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BRIEF ARTICLE

Evaluation of a new method for placing nasojejunal feeding tubes

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Abstract

AIM: To compare fluoroscopic, endoscopic and guide wire assistance with ultraslim gastroscopy for placement of nasojejunal feeding tubes.

METHODS: The information regarding nasojejunal tube placement procedures was retrieved using the gastrointestinal tract database at Tongji Hospital affiliated to Tongji Medical College. Records from 81 patients who underwent nasojejunal tubes placement by different techniques between 2004 and 2011 were reviewed for procedure success and tube-related outcomes.

RESULTS: Nasojejunal feeding tubes were successfully placed in 78 (96.3%) of 81 patients. The success rate by fluoroscopy was 92% (23 of 25), by endoscopic technique 96.3% (26 of 27), and by guide wire assistance (whether *via* transnasal or transoral insertion) 100% (23/23, 6/6). The average time for successful placement was 14.9 ± 2.9 min for fluoroscopic placement, 14.8 ± 4.9 min for endoscopic placement, 11.1 ± 2.2 min for guide wire assistance with transnasal gastroscopic placement, and 14.7 ± 1.2 min for transoral gastroscopic placement. Statistically, the duration for the third method was significantly different ($P < 0.05$) compared with the other three methods. Transnasal placement over a guidewire was significantly faster ($P < 0.05$) than any of the other approaches.

CONCLUSION: Guide wire assistance with transnasal insertion of nasojejunal feeding tubes represents a safe, quick and effective method for providing enteral nutrition.

Key words: Enteral nutrition; Nasojejunal feeding tube; Guide wire assistance; Fluoroscopy; Endoscopy

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INTRODUCTION

Enteral nutrition (EN) not only provides energy support as with parenteral nutrition, but also maintains the functional intestinal barrier, significantly reducing the incidence of infection and organ failure, shortens hospital

stays, and lowers treatment costs[1-4]. EN has therefore become an important nutritional therapy[5]. A nasogastric (NG) tube is often associated with some problems of large gastric residual volumes, reflux and vomiting, while a nasojejunal (NJ) tube and prokinetic agents are useful for circumventing the problems associated with upper gastrointestinal intolerance of NG feeding[6]. NJ feeding tubes positioned beyond the ligament of Treitz's have been shown to allow early attainment of caloric needs and a reduction in tube-feeding aspiration events in patients with gastric feeding intolerance[7,8]. There are presently several methods for placement of NJ feeding tubes[9-11]. Previously, we would use fluoroscopic placement under direct endoscopic visualization instead of using NJ tubes.

Recently, we have applied an ultrathin transnasal endoscope which afforded us a higher success rate and a shortened procedure time. Herein we evaluated the usefulness and safety of this new method compared with the other two traditional methods.

MATERIALS AND METHODS

Patients

This is a retrospective study involving the patients who were treated with enteral feeding from January 2004 through September 2011 at our hospital. Written informed consent was obtained from all patients or their representatives. The Ethics Committee of Tongji Hospital, Tongji Medical College of Huazhong University of Science and Technology, approved the study protocol. All subjects were $\geqslant$ 18 years of age. The technique, success rate, procedure duration, and complications were recorded for each patient. Patient sex, age and diseases were also recorded. According to the placement methods, the patients were divided into three groups as described below. A 130-cm long polyurethane nasoenteral feeding tube with a front-end opening (Flocare, Nutricia, Netherlands) was used in each case. All NG tubes were removed before the start of the procedure, as they might have interfered with placement of both the feeding tube and endoscope.

Fluoroscopic technique

The feeding tube was placed by one skilled doctor. Some gastroenterologists were also involved in the fluoroscopy. Additional sedation was not required for fluoroscopic tube placement. A portable C-arm fluoroscope was positioned over the supine patient's abdomen. The timing of the procedure began when the feeding tube entered the nares. When the tube was advanced to 50-55 cm, its position was evaluated by intermittent fluoroscopy. The operators rotated the feeding tube to facilitate passage to the pylorus. Fluoroscopy was used intermittently or continuously as needed. When the tip of the feeding tube was beyond the pylorus, it was gently advanced as far as possible. Placement of the tube beyond the third portion of the duodenum was preferred. Finally, a fluoroscopic print was obtained after 10-15 mL of meglumine diatrizoate was injected into the feeding tube.

Endoscopic technique

All feeding tubes were placed at the Endoscopy Center by one skilled endoscopist. The posterior oropharynx was anesthetized with topical 4% Xylocaine. The timing of the procedure began when the feeding tube entered the nares. The lubricated feeding tube was inserted into the stomach and advanced until resistance was encountered (usually 55-60 cm), and the wire stylet was left in place. At this point, a standard forward-viewing endoscope (Olympus GIF 240 or 260, Olympus Corporation, New York, NY, United States) was placed into the esophagus and then the stomach. The stomach was insufflated with air, and the feeding tube usually traveled along the greater curvature of the stomach. The feeding tube was advanced to the nasopharynx. The distal 10-20 cm of the feeding tube was grasped by the biopsy forceps, and then the tip of the catheter was directed into the pylorus under endoscopic visualization. The feeding tube was then advanced at the nasopharynx, its distal 10-20 cm grasped with biopsy forceps and the tip directed through the pylorus under direct vision. When the feeding tube was observed in a good position, the endoscope was carefully withdrawn with the feeding tube secured by the forceps, which was advanced along with the withdrawal of the endoscope. When the forceps could no longer advance, the endoscope movement was stopped and the forceps was gently pulled back to the end of the lens. Then the forceps was again used to grasp the feeding tube and the above process was repeated until the endoscope was removed completely from the throat. The wire stylet was removed and a fluoroscopic print was obtained after 10-15 mL meglumine diatrizoate was injected into the feeding tube to confirm placement of the feeding tube into the second or third portion of the duodenum.

Guide wire technique

Topical Xylocaine was sprayed into the nose and retropharynx in conscious patients. The tip of the ultraslim transnasal endoscope with an outer diameter of 5.0 mm (Olympus XP-260N, Olympus Corporation, New York city, NY) was then passed under direct vision into one of the nasal passages. Extreme care was taken to avoid traumatizing the mucous membranes. After the endoscope arrived at the third portion of the duodenum, a 260-cm long guide wire with a soft tip (Zebra Exchange Guidewire, Boston Scientific, United States) was inserted along the endoscopic biopsy channel. Using a pull-push technique, the endoscope was slowly withdrawn while the wire was simultaneously threaded forward, so that the wire stayed in a fixed position in the intestine. Before exiting the stomach, the path made by the wire was studied and adjusted to ensure that there were no coils or loops within the gastric body. After withdrawal of the endoscope, an open-ended feeding tube was lubricated and passed over the guide wire, ensuring that the wire remained taut and

Table 1 Patient characteristics

Patient characteristics	Fluoroscopic placement	Endoscopic placement	Guide wire placement
Age (yr), mean ± SD	54.4 ± 9.9	55.8 ± 9.7	56.2 ± 9.5
Gender			
Men	15	14	16
Women	10	13	13
Primary diagnoses			
Pancreatitis	25	14	8
Postoperative gastric cancer	0	6	10
Postoperative esophageal cancer	0	4	6
Abdominal injury	0	1	2
Pancreatic cancer after Whipple surgery	0	1	1
Thoracic esophageal fistula	0	1	1
Gastric perforation	0	0	1

in place. Care was taken not to over-advance the tubes because this often results in coiling in the stomach and loss of duodenal access. Finally, using the adjacent naris, the endoscope was reintroduced into the proximal stomach to check final placement. In most cases, the hub of the wider gastric aspiration tube was too short and had to be advanced gently into the antrum visually, making sure that the tube remained straight along the greater curvature and that the jejunal extension slid further through the pylorus. With an assistant securing the feeding tube to prevent displacement, the endoscope was then eased back into the apex of the body to check the final position before exiting the esophagus. Transnasal endoscopy was not feasible in patients with congestion or stenosis of the nasal passageway. Conventional per-oral endoscopy was used to place the guide wire, which consequently ended up emerging from the mouth. The wire was then redirected through the nose by nasopharyngo-oral cannulation with a small 2-mm internal diameter flexible tube, allowing final placement of the NJ feeding tube.

Statistical analysis

All data were presented as the mean ± SD. The SPSS 15.0 software package (SPSS, Inc., United States) was used for all statistical analyses. Differences between and among outcome groups were determined using the χ^2 test. Significance was determined at P <0.05.

RESULTS

Patient characteristics

Demographic data of the included patients are shown in Table 1. The mean age was 55.5 years (range: 24-70 years). There were 45 men and 36 women. Common primary diagnoses were pancreatitis, postoperative gastric cancer, postoperative esophageal cancer, abdominal injury, pancreatic cancer after Whipple surgery, thoracic esophageal fistula and gastric perforation. All patients demonstrated either high gastric residuals on attempted NG feeding or a physiologic requirement for postduodenal enteral feedings (i.e., pancreatitis), or they were believed to be at high risk for gastric aspiration.

Table 2 Outcome data of the patients

Variables	Fluoroscopic placement	Endoscopic placement	Guide wire placement	
			Transnasal	Transoral
Time to complete procedure (min)	14.9 ± 5.8	14.8 ± 4.9	11.1 ± 2.2[a]	14.7 ± 1.2
Successful placement	23/25 (92)	26/27 (96.3)	23/23 (100)	6/6 (100)
Complications	0/25 (0)	4/27 (14.8)	0/23 (0)	0/6 (0)

Data are presented as mean ± SD or *n/N* (%). [a]P < 0.05 *vs* the other three groups.

Patient outcomes

Outcome data of the patients are shown in Table 2. NJ feeding tubes were successfully placed in 78 of 81 (96.3%) patients. The success rate by fluoroscopy was 92% (23 of 25), by endoscopic technique was 96.3% (26 of 27), and by guide wire was 100% with either transnasal endoscopy or transoral endoscopy. Significant differences between the guide wire assistance with transnasal ultraslim endoscopy and the other three groups were noted in placement duration, whereas there were no significant differences among the other three treatment groups. No significant differences among all the groups were noted in the success or complication rate. No complications were reported from fluoroscopic placement. There were four instances of epistaxis related to replacement of the NG tube after endoscopic placement. All cases of epistaxis resolved without intervention. There was no death related to either procedure.

DISCUSSION

It is well known that malnutrition of critically ill patients is associated with poorer clinical outcomes, and early, sufficient nutritional support can significantly improve the outcomes of the patients[12-16]. EN support is indicated for patients who are unable to take foods orally but have normal intestinal function[17,18], such as those with severe acute pancreatitis, cerebrovascular accidents, traumatic brain injury, *etc*. EN can be delivered through NG tube or NJ tube. The complications of upper gastrointestinal intolerance to EN has been reported to occur in 31%-46% of the patients with NG feeding, some prokinetic agents such as metoclopramide and erythromycin were used to enhance gastric motility and tolerance of enteral feeding. Whether it should be reserved for those patients who are at high risk of upper gastrointestinal intolerance or have already experienced it while receiving NG feeding, requires further studies. Moreover, the optimal dose remains unknown. NJ feeding leads to fewer gastrointestinal complications, largely by reducing gastric residual volumes. So placement of a NJ feeding tube to provide energy support or medication, is increasingly used as a standard clinical practice for many patients[19-21].

But how to place the NJ feeding tube quickly and safely remains an important technique for doctors. The approaches of placing NJ tubes include placement at

surgery, under fluoroscopic or ultrasound-guidance, at endoscopy and blind introduction at the bedside with or without prokinetic administration. The Cathlocator™ is a novel device that permits real time localization of the end of feeding tubes through generating a low energy electromagnetic field from a coil incorporated in the tip of a modified enteral feeding tube connected by wires to a proximal interface. Previously, we would use fluoroscopic placement and/or under direct endoscopic visualization to place NJ tubes. Recently, we have used an ultrathin transnasal endoscope that afforded us a greater success and a shortened procedure time. We evaluated three common methods used to place NJ feeding tubes.

Many studies reported that fluoroscopic guidance in the placement of NJ feeding tubes had a success rate of > 84%[22-24], and endoscopic placement presented a success rate ranging from 90% to 100%[25,26], which are consistent with our outcome. However, fluoroscopic placement exposed patients and doctors to varying doses of radiation. Endoscopic placement procedures are often time consuming, technically cumbersome, and require a significant learning curve[27]. As a result, most gastroenterologists and surgical endoscopists are not satisfied with the current techniques of endoscopic placement. We therefore described a new method to place NJ tubes through guide wire assistance with ultraslim gastroscopy.

Our experience with 29 consecutive guide wire placements of feeding tubes showed that the technique was successful in most patients. Before the operation, we asked the patient whether he/she had received nasal surgery before, and whether accompanied by associated diseases, such as severe bending septum, nasal polyps, severe rhinitis, often epistaxis and other diseases. Six patients who had the aforementioned diseases and subsequently changed to transoral insertion also had the tube placed smoothly in the correct position. In 6 patients with the above complaints, where the assembly was inserted using the transoral route, this did not impair smooth passage of the feeding tube into the correct position. No complications were reported from these methods. Transnasal insertion possessed many advantages compared with other methods. Firstly, the total success rate in the feeding tube placement was high, up to 100%. The operative point was the retropulsion of the feeding tube from the small intestine to the stomach when the endoscope or guide wire was withdrawn. It is not easy to place the guide wire at or beyond the Treitz's ligament using a common endoscope. However, with the transnasal ultraslim endoscope, it became less difficult. Moreover, before inserting the feeding tube along the guide wire, it is very important to lubricate the inner lumen of the feeding tube with paraffin in advance. It not only makes the procedure of withdrawing the guide wire easier, but also avoids pulling out the feeding tube. Secondly, the procedure required less time. In 23 cases with successful one-time transnasal tube placement, the average time required from endoscopic transnasal insertion to the complete removal of the guide wire was only 11.1 ± 2.2 min. Thirdly, the procedure was safe and produced few complications.

In conclusion, our experience showed that the technique of placing NJ feeding tubes with the transnasal ultrathin endoscope is quick, effective and safe.

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COMMENTS

Background

Enteral nutrition (EN) not only provides energy support as with parenteral nutrition, but also maintains the functional intestinal barrier, significantly reducing the incidence of infection and organ failure, shortening hospital stays, and lowering treatment costs. Placement of a nasojejunal (NJ) feeding tube with the aim of providing metabolic support or medication, is increasingly used as a standard clinical practice for many patients.

Research frontiers

NJ feeding tubes positioned beyond the ligament of Treitz's have been shown to allow early attainment of caloric needs and a reduction in tube-feeding aspiration events in patients with gastric feeding intolerance. There are presently several methods for placement of NJ feeding tubes.

Innovations and breakthroughs

The authors used guide wire assistance to place NJ tubes, using an ultrathin transnasal endoscope that afforded them a higher success rate and a shortened procedure time. The authors evaluated the usefulness and safety of the new method compared with the other two traditional methods.

Applications

The technique of placing NJ feeding tubes with the transnasal ultrathin endoscope is quick, effective and safe, which can be applied in clinical practice.

Terminology

Guide wire technology means through guide wire to place NJ feeding tubes. Guide wire was placed beyond the ligament of Treitz's under the ultraslim transnasal endoscope.

Peer review

This article directly compared guide wire method with other two old methods in the duration, success and complications, providing sufficient evidence to prove the superiority of the guide wire method.

REFERENCES

1 **McClave SA**, Chang WK, Dhaliwal R, Heyland DK. Nutrition support in acute pancreatitis: a systematic review of the literature. *JPEN J Parenter Enteral Nutr* 2006; **30**: 143-156
2 **Abou-Assi S**, Craig K, O'Keefe SJ. Hypocaloric jejunal feeding is better than total parenteral nutrition in acute pancreatitis: results of a randomized comparative study. *Am J Gastroenterol* 2002; **97**: 2255-2262
3 **Eckerwall GE**, Axelsson JB, Andersson RG. Early nasogastric feeding in predicted severe acute pancreatitis: A clinical, randomized study. *Ann Surg* 2006; **244**: 959-965; discussion 965-957
4 **Oláh A**, Pardavi G, Belágyi T, Nagy A, Issekutz A, Mohamed GE. Early nasojejunal feeding in acute pancreatitis is associated with a lower complication rate. *Nutrition* 2002; **18**: 259-262
5 **MacFie J**. Enteral versus parenteral nutrition: the significance of bacterial translocation and gut-barrier function. *Nutrition* 2000; **16**: 606-611
6 **Davies AR**, Bellomo R. Establishment of enteral nutrition: prokinetic agents and small bowel feeding tubes. *Curr Opin Crit Care* 2004; **10**: 156-161
7 **Davies AR**, Froomes PR, French CJ, Bellomo R, Gutteridge GA, Nyulasi I, Walker R, Sewell RB. Randomized comparison of nasojejunal and nasogastric feeding in critically ill

patients. *Crit Care Med* 2002; **30**: 586-590
8 **Silk DB**. The evolving role of post-ligament of Trietz nasojejunal feeding in enteral nutrition and the need for improved feeding tube design and placement methods. *JPEN J Parenter Enteral Nutr* 2011; **35**: 303-307
9 **Schwab D**, Mühldorfer S, Nusko G, Radespiel-Tröger M, Hahn EG, Strauss R. Endoscopic placement of nasojejunal tubes: a randomized, controlled, prospective trial comparing suitability and technical success for two different tubes. *Gastrointest Endosc* 2002; **56**: 858-863
10 **Welpe P**, Frutiger A, Vanek P, Kleger GR. Jejunal feeding tubes can be efficiently and independently placed by intensive care unit teams. *JPEN J Parenter Enteral Nutr* 2010; **34**: 121-124
11 **Stroud M**, Duncan H, Nightingale J. Guidelines for enteral feeding in adult hospital patients. *Gut* 2003; **52** Suppl 7: vii1-vii12
12 **Weimann A**, Andrä J, Sablotzki A. [Nutrition in the critically ill]. *Dtsch Med Wochenschr* 2011; **136**: 2251-2262
13 **Phillips NM**, Nay R. A systematic review of nursing administration of medication via enteral tubes in adults. *J Clin Nurs* 2008; **17**: 2257-2265
14 **Wiegand N**, Bauerfeind P, Delco F, Fried M, Wildi SM. Endoscopic position control of nasoenteral feeding tubes by transnasal re-endoscopy: a prospective study in intensive care patients. *Am J Gastroenterol* 2009; **104**: 1271-1276
15 **Krishnan JA**, Parce PB, Martinez A, Diette GB, Brower RG. Caloric intake in medical ICU patients: consistency of care with guidelines and relationship to clinical outcomes. *Chest* 2003; **124**: 297-305
16 **Anderson C**. Enteral feeding: a change in practice. *J Child Health Care* 2000; **4**: 160-162
17 **Phillips MS**, Ponsky JL. Overview of enteral and parenteral feeding access techniques: principles and practice. *Surg Clin North Am* 2011; **91**: 897-911, ix
18 **DeWitt RC**, Kudsk KA. Enteral nutrition. *Gastroenterol Clin North Am* 1998; **27**: 371-386
19 **Gunn SR**, Early BJ, Zenati MS, Ochoa JB. Use of a nasal bridle prevents accidental nasoenteral feeding tube removal. *JPEN J Parenter Enteral Nutr* 2009; **33**: 50-54
20 **Krzak A**, Pleva M, Napolitano LM. Nutrition therapy for ALI and ARDS. *Crit Care Clin* 2011; **27**: 647-659
21 **Wiggins TF**, DeLegge MH. Evaluation of a new technique for endoscopic nasojejunal feeding-tube placement. *Gastrointest Endosc* 2006; **63**: 590-595
22 **Stănescu D**, Mihalache D, Nistor A, Buciu A, Irimescu O, Tiron C, Gorceag R. [Importance of enteral nutrition support in necrotic hemorrhagic pancreatitis]. *Rev Med Chir Soc Med Nat Iasi* 2010; **114**: 91-94
23 **Zhihui T**, Wenkui Y, Weiqin L, Zhiming W, Xianghong Y, Ning L, Jieshou L. A randomised clinical trial of transnasal endoscopy versus fluoroscopy for the placement of nasojejunal feeding tubes in patients with severe acute pancreatitis. *Postgrad Med J* 2009; **85**: 59-63
24 **Foote JA**, Kemmeter PR, Prichard PA, Baker RS, Paauw JD, Gawel JC, Davis AT. A randomized trial of endoscopic and fluoroscopic placement of postpyloric feeding tubes in critically ill patients. *JPEN J Parenter Enteral Nutr* 2004; **28**: 154-157
25 **Fan AC**, Baron TH, Rumalla A, Harewood GC. Comparison of direct percutaneous endoscopic jejunostomy and PEG with jejunal extension. *Gastrointest Endosc* 2002; **56**: 890-894
26 **O'Keefe SJ**, Foody W, Gill S. Transnasal endoscopic placement of feeding tubes in the intensive care unit. *JPEN J Parenter Enteral Nutr* 2003; **27**: 349-354
27 **Neumann DA**, DeLegge MH. Gastric versus small-bowel tube feeding in the intensive care unit: a prospective comparison of efficacy. *Crit Care Med* 2002; **30**: 1436-1438

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