Carol Rees Parrish, R.D., M.S., Series Editor

Nasal Bridle: Married to Your Tube

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Nasal bridles have been around since the 1980's and have been drastically modified over time. Despite improvements in nasal bridles they continue to be used sparingly. Bridles may prevent the discomfort and trauma of repeated nasal tube reinsertion, unnecessary radiation for repeat x-ray confirmation or fluoroscopy tube placement, decrease sedative usage, improve utilization of physician, nurse and dietitian's labor, and as such, be cost effective over time. They have not only increased the number of days a feeding tube stays in, but have also increased the amount of calories delivered over that of a feeding tube alone. New data has emerged suggesting that bridles may delay or decrease the need for percutaneous endoscopic gastrostomy (PEG) placement, and as a result, the 30-day mortality associated with it. This review describes the technique of bridle placement and the latest outcomes data.

CASE SCENARIOS

Scenario #1

A 60-year-old male found unresponsive for roughly 10 hours at his home was brought to the emergency department. A head computer tomography (CT) revealed an ischemic stroke affecting the right middle cerebral artery. He was subsequently admitted to the neurology service and underwent a swallow study, which revealed pharyngeal motor dysfunction and a delay in swallow initiation leading to aspiration. A nasogastric tube (NGT) was placed for nutrition support. Unfortunately, the patient unintentionally removed the NGT tube three times in less than a week. The gastroenterology fellow was consulted for placement of a percutaneous endoscopic gastrostomy (PEG). Is a PEG necessary in this scenario?

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Scenario # 2

A 50-year-old male with heavy alcohol abuse in the past presented to the ER with severe abdominal pain, nausea and vomiting. A CT scan was performed and revealed a severe necrotizing pancreatitis and he was subsequently admitted to the ICU, intubated and ventilated. From a nutritional standpoint he was adequately hydrated with intravenous fluids and subsequently had

a nasojejunal tube (NJT) placed under fluoroscopy for nutrition. After the third day the NJ was displaced secondary to decreased adhesiveness of the tape due to his oily skin. After one day of no enteral feeding another NJT was placed under fluoroscopy. Due to his oily skin the tape continues to lose adhesiveness again. How can we prevent the NJT from displacing again?

Scenario #3

A 9-year-old girl with Toxic Epidermal Necrolysis Syndrome (TENS) was admitted with blisters affecting the face and mucous membranes of the mouth. She needed to be intubated and sedated for cleaning and dressing of the affected areas. It was necessary to secure the tube without promoting further injury to the site. The use of a nasal bridle was entertained! Could this work?

INTRODUCTION

Often the role of enteral nutrition (EN) in immune modulation and gut motility is under-appreciated (1). Nutritional support is a necessary intervention, not only in the critical care setting, but also for many general floor patients as well (2,3). Early initiation of nutrition enhances gut motility, prevents bacterial translocation and bacterial overgrowth (1). The impact of inadequate feeding in patients in the intensive care unit (ICU) has demonstrated an increased rate of complications, especially infections (4). EN is preferred to parenteral nutrition (PN) due to the infectious risks as well as the increased cost associated with PN.

Even though the enteral delivery of nutrients has improved, multiple factors can hinder accomplishing adequate nutritional goals. In the ICU setting, cessation of enteral feedings have been attributed to procedures, increased gastric residual volume, diagnostic tests, nursing care, and tube displacement (2). In fact, sixty-six percent of the time tube displacement could have been avoided, and more than 50% of the time the rest of the above mentioned could have been avoided as well (5–7). On the general floor 60% of cases had suboptimal formula delivery as a result of inadvertent NGT extubation (3). Recurrent replacements of NGT's are associated with multiple complications such as endotracheal intubation, pneumonia, pneumothorax, epistaxis and esophageal perforation (8,9). Other concerns include increased costs, unnecessary radiation exposure and an extra burden on those professionals placing these tubes. The nasal bridle (NB) system was invented to prevent NGT displacement and augment delivery of enteral nutrition. There are several patient populations in which use of the NB are gaining momentum (see Table 1). Nasal bridling, while abhorrent to some, might deserve a second look.

Table 1.
Indications and Contraindications of Nasal Bridle

Indications

- Recurrent dislodgment of NGT/ NJT
- Any fluoroscopically placed NGT/NJT
- Facial burn victims with NGT/NJT
- History of difficult NGT/ NJT placement
- Confused and agitated patients
- Oily skin with decreased adhesiveness of tape

Contraindications

- Facial Trauma with nasal bone involvement
- Recurrent Epistaxis
- Nasal ulceration
- Nasal pain

HISTORY

The definition of a bridle is anything that can be used to secure both ends of an object by its center point. In our case the center point is the vomer bone (nasal septum) located in the anterior aspect of the skull (see Figure 1). In 1980 the NB was first introduced, but was not readily accepted due to the complexity of placing the bridle (10). Further modifications were achieved in later years, but due to the type of bridle material and connection difficulties associated with EN, it was not eagerly received by many clinicians (11,12). In 1996, the tubing used for the manufacture of the NB was replaced by umbilical tape, which made it more acceptable than previous versions (13). Although the umbilical tape improved utility of preventing NGT extubation, placement was still technically challeng-

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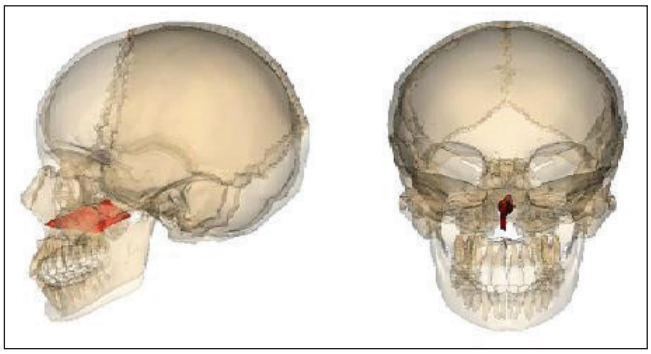

Figure 1. Vomer Bone (red color).

ing. Nevertheless, with the help of powerful magnets, the latest modification to the NB is now simple to place and is slowly gaining wider acceptance (14). See Table 2, Figures 2 and 3 which demonstrates the placement of nasal bridle.

OUTCOME DATA

Dislodgement

To assess the effectiveness of the NB, multiple studies have been undertaken comparing it to the usual tape (T) method (see Figure 4). Two different studies looked at NGT dislodgment and outcomes. Gunn et al. prospectively looked at the proportion and rate of tube dislodgment in the ICU setting. He determined a 26% absolute risk reduction favoring the NB (36% T vs. 10% NB, $p < 0.004$) (15). Interestingly, a survival analysis on the NGT was performed; it demonstrated that a NB prevented dislodgment and consequently increased the tube survival (see Figure 5). A randomized controlled trial recently established the efficacy of NB over tape (63% T vs. 18% NB dislodgment, $p < 0.0001$) (16). Similar findings have been confirmed in NJT displacement as well (see Figure 4) (17–19). Recently, Gupta et al. not only demonstrated a decrease in NGT dislodgment, but also showed a significant decrease in the amount of radiographic studies that were performed after the NB placement (20).

NASAL BRIDLES AND CALORIC DELIVERY

It has been demonstrated that NB decreases dislodgment of enteral feeding tubes, but more importantly, it increases caloric delivery to the patient. Cheung et al. performed a retrospective review of all patients who underwent NB and looked at 7 day pre-NB and 30 day post-NB caloric delivery (21). He included 48 patients referred for NB placement with an average of 2.3 NGT displacements. Pre-NB insertion less than half of the caloric requirements were met in 67.3% of patients. Post-NB this percentage dropped to 13.4%. It was also

Table 2.
Procedure for Nasal Bridle Placement

The placement of the NB has been modified over the years and is quite a simple process (see Figure 2 and 3). The package comes with a rigid blue probe, flexible white probe with umbilical tape/guide wire and clips corresponding to the size of the NGT.

- The first step is to inspect the nostril and mouth to identify any causes of obstruction or deformities. The NB comes in different sizes from 5 french (F) to 18F and needs to correspond to the NGT size.
- The next step is to lubricate the rigid blue probe and insert it into the nostril without the NGT up to the first rib on the probe.
- With the blue probe in position, place the flexible white probe in the opposite nostril.
- Withdraw the guidewire 1–2 cm and manipulate the white probe until a click or a feeling of the joining magnets occurs (Figure 3).
- After confirmation of the joined magnets by the previous technique, remove the guidewire completely.
- Slowly withdraw the blue probe with the white probe attached at the other end. The tape will follow the white probe around the vomer bone (nasal septum) as it comes out through the opposite nostril. The tape will be protruding out of both nostrils at this point. The umbilical tape attached to the white probe is cut leaving only the tape in the nostrils.
- After the NGT is placed, it is then put in the clip channel with both strands of tape at the hinge of the clip. After the clip has been closed, the tape is cut and tied.
- It is important to keep in mind that if a patient pulls hard enough on the NGT with NB, the NGT stretches and decreases in size and consequently slips out of the NB.
- For further information on placement please visit http://www.youtube.com/appliedmedical

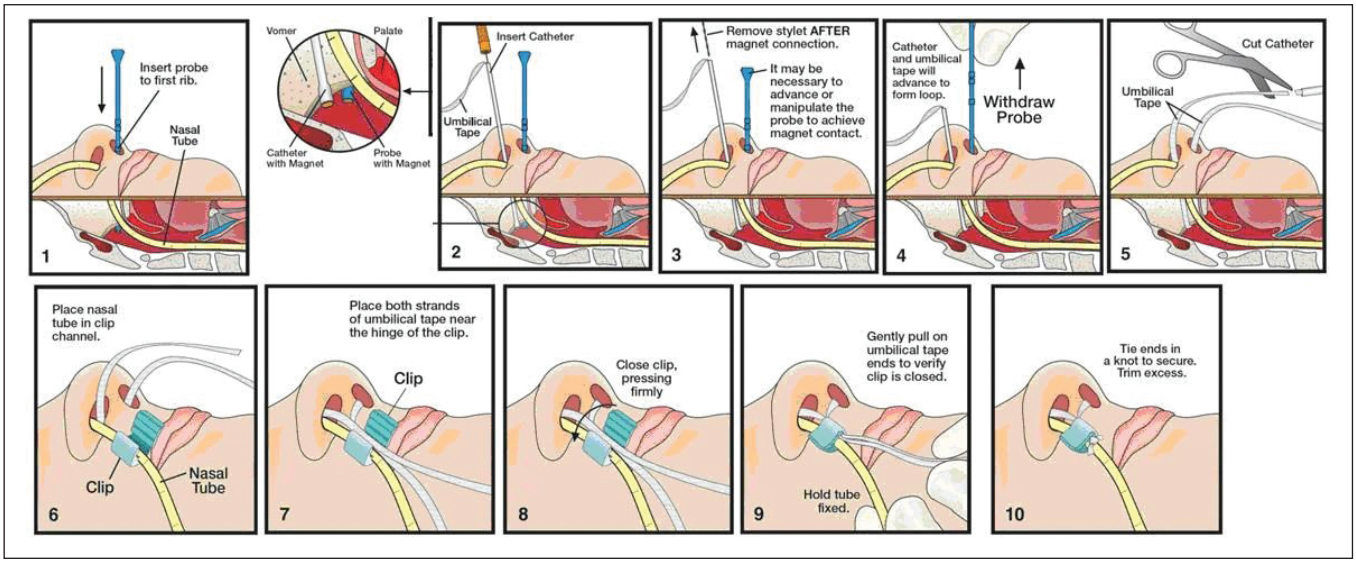

Figure 2. Nasal Bridle Placement.

noted that one-third of these patients required more than one nasal bridle placement (mean 1.4 reinsertions) due to either intentional removal by the patient or NGT blockage.

Donaldson et al, prospectively looked at the role of NB insertion and the outcomes associated with it (22). There were a total of 96 patients who underwent NB placement for various reasons, the most common being stroke and dementia. Prior to NB placement the caloric goals received were only an average of 20%; after NB placement it increased to 98%. Delivery of 98% of calorie goal is quite optimistic and a lot more than is typically reported in enteral feeding studies; details of how many NGTs were placed prior to the NB, or the reason for their initial low caloric delivery was not described.

Recently, a randomized controlled trial aimed at identifying caloric delivery with NB was performed (16). Eighty ICU patients were randomized to receive a NJT with either NB or routine tape. In the study, the NB group reached a higher caloric goal than the adhesive tape group (78% vs. 62%, p = 0.016). The increased nutrition delivery was mostly due to the decreased dislodgment rate (18% vs. 63%, p < 0.0001). There were 5 cases of mild epistaxis upon insertion and 4 cases of superficial nasal ulceration without any major complications. Consistently, NB is associated with a higher percentage of calorie goals being reached (16, 21–23).

Figure 3. Magnetic attachment model.

DO NASAL BRIDLES HELP PREVENT UNNECESSARY PEG PLACEMENT?

In one study, dysphagic patients who were unable to have continuous NG feeding (the authors did not described why) were referred for PEG placement (23). They were divided into 2 groups; the first group were stroke patients referred < 28-day post event (n = 14); the second group was > 28 days post event (n = 7). The first group underwent NGT with bridle and the second group underwent PEG placement. Fourteen patients had NB for median of 15 days and therefore prevented PEG placement in 8 patients (4 recovered, 4 died)

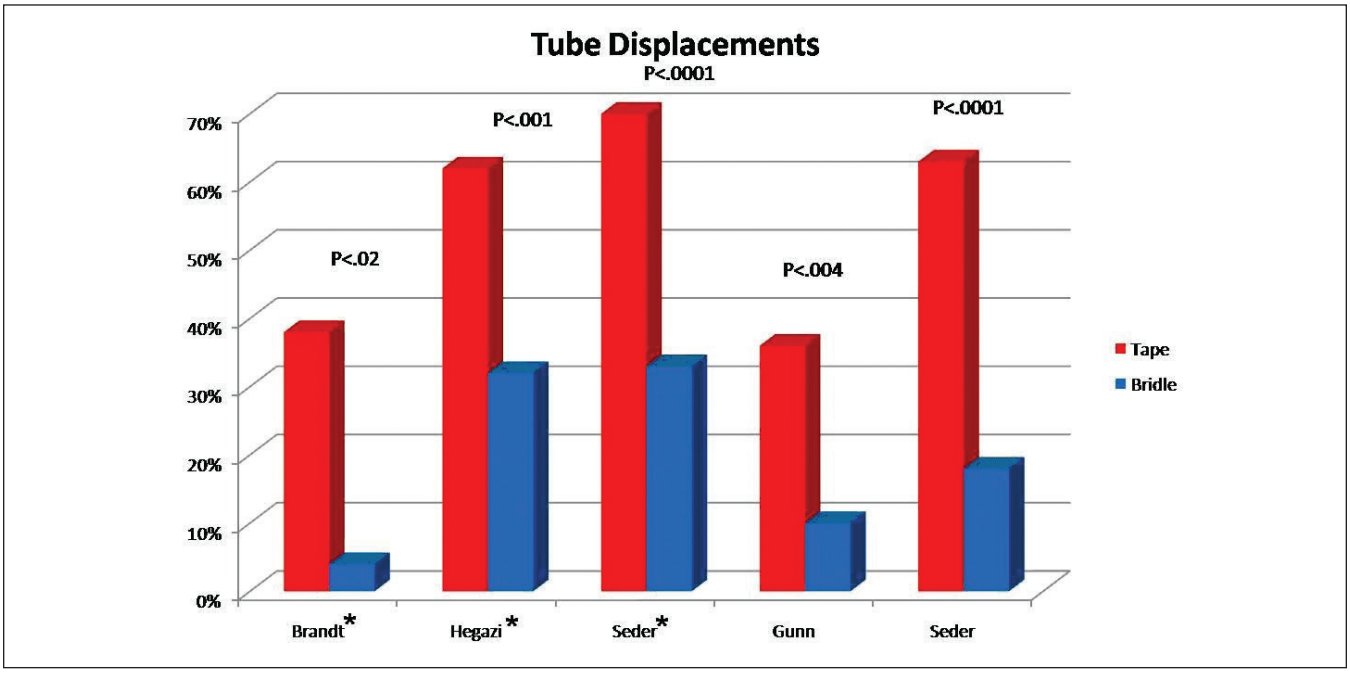

Figure 4. Tube displacement outcomes between Tape (T) and Nasal Bridle (NB). *Studies with Nasojejunal Tubes (NJT) (15–19).

while 6 went on to receive a PEG (4 died). Interestingly, 3 out of 4 patients in the NB group died of bronchopneumonia, while only one of the 2 out of the 4 in PEG deaths were related to pneumonia (series editor's note: one might question whether early PEG placement might have decreased the acquisition of pneumonia). At the 3 month follow-up, 5 had normal swallowing, 8 had died, and 1 was still using the PEG. NB might have prevented 56% (8/14) of people from undergoing a PEG. Four did undergo PEGs and died from pneumonias, renal failure, or myocardial infarction. Similarly, in other studies NB decreased PEG placement > 50% of the time (24,25).

Since PEG placement by itself is associated with an overall increased mortality and morbidity, the next question is can NB offset these complications (26)? The FOOD Trial was a randomized controlled trial of 321 patients to undergo either PEG or NGT feeding (27). The primary outcomes were death or poor outcomes at 6 months. There was a borderline significance in absolute risk of death or poor outcome of PEG at 6 months with 7.8% higher likelihood ($p = 0.05$). Unfortunately, the study was stopped early due to lack of funding. This study has been critiqued for its selection bias and probably does not clearly answer the question it was set forth to answer. Since the study was not a true randomization and the outcome measure of poor outcomes was performed as a single assessment 6 months after enrollment, there are too many variables not taken into consideration in order to identify true outcomes. Keeping the previous study in mind, Donaldson et al. compared post-PEG 30 day mortality pre and post NB introduction and found a 10% absolute risk reduction (22). A similar study by Johnston et al. demonstrated the PEG 30 day mortality decreased from 28% to 11% ($p < 0.01$) with the introduction of NB (25). The abstract did not fully explain the cause of the decreased motility, but it was thought that the NB offered an average of 10 days of adequate nutrition prior to PEG placement and allowed a better selection of patients for the PEG.

COST SAVINGS ASSOCIATED WITH BRIDLES

Seder et al. evaluated the cost effectiveness of the NB and described $4038 savings over a three month period (19). Of note, the cost of material and labor required to place 62 bridles was reported as only $372 ($6/patient),

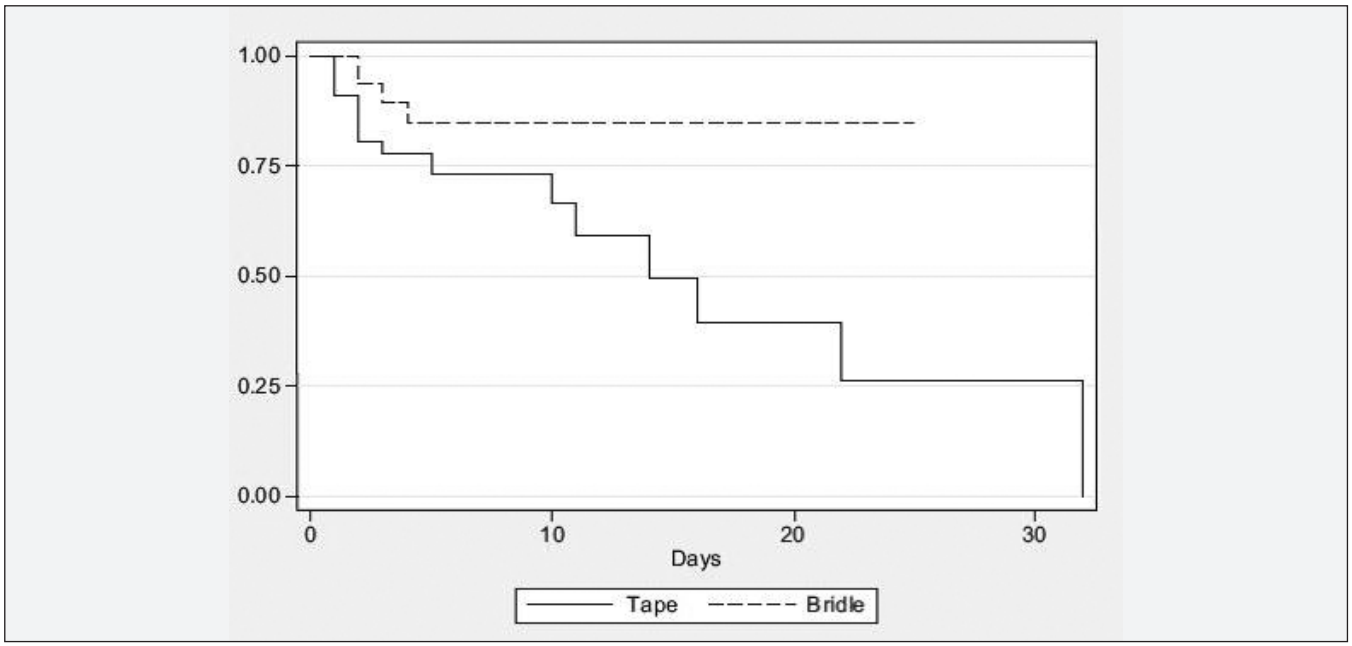

Figure 5. Survival analysis on Nasogastric Tube (NGT) comparing Nasal Bridle (Dashed line - - - - -) and Tape (Continuous Line ———) (15).

suggesting this was hospital cost vs. patient cost. They did take into consideration the role of fluoroscopic placement ($875) and bedside replacement ($190) as well and predicted that 2 would be performed under fluoroscopy and 14 bedside procedures. The figures are extremely low as the cost of the NB itself is around $80. Additionally, the numbers of NGT used in the NB group (67) compared to tape (66) were similar as it was a crossover trial (16). Some tape patients crossed over to the NB group while unsuccessful attempt at postpyloric tube placement in the NB group required a second tube insertion. However, when positioned properly the non-crossover tubes were 15% less in the NB group (54 NB vs. 62 tape). Nevertheless, it might be cost effective if one considers that PEG placement could potentially be deferred.

Some studies have demonstrated minor complications associated with the NB (15,16,18,19). These include epistaxis and nasal ulcerations and are usually mild and infrequent. In one study, 26% of patients (n = 4) had minor epistaxis at time of insertion, but no other complications thereafter (28). One study demonstrated a decrease in complications with the utilization of umbilical tape compared to the bulky red rubber tube (16). Although the studies were not powered to look at the complications, very few complications have occurred that required removal. In the latest study by Seder et al., of the 40 patients with NB, four patients had nasal ulceration, but only two required NB removal (< 5% removal) (16).

Two other cases of NB use have been reported in the pediatric age group (29,30). The first case was a patient with TENS that had mucous membrane involvement; the other was a patient with Type 1 spinal muscular atrophy with irritation from tape.

CONCLUSION

Overall the bridle appears to be an efficient way of preventing recurrent NGT/NJT displacements while promoting higher caloric delivery than NGT alone. A NB also prevents the discomfort and trauma of repeated nasal tube reinsertion, unnecessary radiation for repeat x-ray confirmation or fluoro tube placement, decrease sedative usage, improve utilization of physician and nurse's labor, and ultimately be cost effective over time. The use of a NB may potentially decrease the need for early PEG placement and thereby decrease

the early 30-day and possibly 6 month mortality or poor outcomes. The bridle has many promising features and deserves a closer look. ■

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