; p=0.05). Importantly, utilization of a nasal bridle decreased overall estimated costs for enteric feeding management ($1,379.72±120.70 vs. $1,107.66±63.95; p=0.05).
Conclusions: Utilization of a nasal bridle system provides a reliable method for securement of nasoenteric feeding tubes with clinical benefits in the burn patient population.

1. Introduction

Adequate nutritional support is an essential component to proper management of severe burns as burn physiology is characterized by a hypermetabolic and hypercatabolic state [1,2]. Most commonly, nutritional support is provided via a nasoenteric feeding tube, but burns involving the face can increase the difficulty of securing these feeding tubes [3]. Traditional methods of securing feeding tubes with tape and

* *Corresponding author at*: Santa Clara Valley Medical Center, 751 South Bascom Avenue, San Jose, California 95128, United States. Fax: +1 408 885 6675.
E-mail address: Yvonne.Karanas@hhs.sccgov.org (Y.L. Karanas).
http://dx.doi.org/10.1016/j.burns.2017.05.025
0305-4179/

tubular elastic dressing are challenging in this setting given that tape does not adhere well to sloughed skin [4]. As a result, feeding tubes are at risk for inadvertently becoming dislodged, which would disrupt patients' nutritional regimen, expose patients to additional radiation due to radiographs needed to re-confirm tube placement, and consume additional hospital resources [4,5]. Additionally, the use of tape can also compromise surgical access to facial injuries and can cause further trauma to already damaged skin [6]. Compression of the feeding tube against the nasal ala or columella with these methods, for instance, can cause pressure necrosis of the skin and underlying cartilage, resulting in significant morbidity.

An alternative method of securing nasoenteric tubes is the nasal bridle system, which was first described in 1980 by McGuirt and Strout as a method of securing feeding tubes during the postoperative care of head and neck cancer patients [7]. The procedure for securing feeding tubes with a nasal bridle has benefited from several improvements since then but still requires a healthcare provider to guide a catheter into one naris, advancing posteriorly, hooking around the nasal septum, and continuing anteriorly out the contralateral naris [8]. This creates a bridle to which the feeding tube can be secured. Currently, commercially available bridle systems involve passing magnetic probes through the nasopharynx, which allows umbilical tape to be looped around the vomer bone and then secured to the feeding tube with a clip. Minimal adverse effects have been reported for this inexpensive system that has been shown to be effective, easy to use, and relatively comfortable for patients [5]. In addition, the clip and umbilical tape hang freely from the nose so there is no risk of compression leading to skin necrosis.

Although there is literature to support the use of the bridle system in acutely ill patients, studies of their use in the burn patient population are sparse despite the importance of adequate nutritional support in this group. Thus, in this prospective study, we aimed to analyse the effectiveness of securing nasoenteric feeding tubes by a nasal bridle system compared to traditional adhesive methods in a cohort of 74 burn patients. We hypothesized that patients whose feeding tubes were secured with a nasal bridle would have a lower incidence of accidental tube removals and thus fewer hours of missed enteric feeding.

2. Materials and methods

2.1. Study design

A prospective study was conducted within a regional American Burn Association verified burn center on a sequential series of patients admitted for acute burns that included the face who required nasoenteric nutritional support. This study was performed in accordance with Institutional Review Board protocol. A total of 74 patients were followed throughout the period during which they required enteric feeding. Thirty-three of these patients were captured prior to a practice change involving the routine use of nasal bridle securement and thus had enteric feeding tubes secured with traditional adhesive tape and tubular elastic dressing method. Fourty-one patients had nasoenteric feeding tubes placed that were secured with a nasal bridle system (Applied Medical Technology, Brecksville, OH). Baseline characteristics between cohorts, including age, gender, burn type, burn total body surface area (TBSA), and length of stay were obtained from patient hospital records. Primary indications for feeding tube insertion were recorded at the time of tube placement. Dislodgement was defined as any event that led to a removal of feeding tube. Most dislodgements required tube replacement. In some occasional cases (12.1%), the tube was not entirely removed, but was severely malpositioned. In these instances, they were reinserted and reused after XR imaging.

Primary outcomes measured were frequency of feeding tube dislodgement, number of abdominal X-rays obtained during hospitalization to confirm feeding tube placement, number of tube removals per 10 days of tube feeding, hours of missed feeding time due to tube failure/dislodgement, and days to first tube dislodgement.

Individual service and product costs were obtained by internal request from their respective hospital billing departments. Subtotals for hospital costs attributed to abdominal imaging to verify tube placement, feeding tube replacement, and bridle securement devices were calculated for each patient by multiplying cost per product or service by the number of utilizations per patient throughout the study period. A cost estimate of nursing and MD time effort was provided for each tube replacement. A linear cost model was then generated based on the sum of these subtotals to quantify overall costs associated with nasoenteric feeding and then compared between groups to assess the impact of bridle securement.

2.2. Statistical analysis

Comparisons of cohort characteristics were conducted between traditional tape/elastic dressing and nasal bridle securement method groups. Continuous variables were described by means and standard errors. Categorical variables were described by counts and percentages. Differences between cohorts were tested by the Student's t-test for continuous variables and the Chi-square test for categorical variables. A Kaplan–Meier survival curve was constructed to demonstrate differences in time to first tube dislodgement and analyzed using a standard log rank test. Tests of significance were performed on all outcomes using an alpha of 0.05. Data are presented as means and standard errors. Data preparation and analysis was conducted using SAS version 9.4 (SAS Inc., Cary, NC, USA).

3. Results

3.1. Patient demographics

Of 74 sequential patients receiving nasoenteric feeding tubes, 33 were secured via a traditional tape-based method while 41 were secured using a nasal bridle system. The majority of captured patients were middle-aged, males (59.5% of overall cohort) with admission for flame burns (25.7% TBSA injury average). Analysis of patients between the two treatment cohorts yielded no statistically significant differences in

Please cite this article in press as: A.Y. Li, et al., Reduced incidence of feeding tube dislodgement and missed feeds in burn patients with nasal bridle securement, Burns (2018), http://dx.doi.org/10.1016/j.burns.2017.05.025