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Percutaneous gastric tube placement: Comparison of trans-abdominal and trans-oral approach in patients with chronic ascites



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KEYWORDS

Percutaneous gastric tube;
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Abstract

Purpose: The purpose of this study was to compare the trans-abdominal (TA) and trans-oral (TO) approaches for fluoroscopic-guided gastrostomy tube placement in patients with chronic ascites.

Materials and methods: A 10-year review of clinical imaging and medical records at a single institution identified 29 patients with chronic recurrent ascites who underwent gastrostomy (GT) or gastro-jejunostomy tube (GJT) placement. In 22 patients (18 women, 4 men) aged from 22 to 76 years of age (mean age, 57.7 ± 13.1 years), a GT or GJT was placed with the TO approach, and in 7 (7 women) from 31 to 86 years of age (mean age, 63 ± 16.8 years) with the TA approach.

Results: Technical success was 100% in both groups with one (1/22; 5%) immediate complication in the TO group. Fluoroscopy time was significantly greater in the TO group ($P=0.002$). Leakage of ascites was significantly more frequent in the TA group ($P=0.04$). There was no significant difference in bleeding or inflammation ($P=0.14$ and $P=0.43$, respectively). The cumulative tract related complication rate was significantly greater in the TA group ($P=0.03$).

Conclusion: Fluoroscopy times and the overall incidence of tract-related complications, in particular leakage of ascites from the stoma, are more frequent in patients in chronic ascites who underwent TA gastrostomy tube placement compared to those who underwent TO placement.

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Ascites is considered as a relative contraindication to gastrostomy tube (GT) placement [1]. Risks related to the procedure include delayed maturation of the tract, higher risk for bacterial peritonitis and leakage of ascites from the stoma site. The mechanism responsible for these complications is ultimately related to inappropriate effacement with lack of attachment/adhesion of the gastric wall to the abdominal wall.

To reduce the incidence of these complications, some authors suggested the use of gastropexy prior to intervention [2,3]. Also, paracentesis at the time of intervention and prevention of its re-accumulation in the 7–10 days after the procedure is believed to improve the outcomes of GT placements in patients with recurrent ascites [4,5].

The trans-oral (TO) and trans-abdominal (TA) approaches are the two main techniques to perform an image guided GT or gastro-jejunostomy (GJT) tube placement. The main difference is that in the former the stoma tract dilation and tube placement is directed from the stomach to the outside, whereas in the latter, these are directed from the outside towards the dilated stomach. Overall, the two techniques are believed to be equivalent and the preference of one over the other is mostly operator dependent [2,3,6]. However, to our knowledge, there are no studies in the English literature that compare the outcomes of the two techniques in patients with ascites.

The purpose of this study was to compare the TA and TO approaches for fluoroscopic-guided gastrostomy tube placement in patients with ascites.

Materials and methods

Patients

This study was approved by the institutional review board. From January 2006 to September 2016 percutaneous GT/GJT tubes were placed in 199 patients. Inclusion criteria were imaging evidence of chronic ascites over the gastric area or chronic recurrent ascites requiring periodic paracentesis. Patients with no ascites, only loculated ascites far away from the stomach, or a history of previous GT placement were excluded from the study. Chronic ascites was defined as ascites present for greater than 6 months, as seen on serial imaging or requiring repeated paracentesis.

A total of 29 patients fulfilled the inclusion criteria. In 22 patients (18 women, 4 men) aged from 22 to 76 years (mean age, 57.7 ± 13.1 [SD] years) the TO technique was used. Mean follow-up in this group was 66.8 ± 80.6 (SD) days. In 7 patients (7 women) aged from 31 to 86 years (mean age, 63 ± 16.8 [SD] years) the TA technique was used. Mean follow-up in this group was 89.7 ± 85.8 (SD) days. All patients were ASA class 3.

Data collection

Collected data included demographic information, clinical indication for tube placement, underlying illness, frequency and volume of paracentesis, use of anaesthesia or sedation, fluoroscopy time, bio-humoral markers (including INR, hemoglobin, platelets), type and size of tube placed (GT or GJT), technique used to perform the procedure,

immediate technical success, immediate complications, delayed complications (including leakage from tube site, bleeding and site inflammation) and their management. Tract site inflammation was defined as redness and/or pain persisting for more than 1 week. Stoma bleeding was defined as oozing of blood from tract site persisting for more than 1 week. Follow up for detection of delayed complications was performed via review of the patient's electronic medical record, including IR clinic visits, ER visits and outside hospital visits. Follow up was discontinued when death occurred or the tube was removed or exchanged.

Procedure details

All procedures were performed in an academic tertiary referral center by or under the guidance of experienced operators. The choice of TO versus TA technique depended on the personal preference of the primary operator. All laboratory values were in accordance with SIR recommendations [7]. Paracentesis was performed before initiating the procedure if ascites was seen around the stomach on ultrasound.

Trans-oral procedure

The procedure was performed under general anaesthesia. A 5-French angled tip catheter was advanced from the oral cavity into the stomach over an 0.035-Inch Bentson wire guide (Cook Medical, Inc.) under fluoroscopic guidance. The catheter was then exchanged for a 25–35 mm Amplatz Gooseneck snare catheter (Covidien) over the wire and the wire exchanged for the gooseneck snare. The Amplatz snare was opened in the stomach and positioned against the anterior portion of the distal body of the stomach below the costal margin, and above the visible bowel loops. A less than 5 mm skin incision was made over the stomach. An 18-gauge trocar needle was advanced through the skin incision towards the snare. Once the needle tip had been demonstrated to pass through the snare, a 0.035-inch, 260 cm long wire was placed through the needle. The guide wire was snared and withdrawn from the stomach out of the mouth. Once a through-and-through wire was established, an 8 French sheath was advanced percutaneously over-the-wire through the abdominal wall soft tissue into the stomach. The TO GT (BARD® Guidewire PEG system with soft silicone retention dome, Bard access system Inc.) with a tapered tip was placed over the guide wire and advanced until the tapered tip was wedged into the 8-French sheath. The tip of the GT and sheath were withdrawn with the entire tube passing through the mouth, esophagus, stomach, the percutaneous tract and the dermatotomy which was smaller than the tube caliber. This way, the tube dilated the dermatotomy as it was withdrawn. The mushroom end of the GT was snugged up against the anterior wall of the stomach.

Trans-abdominal procedure

The procedure was performed using conscious sedation. Using fluoroscopic guidance, the air-insufflated stomach was identified. Two T-fasteners were inserted into the stomach. Between the T-fasteners an 18-gauge needle was used to puncture the body of the stomach. The puncture was directed towards the pylorus to allow jejunal extension in case of future need. Over a guidewire,

the tract was serially dilated and a peel-away sheath inserted. The peel away sheath was 4-French larger than the tube size, in order to accommodate the deflated balloon. The GT (Kimberly–Clark® Gastrostomy Feeding Tube, Kimberly–Clark Corp.) was then inserted and the peel-away sheath removed. The retention balloon was inflated in the stomach with dilute contrast.

Statistical analysis

Categorical variables were expressed as frequencies and percentages. Continuous variables data were expressed as mean \pm standard deviation (SD). Fisher exact test was used to compare the frequency of complications, while unpaired *t*-test was utilized to compare distributions of continuous scale variables between patients who underwent TO and TA procedures. A two-sided $P \leq 0.05$ significance level was used as the null hypothesis rejection criterion. IBM SPSS version 22.0 was used to conduct the statistical analyses.

Results

TO technique

Nineteen GT and 3 GJT were placed using the TO technique in 22 patients. Fourteen (14/22; 64%) were placed for decompression due to chronic malignant bowel obstruction and eight (8/22; 34%) for feeding purposes. Underlying diseases included ovarian cancer in seven patients (7/22; 32%), end-stage liver disease in five patients (5/22; 23%), tumors of the gastrointestinal tract in four patients (4/22; 18%), primary peritoneal cancer in four (4/22; 18%) and metastatic breast cancers in two patients (2/22; 9%). Mean paracentesis duration was 11.5 ± 6.0 days and mean ascites volume drained was $2847 \text{ mL} \pm 1240$ (SD) mL (Table 1). Technical success was achieved in all patients (22/22; 100%). Mean fluoroscopy time was 9.51 ± 7.1 (SD) minutes. There was one (1/22; 5%) immediate complication. While performing the gastrostomy puncture pulsatile blood through the gastrostomy needle was noted. Contrast injection demonstrated inadvertent injury to a pancreatic artery branch. Two 0.035-inch 4 mm \times 3 cm coils (Tornado® Embolization coil, Cook) and Gelfoam pledgets (Gelfoam®, Pfizer) were deployed

through the access needle. The patient's vital signs were stable following needle removal and bleeding through the needle stopped, therefore, it was elected to continue the procedure. The patient was monitored in the subsequent days with no adverse clinical sequelae.

Five patients (23%) had one tract-related complication each in the follow-up period: three with leakage of ascites (3/22; 14%), one with inflammation of the skin site (1/22; 5%) and one with bleeding (1/22; 5%).

TA Technique

Six GT and 1 GJT were placed using the TA technique. All tubes were palliative for small bowel decompression. Indications included uterine cancer in two patients (2/7; 29%), ovarian cancer in three patients (3/7; 43%), peritoneal cancer in one patient (1/7; 14%) and appendiceal cancer in one patient (1/7; 14%). Median paracentesis duration was 14.0 ± 4.0 (SD) days and mean ascites volume drained was 2016 ± 1711 (SD) mL. Technical success was 100%. Mean fluoroscopy time was 4 ± 1.4 (SD) minutes. Five patients (71%) had at least one and two patients (29%) had two or more tract-related complications within the follow-up period: four with leakage of ascites, one with inflammation of the skin site and 2 with bleeding (Table 2).

No significant differences were found in the baseline groups in terms of demographics, biological markers or follow-up length (Table 1). Fluoroscopy-time was significantly greater in the TO group. Leakage from the stoma was significantly greater in the TA group ($P=0.04$). The rate of the remaining tract related complications was similar between the two groups with respect to skin infection/inflammation and bleeding when considered individually ($P=0.43$ and $P=0.14$, respectively), however the cumulative complication rate was greater in the TA group ($P=0.03$) (Table 2).

Discussion

Our study shows a high number of tract-related complications in patients with chronic ascites undergoing percutaneous GT/GJT placement via the TA approach compared to the TO approach, though almost all the

Table 1 Demographics and baseline characteristics of 29 patients who underwent percutaneous gastric tube placement.

Variable	Trans-abdominal(<i>n</i> = 7)	Trans-oral(<i>n</i> = 22)	<i>P</i> value
Age (years)	63.0 \pm 16.8	57.7 \pm 13.1	0.39
Gender (M/F)	0/7	4/18	0.23
Follow-up length (days)	89.7 \pm 85.5	66.8 \pm 80.6	0.20
GT/GJT	6/1	19/3	0.96
Paracentesis duration (days)	14.0 \pm 4.0	11.5 \pm 6.0	0.37
Paracentesis volume (mL)	2016 \pm 1711	2847 \pm 1240	0.17
Average tube diameter (French)	16.7 \pm 3.3	17.6 \pm 2.0	0.39
INR	1.15 \pm 0.15	1.28 \pm 0.26	0.22
Platelets count	247.9 \pm 125.2	206.1 \pm 103.1	0.43
Indication (% decompression)	100%	64%	0.60

INR: International normalized ratio; GT: Gastric tube; GJT: Gastro-jejunal tube.

Table 2 Outcomes comparison in 29 patients who underwent percutaneous gastric tube placement.

Variable	Trans-abdominal(n = 7)	Trans-oral(n = 22)	P value
Technical success (%)	7 (100)	22 (100)	0.99
Immediate complications (%)	0 (0.0)	1 (5)	0.81
Fluoroscopy time (minutes)	4.0 ± 1.4	9.5 ± 7.1	0.002
Leakage from the stoma (%)	4 (57)	3 (14)	0.04
Bleeding from the stoma (%)	2 (29)	1 (5)	0.14
Inflammation of the skin site (%)	1 (14)	1 (5)	0.43
Cumulative delayed complications (%)	5 (71)	5 (23)	0.03

Numbers are expressed as mean ± standard deviation (SD). Numbers in parentheses are percentages (%).

complications were minor and managed conservatively. Despite the high number of patients that developed complications during the follow up, this study showed a 100% overall technical success of both TO and TA GT/GJT procedures, similar to the success rates in patients without ascites that are reported to be close to 100% [6,8]. Regarding the TO approach, inflammation at the skin site was observed in 5% of our patients in line with a parastomal infection rate of 9.8% reported by Kahrman et al. [9]. Similarly, we found stoma bleeding in 5% of our patients in line with 2.9% of subcutaneous hematoma post procedure reported by Kahrman et al. [9]. By contrast, we observed a rate of leakage from the stoma of 14% compared to 2% in Kahrman et al. study [9]. We hypothesize this is related to the presence of ascites in our cohort. Overall, this data is congruent with the current idea that ascites should not be considered as a contraindication to GT/GJT placement as it was considered in the past [2,10,11]. A recently published randomized trial comparing the outcomes of radiologic GT placement has shown no significant differences in technical success and complication rates when fluoroscopic-guided TA and TO GT were performed, however, these patients did not have ascites [12].

Ascites management with paracentesis is essential for leakage control from the stoma [2]. However, the ascites distribution is unpredictable as it varies with differing patient anatomy and patient positioning. Our experience showed that leakage with TA puncture occurred four times more frequently than with TO puncture. Contrary to the TA technique, the stoma created with the TO technique is equal to the tube size. This results in a tighter tract around the tube which ultimately we believe to be the cause for less tract-related complications. Successful management of leakage at the stoma site with ‘‘Z’’ stitch was done in some TA tube instances.

Bleeding complications in this study were likely of venous origin and the inflammatory changes at the stoma site were found to be self-limiting. Although no significant difference in terms of bleeding rates could be appreciated in this cohort, we descriptively report uncomplicated TO GT/GJT placement in coagulopathic patients and in patients whose antiplatelet or anticoagulation therapy could not be suspended.

There was no difference in terms of inflammation of the skin at the gastrostomy site. Data regarding this complication was collected from medical records and the assessment of the skin was done during clinic visits or inpatients rounds.

Topical antibiotics and non-steroidal anti-inflammatory medication were administered with improvement of the skin conditions in all patients.

We preferred general anesthesia over conscious sedation for TO procedures as the procedure usually was more challenging and uncomfortable for the patient. General anesthesia is believed to be associated with higher mortality and morbidity however a recent publication by Saied et al. showed that the survival is extremely high, similar to that of regional anesthesia [13]. No complications related to general anesthesia or conscious sedation were reported in our study.

Fluoroscopy times were on an average 50% less for patients who underwent TA GT/GJT placement compared to those who underwent TO GT/GJT placement. These results are consistent with previous studies that found significantly shorter fluoroscopy times for TA radiological-created pigtail gastrostomy compared to the TO cohort [12,14].

Our study has some limitations. One relates to the heterogeneity of the indications for GT/GJT placement. However, there is no current evidence that the indication for placement of a percutaneous GT/GJT influences the measured complications post procedure, also the difference in indications was not significant. Another limitation is that TO procedures were performed under general anesthesia whereas TA procedures were performed under conscious sedation; this could have introduced a bias affecting especially the fluoroscopy time. Other important limitations include the retrospective nature and small number of patients included in the study. We also recognize that a small sample size may impact the reproducibility at different institutions, and further studies with wider cohorts are needed to confirm the validity of our results.

In conclusion, we suggest for the first time that TA and TO techniques may not always be equivalent for placement of GT/GJT in patients with chronic ascites. The TO approach for GT and GJT placement should be considered as the first-line approach in patients with chronic recurrent ascites, due to lower incidence of tract related complications.

Disclosure of interest

The authors declare that they have no competing interest.

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