COMPARISON OF 2 METHODS FOR POSTPYLORIC PLACEMENT OF ENTERAL FEEDING TUBES

By Sylvia Lenart, RN, MSN, CCRN, and Nayak L. Polissar, PhD. From Overlake Hospital Medical Center, Bellevue, Wash (SL), and The Mountain-Whisper-Light Statistical Consulting, Seattle, Wash (NLP).

- **BACKGROUND** Multiple techniques are available for postpyloric placement of feeding tubes. Administration of metoclopramide and air insufflation are easily accomplished at the bedside. Variable success rates have been reported for both procedures.
- **OBJECTIVES** To determine which method, administration of 10 mg of metoclopramide or gastric insufflation of 350 mL of air, is superior for successful postpyloric placement of feeding tubes at the bedside.
- **METHODS** A prospective trial consisting of 60 adult patients randomized to have a feeding tube placed by 1 of 2 methods, either after intravenous administration of 10 mg of metoclopramide or via gastric insufflation of 350 mL of air. Placement results were confirmed by radiography.
- **RESULTS** Among patients receiving narcotics, the 72% successful placement rate with insufflation was significantly better than the 11% success rate achieved with metoclopramide (P < .001). Among the narcotic-free patients, the 83% success rate with metoclopramide was not significantly better than the 58% success rate with insufflation (P = .37). The difference in treatment effect between narcotic and narcotic-free groups was significant (P < .001).
- **CONCLUSION** Patients receiving narcotics should have feeding tubes placed via the air insufflation technique. The use of continuous or regularly scheduled administration of narcotics significantly decreases the effectiveness of metoclopramide in successful placement of feeding tubes. (American Journal of Critical Care. 2003;12:357-360)

P ostpyloric enteral feeding via a small-bore feeding tube is a common means for providing nutrition to critically ill patients. The issue of whether to administer feed formulas into the stomach or the small intestine continues to be investigated. Evidence is increasing that many patients have problems with inadequate gastric emptying.1,2

Additionally, small-bowel motility and absorption remain normal after surgery or trauma, whereas gastric motility remains abnormal for 1 to 2 days after surgery or trauma. Frequent use of narcotics also adds to the reduction in gastrointestinal motility. Several investigators have shown that, because of these changes in gastric motility, improved caloric intake and protein delivery can be achieved by small-bowel feeding. Torres et al6 discussed the role of the stomach as a source of colonization of the respiratory tract during mechanical ventilation. They also described a decrease in the prevalence of ventilator-associated pneumonia in patients in whom prophylactic measures (eg, treatment of stress ulcers, prevention of duodenal reflux with metoclopramide, reduction of gastric burden and bacterial translocation by selective digestive decontamination, acidification of enteral feeding and jejunal feeding) were indicated.

**Review of the Literature**

Bedside placement of a feeding tube into the small intestine is a challenge. Endoscopic and fluoroscopy methods have been developed to assist nurses in the bedside placement of feeding tubes for patients who do not require immediate placement of a gastric feeding tube. These methods include air insufflation of the stomach to facilitate GI tract intubation at the bedside or techniques in which the feeding tube is advanced through the pylorus under radiographic visualization. The relative effectiveness of these 2 methods has not been formally studied, and there is no evidence that one method is superior to another in all patients. This study was conducted to compare the effectiveness of the air insufflation and intravenous administration of metoclopramide for postpyloric placement of feeding tubes at the bedside. Patients receiving narcotics should have feeding tubes placed via the air insufflation technique. The use of continuous or regularly scheduled administration of narcotics significantly decreases the effectiveness of metoclopramide in successful placement of feeding tubes.
scoposcopic methods of placement have been well described. Both of these methods require increased resources, time of the healthcare team, and possible transport of patients from the critical care unit to a procedure room. Several bedside methods have also been developed and described. Zaloga described a bedside method of placing the feeding tube into the stomach, removing the stylet, bending it, and then reinserting it, using the bend to feel the lesser curvature of the stomach and the opening into the pylorus. Although a 92% success rate for postpyloric placement was reported, this method required a significant amount of operator expertise and an average placement time of 42 minutes. Gabriel et al described the use of an external magnet to guide a feeding tube with a magnet inserted in the tip. This method was used 42 times with an 88% success rate. Ozdemir et al reported a similar success rate of 88%, 51 intubations in 42 patients, when they used the same technique. Grathwohl et al inserted a fiberoptic scope through a feeding tube to guide the tube through the pylorus. They reported a 100% success rate and a mean procedure time of 118 minutes (SD, 12 minutes). The procedure was considered cost neutral because having tube placement confirmed via chest radiography was not required. Use of prokinetic agents to aid the passage of feeding tubes into the small bowel has also been well described. The rate of success of placement after intravenous administration of 10 mg of metoclopramide has varied. Whatley et al studied 12 adult patients who were given metoclopramide and then had a feeding tube placed into the stomach. None of the patients had spontaneous duodenal intubation.

Methods using metoclopramide administration or gastric air insufflation can be performed by the bedside nurse.

A newer bedside technique that uses gastric insufflation of air has been investigated. Schulz et al placed feeding tubes in 21 patients. Once gastric placement was confirmed, 500 to 1000 mL of air was insufflated and the tube was advanced. The overall success rate was 93%. Using a similar technique, Salasidis et al studied 32 patients who required placement of a feeding tube. With only 500 mL of gastric air insufflation, Salasidis et al achieved successful postpyloric placement of 21 of 32 feeding tubes.

Both techniques, metoclopramide administration and gastric air insufflation, are easily performed at the bedside by nurses. Ascertaining the superior method for placement would be helpful for increasing nutrition received by patients, decreasing potential risk factors associated with gastric tube placement, decreasing the cost of endoscopic or fluoroscopic procedures, and decreasing nursing time spent traveling with patients to locations for procedures. In this study, we evaluated 2 methods of feeding tube placement: intravenous administration of metoclopramide and air insufflation.

**Methods**

After we obtained approval from the institutional review board, all patients in the intensive and coronary care units at Overlake Hospital Medical Center (Bellevue, Wash) who required enteral tube feeding were considered for the study. Patients with basilar skull fracture, esophageal varices, Mallory-Weiss syndrome, facial fractures, pyloric stenosis, or ileus and patients who had undergone gastrointestinal surgery within the preceding month were excluded from the study. The sample consisted of 60 consecutive eligible adult patients prospectively randomized to 1 of 2 groups. Patients either received 10 mg of metoclopramide intravenously 10 minutes before tube insertion or had gastric insufflation of 350 mL of air once the tube was placed in the stomach. In both techniques, the patients were positioned on their right sides, and tubes were inserted to within 10 cm from the infusion port. Roth 45-cm weighted 12F enteral feeding tubes were used. The primary investigator placed all feeding tubes. Once the procedure was complete, placement was confirmed by radiography. Demographic and patient-specific data on age, sex, medical or surgical primary diagnosis, receiving mechanical ventilation or not, height, weight, body surface area, and narcotic use
were also collected. Successful placement of a feeding tube was defined as placement past the pyloric sphincter and in the duodenum.

**Statistical Analysis**

Descriptive statistics are presented as means, SDs, and percentages. The 2 treatments were compared by using the $t$ test for continuous variables (age, body surface area, height, and weight). The Fisher exact test was used for dichotomous variables (successful placement, sex, narcotic use, medical or surgical primary diagnosis, and mechanical ventilator use). Logistic regression was used to compare the treatment effect between patients receiving narcotics and narcotic-free patients (Table 2). Patients receiving narcotics were much more likely to have successful postpyloric placement of a feeding tube via the air insufflation method than after administration of metoclopramide (72% vs 11% success, $P < .001$). Patients not receiving narcotics had more successful postpyloric placements of feeding tubes after administration of 10 mg of metoclopramide intravenously than via air insufflation, although the difference was not significant (83% vs 58% success, $P = .37$). The difference in the treatment effect between the narcotic and nonnarcotic groups was highly significant ($P < .001$, logistic regression). Among patients treated with metoclopramide, the success rate in placement was more than 7 times higher among patients not receiving narcotics than among patients who were receiving narcotics (83% vs 11%, $P < .001$).

**Results**

Sixty patients were enrolled in the study. Two patients had their tubes dislodged several days after the initial insertion and were randomized for a second insertion procedure. No complications with either insertion technique were encountered.

Demographic and clinical data did not differ significantly between the 2 groups (Table 1). Most patients were receiving mechanical ventilation when the feeding tube was placed. Twenty-eight percent of the patients had a primary surgical diagnosis. Fifty percent of the patients were female. Sixty percent of patients were either receiving a narcotic infusion or were receiving narcotics on a regular schedule around the clock, with the last dose given within 6 hours of the feeding tube placement.

The overall success rate of air insufflation (67%) was greater than the overall success rate for metoclopramide (40%). Success rates differed considerably between patients receiving narcotics and narcotic-free patients (Table 2). Patients receiving narcotics were much more likely to have successful postpyloric placement of a feeding tube via the air insufflation method than after administration of metoclopramide (72% vs 11% success, $P < .001$). Patients not receiving narcotics had more successful postpyloric placements of feeding tubes after administration of 10 mg of metoclopramide intravenously than via air insufflation, although the difference was not significant (83% vs 58% success, $P = .37$). The difference in the treatment effect between the narcotic and nonnarcotic groups was highly significant ($P < .001$, logistic regression). Among patients treated with metoclopramide, the success rate in placement was more than 7 times higher among patients not receiving narcotics than among patients who were receiving narcotics (83% vs 11%, $P < .001$).

**Overall, the success rate for postpyloric enteral tube placement was greater using the air insufflation method. However, the metoclopramide success rate was significantly affected by presence of narcotic administration.**
Table 2  Association between treatment and successful postpyloric placement of feeding tube

<table>
<thead>
<tr>
<th>Group of patients</th>
<th>No. (%) of patients</th>
<th>Air insufflation</th>
<th>Metoclopramide</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>30 (67)</td>
<td>30 (40)</td>
<td></td>
<td>.07**</td>
</tr>
<tr>
<td>No narcotic use*</td>
<td>12 (58)</td>
<td>12 (83)</td>
<td></td>
<td>.37</td>
</tr>
<tr>
<td>Narcotic use*</td>
<td>18 (72)</td>
<td>18 (11)</td>
<td></td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
*The contrast in success rate between air and drug treatment differs significantly between narcotic and no narcotic groups (P < .001 on the basis of logistic regression and a likelihood ratio test for the interaction of narcotic use and treatment). **P noted for completeness only.

Discussion

The overall success rate in postpyloric placement of feeding tubes was 67% for insufflation of 350 mL of air into the stomach and 40% for administration of 10 mg of metoclopramide. However, the use of narcotics played a significant role in the failure of placement when metoclopramide was used (P < .001). Therefore, in this study, air insufflation was the superior technique.

The use of narcotics should be included in the analysis of any future studies of this topic, and the treatment effect should be evaluated separately for patients who are receiving narcotics and patients who are not. Because of the significant difference in treatment effect between the narcotic and nonnarcotic groups, the computed overall treatment effect for all patients combined (and its computed statistical significance, .07 in this study) will depend on the proportion of patients receiving narcotics. If a large proportion of patients is receiving narcotics, the treatment effect is likely to be large, and if the proportion is small, the treatment effect is likely to be small. Stratifying the analysis according to the use of narcotics avoids this arbitrariness.

It is important to consider each patient’s medications when placing a feeding tube. Many critically ill patients are treated with mechanical ventilation and have feeding tubes placed to provide nutrition and medication. These same patients are often the ones receiving narcotics for pain management and comfort. Additionally, the mean length of time to perform the procedure was 10 minutes less for the air insufflation technique because of the time required for metoclopramide to take effect. Use of the air insufflation technique also allowed repeated auscultation to verify that the tube was in the stomach before the tube was advanced further.

The patients in this study were diverse in demographic and treatment characteristics. However, a study with a larger sample size is needed to increase the number of patients not receiving narcotics or medications that slow gastric motility.

Conclusion

Insufflation of 350 mL of air into the stomach yielded a significantly higher success rate for postpyloric placement of feeding tubes than did intravenous administration of 10 mg of metoclopramide in patients receiving narcotics. For patients not receiving narcotics, administering 10 mg of metoclopramide resulted in a higher success rate of postpyloric placement of feeding tubes than did air insufflation, although the difference was not significant. When narcotics were used, air insufflation was clearly superior to metoclopramide. Patients receiving narcotics should have feeding tubes placed via the air insufflation technique.

For patients who are receiving narcotics, the use of air insufflation to place postpyloric enteral feeding tubes may increase the placement success rate. However, for patients not receiving narcotics, both methods appear to be equally effective.

ACKNOWLEDGMENTS

This study was supported by a Clinical Inquiry Grant from the American Association of Critical-Care Nurses and a grant from the Ross Products Division of Abbott Laboratories, Inc.

Commentary by Mary Jo Grap (see shaded boxes).

REFERENCES
