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Original Article

# Percutaneous Image-guided Gastrostomy Insertion with and without Gastropexy

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## Abstract

**Purpose:** The objective was to compare the major and minor complications of percutaneous gastrostomy with and without gastropexy. **Materials and Methods:** This was a retrospective study of adult patients who underwent percutaneous gastrostomy with or without gastropexy between January 2015 and November 2018. A total of 830 patients (512 males [61.8%] and 318 females [38.2%]) were included in the study. Gastropexy was performed for 428 (51.6%) patients (343 pigtail and 85 balloon-type gastrostomies). The remaining 402 patients (48.4%) had no gastropexy (387 pigtail and 15 balloon-type gastrostomies). Major and minor complication rates were assessed within 30 days postprocedure. **Results:** Technical success was 100% with and without gastropexy. Complications were recorded in 143 patients (17.2%): six major complications in 6 patients and 155 minor complications in 137 patients. Major complications included peritonitis ($n$ = 1) and severe skin infection ($n$ = 1) in the gastropexy group, whereas the remaining four complications were without gastropexy and had tube malposition and peritonitis ($n$ = 4). There was no significant difference in major (0.47% vs. 1%; $P$ = 0.37) or minor complication rate (18.7% vs. 14.2%; $P$ = 0.08) between the gastropexy and nongastropexy groups, respectively. Subgroup analysis showed significantly more superficial infections in the gastropexy group (28 vs. 14; $P$ = 0.04), and pneumoperitoneum was significantly more common with pigtail gastrostomy compared to the balloon-type catheter (30 vs. 0; $P$ = 0.04). There was no significant difference in complication rates in relation to the number of anchors ($P$ = 0.32 for major complications and $P$ = 0.57 for minor complications). Thirty patients (3.6%) died within 30 days after the procedure due to other comorbidities. **Conclusion:** Gastropexy does not reduce the incidence of major or minor complications following percutaneous gastrostomy and is associated with increased risk for superficial infections. The use of pigtail-type gastrostomy is associated with a higher incidence of pneumoperitoneum.

**Keywords:** *Complications, fluoroscopy, gastropexy, gastrostomy, T-fasteners*

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## Introduction

Gastrostomy is an enteral nutrition method for patients who are unable to meet their caloric requirements orally. Percutaneous radiological gastrostomy is reported to be as safe and effective as percutaneous endoscopic method with low morbidity and mortality rates.[1,2]

Gastropexy before percutaneous gastrostomy tube insertion fixes the anterior wall of the stomach to the anterior abdominal wall and is presumed to minimize the risk of peritoneal spillage and intraperitoneal catheter displacement.[3,4] However, the use of gastropexy remains controversial in literature due to the theoretical increased risk of hemorrhage from multiple punctures, in addition to the possibility of mucosal and skin ischemia leading to increased risk of pericatheter leak. A previous randomized clinical trial showed that gastrostomy tube insertion without gastropexy has a greater incidence of major complications compared to procedures performed with gastropexy.[5] Another study[6] showed no significant differences between the nongastropexy and gastropexy groups.

The purpose of this study is to compare the technical success and safety of percutaneous image-guided gastrostomy tube insertion with and without gastropexy in a tertiary hospital.

## Materials and Methods

This study is a retrospective case–control study which was conducted in King Abdulaziz Medical City in Riyadh,

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Saudi Arabia, after obtaining the institutional review board approval. Informed consent was waived due to the retrospective nature of the study. Data were collected from the radiology picture archiving and communication system and electronic medical records. The study included adult patients older than 14 years who underwent percutaneous gastrostomy tube insertion for the first time between January 1, 2015, and November 30, 2018. Patients younger than 14 years and those who presented for tube change were excluded from the study.

A total of 830 patients (512 males [61.8%] and 318 females [38.2%]) were included in the study. Gastropexy was performed for 428 (51.6%) patients (1 anchor, 41 patients [9.6%]; 2 anchors, 268 patients [62.7%]; 3 anchors, 118 patients [27.5%]; and 4 anchors, 1 patient [0.2%]). The remaining 402 patients (48.4%) had no gastropexy. Two different kits for gastropexy were used Cope anchor suture set (Cook, Bloomington, USA) and Halyard introducer kit with resorbable suture and locking bolster (Halyard, Milsons Point, Australia). The exact kit used for individual cases was not documented in the procedure reports. The decision of using the gastropexy or not was according to the operator preference. Our institutional protocol does not include routine oral contrast administration before the procedure to outline the colon. However, ultrasound is done for all patients immediately before the procedure to delineate the liver edge. Preprocedure antibiotics are given 1 h before the procedure.

The most common tube was 14-Fr Pigtail catheter (different manufacturers), followed by 18-Fr Tri-Funnel and then 14-Fr Tri-Funnel (C.R. Bard, Inc., AZ, USA). The used tubes were as follow: 14-Fr Pigtail, 703 patients (84.7%); 18-Fr Tri-Funnel, 51 patients (6.14%); 14-Fr Tri-Funnel, 47 patients (5.66%); 12-Fr Pigtail, 19 patients (2.3%); 16-Fr Pigtail, 8 patients (0.96%); and 16-Fr Tri-Funnel, 2 patients (0.24%). When pooling the catheter types, balloon-type catheters were used in 100 patients and were more likely to be inserted using gastropexy (85 patients; $P < 0.0001$). Table 1 shows the number of each type of tubes done with or without gastropexy [Table 1].

Major and minor complications were assessed using the Society of Interventional Radiology definitions.[7] Major complications were defined as the patient who required further hospitalization than expected and who had permanent adverse outcome, whereas minor complications were defined as the patient without consequences or additional therapy. Technical success was defined as successful insertion of gastrostomy tube. The patients' electronic medical records were reviewed up to 1 month after the procedure. Pneumoperitoneum was considered a minor complication when it is more than what is expected postprocedure or when it is symptomatic.

**Table 1: Distribution of gastrostomy tube type according to the use of gastropexy**

| | Gastropexy | No gastropexy | Total | *P* |
|---|---|---|---|---|
| Pigtail | 343 | 387 | 730 | <0.0001 |
| Balloon | 85 | 15 | 100 | |
| Total | 428 | 402 | 830 | |

### Statistical analysis

Data were analyzed using SAS software (Statistical Analysis System, North Carolina, US). Simple descriptive analysis in the form of numbers and percentages was reported. Chi-square was used as a test of significance to compare categorical variables between the gastropexy and nongastropexy groups. Fisher's exact test was used when the expected cell count is <5. Statistical significance is defined when $P < 0.05$.

## Results

Technical success was achieved in 100% with and without gastropexy. Complications were recorded in 143 patients (17.2%): major complications in 6 patients and 155 minor complications in 137 patients. Major complications included two from the gastropexy group who had peritonitis and severe skin infection, whereas the remaining four cases were done without gastropexy and had tube malposition and peritonitis ($n = 4$) [Table 2].

No significant difference was found in major (0.47% vs. 1%; $P = 0.37$) or minor complication rate (18.7% vs. 14.2%; $P = 0.08$) between the gastropexy and nongastropexy groups, respectively [Table 2]. Subgroup analysis showed significantly more superficial infections in the gastropexy group (28 vs. 14; $P = 0.04$), and pneumoperitoneum was significantly more common when pigtail gastrostomy is used compared to balloon-type gastrostomy (30 vs. 0; $P = 0.04$). There is a trend for more superficial infections with balloon catheters [Table 3] which could be explained by the greater percentage of gastropexy in this subset of patients. There was no significant difference when studying complication rates in relation to the number of anchors used ($P = 0.32$ for major complications and $P = 0.57$ for minor complications) [Table 4].

Thirty patients (3.6%) died within 30 days after the procedure due to other comorbidities.

## Discussion

The use of gastropexy remains a controversial step during percutaneous image-guided gastrostomy tube insertion. The current multidisciplinary guideline recommends the placement of gastropexy sutures in patients with high risk for intestinal leakage such as patients with ascites, malnourishment, and ongoing steroid use. A multicenter UK-based survey of 684 patients showed that radiologically inserted gastrostomy tubes are safe

**Table 2: Major and minor complications after image-guided gastrostomy tube insertion with or without gastropexy**

| Complications | With gastropexy ($n$=428), $n$ (%) | Without gastropexy ($n$=402, $n$ (%) | $P$ |
|---|---|---|---|
| Minor ($n$=137 patients, 155 complications) | 80/137 (18.9) | 57/137 (14.2) | 0.08 |
| Tube occlusion | 7 | 5 | 0.6366 |
| Dislodgement | 3 | 2 | 1 |
| Leak | 13 | 12 | 0.9649 |
| Superficial infection | 28 | 14 | 0.0445 |
| Abdominal collection | 20 | 16 | 0.6244 |
| Pneumoperitoneum | 14 | 16 | 0.5844 |
| Minor bleeding | 4 | 1 | 0.3747 |
| Total | 89 | 66 | |
| Major ($n$=6) | 2/428 (0.47) | 4/402 (1) | 0.37 |

**Table 3: Rate of minor complications in relation to the type of gastrostomy tube**

| | Pigtail ($n$=730) | Balloon ($n$=100) | $P$ |
|---|---|---|---|
| Tube occlusion | 9 | 3 | 0.1669 |
| Dislodgement | 5 | 0 | 1 |
| Leak | 19 | 6 | 0.1074 |
| Superficial infection | 33 | 9 | 0.0553 |
| Abdominal collection | 31 | 5 | 0.7919 |
| Pneumoperitoneum | 30 | 0 | 0.0401 |
| Minor bleeding | 5 | 0 | 1 |
| Total | 132 | 23 | |

**Table 4: Rate of minor complications in relation to the number of T-fasteners**

| Number of T-fasteners | Minor complication | No minor complication | Total |
|---|---|---|---|
| 1 | 5 | 36 | 41 |
| 2 | 54 | 214 | 268 |
| 3 | 21 | 93 | 114 |
| 4 | 0 | 1 | 1 |
| Total (%) | 80 (18.9) | 344 (81.1) | 424 (100) |

with or without gastropexy with a mortality rate of 1% and gastropexy-related complications of 5%.[8] This survey found that procedure-related pain was significantly less common with gastropexy but more severe, and pain increases with the number of anchors from 11% with one anchor to 64% with three anchors. Although not statistically significant, bleeding and superficial infections were observed only with gastropexy. The current study revealed that gastrostomy tube insertion without gastropexy is as safe as with gastropexy, with no significant difference in major complications or mortality. Although the total number of minor complications was not significantly different between the two groups, superficial infections were significantly more common with gastropexy but not related to the number of anchor sutures. Our institutional protocol indicates suture removal 10 days after insertion to minimize local infections and pressure-related complications. However, adherence to this recommendation could not be related to chart review, and the exact time of suture removal could not be determined. Therefore, the increased risk of superficial infection with gastropexy could be related to delayed removal of sutures. The incidence of postprocedure pneumoperitoneum was similar with or without gastropexy; however, it was significantly more common following insertion of pigtail-type gastrostomy catheter compared to balloon type. This may be explained by the sealing effect of the balloon that prevents air leak after insertion. Furthermore, there was a trend to more superficial infections when a balloon catheter is used, which can be explained by the greater percentage of gastropexy use when inserting balloon-type gastrostomy tubes. This study is limited by its retrospective nature, missing reporting details on the type of anchor sutures used, indication for using gastropexy or initial placement of balloon retention tube, and the missing information on the time of suture removal.

## Conclusion

The findings of this study suggest that gastropexy does not reduce the incidence of major or minor complications following percutaneous gastrostomy and is associated with increased risk for superficial infections. The use of pigtail-type gastrostomy is associated with a higher incidence of pneumoperitoneum.

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### Conflicts of interest

There are no conflicts of interest.

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