

EXPERIENCE WITH WIDE AND NARROW CALIBER PERCUTANEOUS RADIOLOGICALLY GUIDED GASTROSTOMY TUBES

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ABSTRACT

Objective: To compare the percutaneous radiologically guided gastrostomy (PeRG) tubes of wide caliber with narrow caliber tubes.

Methodology: This retrospective study was performed on 36 patients who were referred to Radiology department for PeRG tube placement between 2008 till 2012. Comparison of wide caliber gastrostomy tubes (18-24 Fr) was done with narrow caliber tubes (14 Fr) considering procedure success rate, procedure related complications and catheter related minor and major complications.

Results: Out of 36 patients, 18 patients were present in each group. Mean age of patients was 53.944 ± 19.380 . Procedure success rate was 100 % in both groups and procedure related immediate complications were none in either groups. Peri-catheter leakage was observed in 1 patient in each group. Tube occlusion was present in 2 patients in narrow caliber group. Two patients had severe pain in wide caliber group and also 3 patients had wound infection in this group.

Conclusion: Regardless of the type of radiologic catheter placed, PeRG can be considered as safe and highly successful procedure. Use of a 24 Fr gastrostomy tubes may show promising results if placed under radiological guidance with comparable technical success and complication rates to other caliber tubes.

Key Words: Gastrostomy tubes, Percutaneous, Radiological guidance

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INTRODUCTION

The insertion of the enteral feeding tube is more commonly achieved by percutaneous endoscopic gastrostomy (PEG). However percutaneous radiological gastrostomy (PeRG) has an established role for enteral access alongside surgical and endoscopic methods, with comparable or better results¹⁻⁶. It can be placed in nearly all kinds of patients including patients who are not candidate for PEG such as with head and neck cancer^{5, 7, 8}.

There are variety of catheters and techniques described for PeRG. Most frequently used catheters are small bore 12-14 French (Fr, F) pigtail catheters; although others such as Mushroom type or balloon gastrostomy catheters of larger bores are also commonly used. Ideally gastrostomy should be performed with a technique that is sound, affordable and carries decreased risk of acute and chronic complications⁹.

The largest size reported in literature for radiologically placed tubes is 24 Fr^{10, 11}. In one of these studies, an angioplasty balloon preloaded with a 24-F peel-away

sheath was used through which a 20-Fr balloon tip gastrostomy catheter was placed through this peel-away sheath⁹. In another study peel away sheath was used for placement of 18 Fr balloon type gastrostomy tubes¹¹. In our study, we placed the large caliber gastrostomy tube of 24 Fr through a peel away sheath.

Small caliber tubes offer more resistance to the medications and solid foods which are difficult to get crushed⁹. Studies on the largest 24 Fr balloon type PeRG tube placement are scanty. The present study was aimed to compare various caliber tubes including wide caliber balloon types (18 to 24 Fr) and a narrow caliber pigtail (14 Fr) type gastrostomy tubes.

METHODOLOGY

The present study was a retrospective data analysis and approved by the institutional research board (IRB) and ethics committee of our Hospital. A total of 36 patients were referred to radiology department, from 2008 till 2012 for gastrostomy tube placement. Eligibility criteria included patients of any age of either gender that underwent initial radiologically guided gastrostomy

tube insertion for nutritional purposes.

Subjects with deficient file records, or those who underwent gastrostomy placement or primary jejunostomy placement were excluded from the study. The subject list was screened using the clinical database (hospital database).

Patients were then divided into two groups. Group A was narrow caliber group in which 14 Fr pigtail type gastrostomy tube (Single Lumen-Mallinckrodt Institute Modification, Cook incorporated, Bloomington, IN, USA) was placed. Group B was wide caliber group in which 18 to 24 Fr (Wilson-Cook medical Inc, Winston-Salem, NC, USA) balloon type gastrostomy tubes were placed radiologically.

Retrospectively patient charts and files were reviewed from the hospital record. Procedure success, procedure related complication and catheter related complications were analyzed for each group.

Information related to patient demographics and clinical characteristics, indication, the tube insertion procedure practices, complications categorization according to Society of Interventional Radiology (SIR) guidelines i.e. minor (requiring no therapy or a minimal therapy with overnight admission and which has no adverse effects) and major (requiring therapy with admission of up to or more than 48hours, those which has serious adverse effects and require major therapy, complication leading to permanent adverse sequelae and death) and as well as patient outcomes, were collected.

Similar protocol was adopted for all of the study patients. Overnight fast was required. All patients had undergone tests of platelet counts, prothrombin time and international normalized ratio (PT/INR) and checked with minimum cut off of INR at 1.5 and platelets at 50,000 per micro liter. Sedation was given if needed using Midazolam and an opiate, such as Fentanyl or Morphine. Routine antibiotics were given (cefazolin).

We performed all the gastrostomy procedures by push-technique. "A nasogastric tube (NG) was placed shortly before the procedure to allow air insufflations to bring the stomach in close approximation to the anterior abdominal wall (Fig. 1)". In cases when this was not possible (e.g. in malignancies involving esophagus and other regions of head and neck) a 5 Fr angle tip catheter and a guide wire were used to access stomach via nasogastric route. About 500-1000 cc room air was then injected through the nasogastric tube or catheter under fluoroscopic control.

After sterile cleaning of skin with povidone-iodine, local anesthetic was injected at the puncture site in the left hypochondrium, over the mid-distal body of stomach. A small skin incision was then made and the stomach was punctured with an 18 gauge (18G) needle. The

correct needle placement was ascertained by air aspiration and flushing with contrast media. A 0.035" Amplatz wire was placed. The procedure from this point onwards differed for the two tubes as described below.

For narrow caliber tubes the tract was serially dilated with dilators provided in the kit and the 14 Fr tube placed. The position was confirmed with contrast injection and tube secured to skin.

"For large caliber tubes we routinely performed a two-point gastropexy using T fasteners (Cope gastrointestinal suture anchor set, Cook incorporated, Bloomington, IN, USA) (Fig.2)". Serial dilatation of the tract was done with 18 and 26 Fr peel away sheath (Cook incorporated, Bloomington, IN, USA) was placed. A balloon gastrostomy tube was then advanced through the peel-away sheath after lubrication while keeping the wire in place as well. The tube sizes used were 18 to 24 Fr. "The correct position was checked again by injecting contrast through the tube (Fig.3)". Tube feeding was started after 24 hours after excluding major complications. The vital parameters were monitored during the entire procedure.

OPERATIONAL DEFINITIONS:

Procedure success: It was defined as gastrostomy tube successfully placed with confirmation of the position. Feeding started after 24 hours without any complication.

Complications: "According to SIR classification system complications were divided into minor complications and major complications (Table 1)". Minor complications defined as one which has no serious consequences and only required nominal therapy or a day care admission. They included pain, vomiting, gastro esophageal reflux, stoma leakage, local infection, local displacement of tube and minor wound bleedings. Major complications were defined as one which has serious outcomes, required major therapy and admission for more than 2 days. Complications which lead to permanent adverse sequelae and lead to death were also included in this category such as; gastro-cutaneous fistula, necrotizing fasciitis, tumor implantation, cardiac failure, gastric hemorrhage, peritonitis, hemorrhage, aspiration pneumonia, intra-peritoneal tube dislodgement.

Procedure related complications included cardiac event, gastric perforation or visceral injury were also included in major category.

RESULTS

Thirty six consecutive subjects were identified as eligible. Mean age of patients was 53.944 ± 19.380 . Tube size used in all the patients in group A was 14 Fr. In group B most commonly used tube was 24 Fr (n=7) followed by 20 Fr (n=6), 22 Fr (n=4) and 18 Fr (n=1).

Procedure success was 100 % in both groups and procedure related immediate complications were none in either groups.

"The indications for tube insertion were listed in Table 2". The major indication of tube insertion in both groups were dysphagia and aspiration secondary to stroke (n=9).

Catheter related complications were observed in few cases in both groups; Pericatheter leakage was observed in 1 patient in each group. Tube occlusion was present in 2 patients in group A. Two patients had complaint of significant pain in group B, in which 24 Fr tube was placed. Also infection was more common in group B; 3 patients contracted wound infections which were controlled by antibiotics. Two patients had wound infection with methicillin resistant staphylococcus aureus (MRSA) and third patient with Enterobacter. Mild dislodgement

of tube in group B was seen in one patient on 2nd day of insertion when an irritable and uncooperative patient tried to pull out the tube. Tube was then readjusted and re-stitched without any complication.

The overall frequency of minor complications and the total number of patients with minor complications were not statistically significantly different among both groups. None of the patients had any major complication in either group.

DISCUSSION

Our study was based on our experience with various caliber percutaneous radiological gastrostomy tubes including initial data regarding the balloon type largest caliber 24 Fr gastrostomy tube by using push technique and peel away sheath.

PerG has been recognized as an effective and safe

Table 1: Categories of complications according to SIR guidelines

COMPLICATIONS	
MINOR	MAJOR
<p>A. No therapy, no consequences</p> <ul style="list-style-type: none"> • Pain • Vomiting • Fever <p>B. Nominal therapy, no consequence; includes overnight admission for observation only.</p> <ul style="list-style-type: none"> • Gastro esophageal reflux • Stoma leakage • Local infection • Local displacement of tube • Minor wound bleedings 	<p>C. Require therapy, minor hospitalization (less than 48 hours)</p> <ul style="list-style-type: none"> • Aspiration pneumonia <p>D. Require major therapy, unplanned increase in level of care, prolonged hospitalization (more than 48 hours)</p> <ul style="list-style-type: none"> • Gastro-cutaneous fistula • Necrotizing fasciitis • Intra-peritoneal tube dislodgement • Gastric hemorrhage • Peritonitis <p>E. Permanent adverse sequelae</p> <ul style="list-style-type: none"> • Cardiac event • Tumor implantation • Visceral injury <p>F. Death</p>

Table 2: Indications for gastrostomy

INDICATION	NUMBER (n)
Stroke	9
Head Trauma	6
Esophageal carcinoma	5
Pharyngeal-Laryngeal carcinoma	5
Tongue carcinoma	3
Multiple Sclerosis	2
Dementia	2
Astrocytoma	1
Intracranial hemorrhage	2
Maxillary carcinoma	1

Figure 1: Gastric insufflations; to bring the stomach into apposition with the abdominal wall

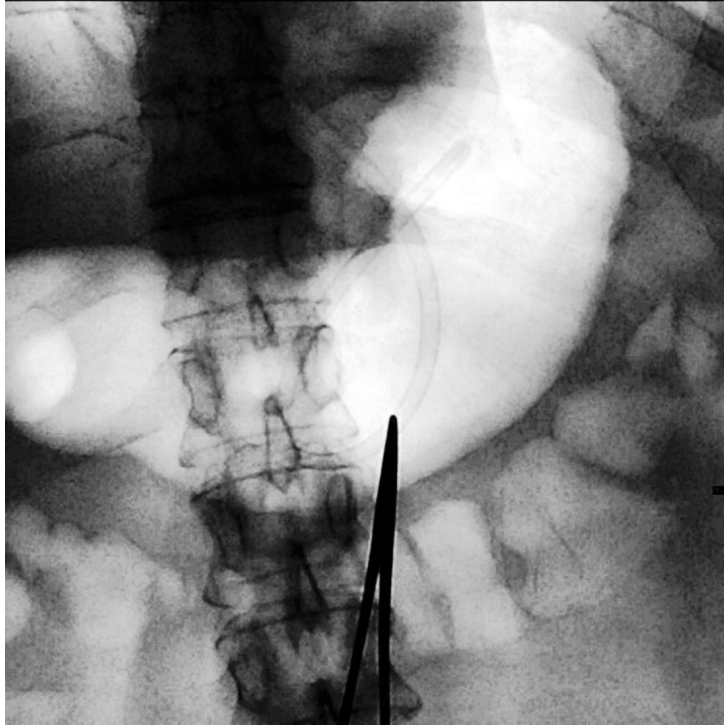


Figure 2: Gastropexy done in large caliber gastrostomy tubes

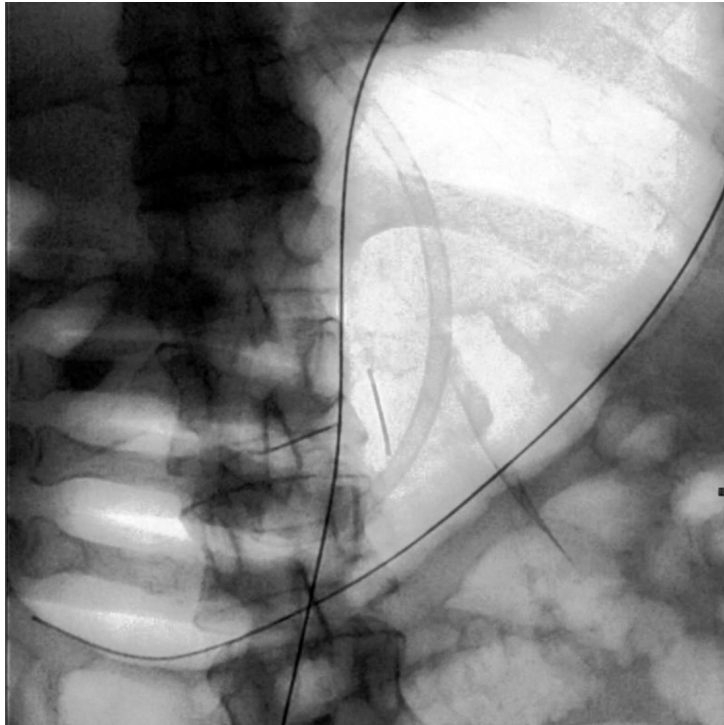
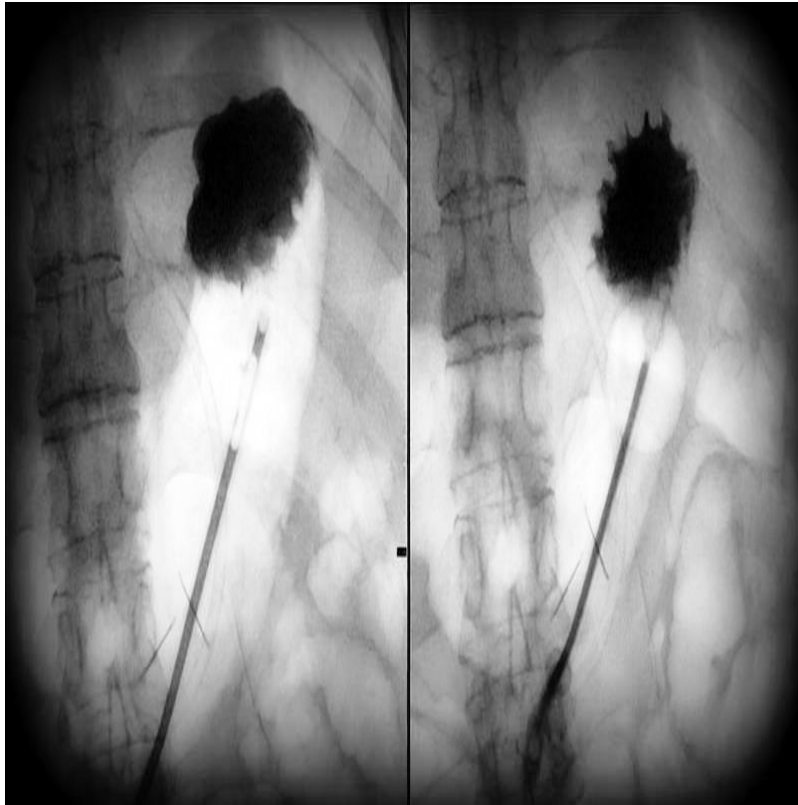


Figure 3: Confirmation of the position of PEG

option for enteral access^{1,2,4-6} comparing favorably with its surgical and endoscopic counterparts in terms of technical success rate, morbidity and cost¹²⁻¹⁴. Procedure success has been widely studied in various techniques. The success rate is higher in both the surgical and radiological techniques as compared to endoscopically placed gastrostomy tubes. The success rate with endoscopically placed tubes was reported around 95.7% as mentioned in a meta-analysis by Wollman et al¹³, however the success rate of radiologically placed gastrostomy tube was almost equal to surgically placed gastrostomy tubes (99.2 % versus 100% respectively) in the same meta-analysis¹³. Our study demonstrated similar results with success rate of 100% in both narrow and wide caliber tubes. All patients had no immediate complications and feeding was started successfully after 24 hours.

Largest caliber of 24 Fr used for PeRG in literature was described in few studies^{15,16}. Our study also had few patients (n=7) in which successful radiological placement of large caliber tubes of 24 Fr was accomplished and no immediate major complications occurred. In patients with 24 Fr PeRG, two patients however suffered severe pain within 1st week of insertion and two patients developed wound infection; one had infection within

1st week (at 7th day) and the other developed it after a month (at 34th day).

We experienced few catheter related complications in both groups. Studies have suggested that narrow caliber tubes are predisposed to obstruction, leakage and dislodgment due to their reduced inner diameter^{17,18}. Tube occlusion was seen only in narrow caliber group in our study as expected. In first patient tube blockade occurred after 7 months of insertion and eventually tube had to be replaced. In the other patient tube blockade, due to impacted food residues, occurred on 20th day of insertion, and tube was re-opened successfully by pushing the guide wire under fluoroscopic control.

Hoffer et al¹⁹ studied 30 day occlusion rate of 10 Fr versus 22 Fr gastrostomy tubes which turned out to be 13.5% versus 1.6% respectively. Funaki and colleagues¹⁷ experienced similar results where tube occlusion rate was more frequent with narrow caliber tubes versus wide caliber tubes 16% vs. 0% respectively.

Three patients developed wound infection in group B who responded well with antibiotics; 02 patients had wound infection with methicillin resistant staphylococcus aureus (MRSA), one suffered infection at 34th day and other developed it on 48th day of tube insertion.

Although no significant link was found between prophylactic antibiotic use and wound infection in the present study as only one patient suffered wound infection within first week of PeRG insertion and all of patients prophylactic antibiotics in our study, but this may be due to lack of comparison group not having prophylactic antibiotic before the procedure. In the meta-analysis by Lipp and Lusardi²⁰, it was concluded that the incidence of peristomal infection is significantly reduced by giving antibiotics prophylactically. However, the recent surge of methicillin-resistant *Staphylococcus aureus* (MRSA) related infections has raised controversy with regard to antibiotic prophylaxis.

One patient in each group had peri-catheter leakage. In narrow caliber group with 14Fr gastrostomy feeding was withheld and feeding was started with NG tube. Upper GI Gastrografin study showed patent gastrostomy tube and peri-catheter leakage which was secondary to gastric outlet obstruction due to scarred pylorus. Patient in wide caliber group with minimal peri-catheter leakage complaint of mild tenderness which was treated conservatively after which patient completely recovered. Previous studies showed that narrow caliber tubes were more prone to get peri-catheter leakage as shown by Funaki et al 9% versus 0% in narrow caliber versus wide caliber tubes respectively¹⁷.

These preliminary findings warrant a future prospective randomized control trial with larger number of patients to assess the complication rate and performance of each of the two classes of PeRG catheters. Our study had a limitation of small sample size especially of largest caliber balloon type 24 Fr gastrostomy tubes placed by push technique using peel away sheath, which did show good procedure success and no immediate procedure related complications. Further studies however on use of these largest caliber tubes are required and also comparison of the 24 Fr gastrostomy tube with other large bore range catheters (18-22 Fr) may be helpful in deciding the optimal size of the gastrostomy tubes in future.

We do not believe there was any bias in the present study, as reflected by the study groups; even number of patients in each group, similar age distribution and almost even number of underlying indication. Moreover, the procedure was performed by a single experienced interventional radiologist.

CONCLUSION

Regardless of the type of radiologic catheter placed, PeRG can be considered as safe and highly successful procedure. Use of a 24 Fr gastrostomy tubes may show promising results if placed under radiological guidance with comparable technical success and complication rates to other caliber tubes.

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CONTRIBUTORS

AIR conceived the idea, planned the study, and drafted the manuscript. HS helped acquisition of data and did statistical analysis. EMK and AK drafted and critically revised the manuscript. All authors contributed significantly to the submitted manuscript.