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Original Research Article

Laparoscopic feeding jejunostomy using T-tube- technique and analysis of outcomes

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ABSTRACT

Background: Enteral nutrition is of paramount importance in management of upper gastrointestinal tract malignancies. Although various access routes for enteral nutrition are available, feeding jejunostomy tube is preferred to other methods. Since minimally invasive techniques have many advantages, we decided to perform it during staging laparoscopy.
Methods: The medical records of all patients who underwent laparoscopic feeding jejunostomy between October 2019 and September 2021, in the Department of Surgical Gastroenterology, Government Rajaji Hospital and Madurai medical college were retrospectively reviewed. Patient demographics, ECOG performance status, types of malignancy, indications for feeding jejunostomy, operative time, time to start feeds, length of hospital stay and complications were analysed.
Results: 75 patients underwent laparoscopic feeding jejunostomies (51 men and 24 women), with a mean age of 51.6±11.7 years, using this method. ECOG performance status was between 0-2. Mean operating time was 83±8.8 minutes. Mean length of hospital stay was 3.5 days. There was no conversion, however one patient required reoperation for peritubal leak.
Conclusions: Feeding jejunostomy can be accomplished by a total laparoscopic technique using intracorporeal suturing. The technique we propose is relatively simple, reproducible, cost effective and can be widely adopted.

Keywords: Enteral feeding, Feeding jejunostomy, Laparoscopic, T-tube

INTRODUCTION

With increasing incidence of upper gastrointestinal tract malignancies, providing adequate nutritional support is crucial at various stages of treatment. Enteral nutrition is preferred in such patients.[1,2] Various access routes for enteral nutrition are available such as nasogastric tube, nasojejunal tube, percutaneous endoscopic gastrostomy, operative gastrostomy or jejunostomy. But considering their long-term need and severe stenosis of the upper gastrointestinal tract at their initial presentation, feeding jejunostomy tube is preferred to other methods. Since minimally invasive techniques have many advantages, increasing attention is paid to laparoscopic feeding jejunostomy.

Staging laparoscopy is useful in detecting radiologically occult liver and peritoneal metastases, that can potentially alter the treatment strategy.[3,4] Also, it is appropriate to place a jejunostomy tube during staging laparoscopy. The first laparoscopic technique of feeding jejunostomy was described by O'Regan et al in 1990.[5] The technique underwent several modifications and commercially available products such as needle catheters, T-fasteners facilitating the insertion of feeding tubes were introduced since then.[6,7] However, total laparoscopic technique using a T-tube is a cost effective and safe alternative to others.

Objective of the article was to describe our technique of performing laparoscopic feeding jejunostomy using Kehr's T-tube and analysis of the clinical outcomes.

METHODS

A retrospective observational descriptive study was done in the department of surgical gastroenterology, Government Rajaji Hospital and Madurai medical college, between October 2019 and September 2021. Patients aged more than 20 years, with malignancies of oesophagus, stomach who underwent laparoscopic feeding jejunostomy were included. Patients who were unfit for laparoscopy, underwent upfront open feeding jejunostomy were excluded. All the patients had undergone clinical examination, preoperative CT, endoscopy, biopsy and preoperative anesthesiologist assessment. Indications for laparoscopic feeding jejunostomy were metastatic or locally advanced upper GI malignancies requiring palliative chemotherapy or neoadjuvant chemoradiation, with gastric outlet obstruction or dysphagia.[8] The decision for feeding jejunostomy or palliative gastrojejunostomy bypass procedure in patients with metastatic gastric cancer was taken intraoperatively based on the extent of tumor infiltration of the stomach. Palliative gastrojejunostomy was the preferred option in patients with gastric outlet obstruction. However, in patients with linitis plastica or proximally located tumors, feeding jejunostomy was performed. Institutional ethical committee approval was obtained. Data of 75 patients who underwent laparoscopic feeding jejunostomy using T-tube, was analysed using software SPSS version 24.0.

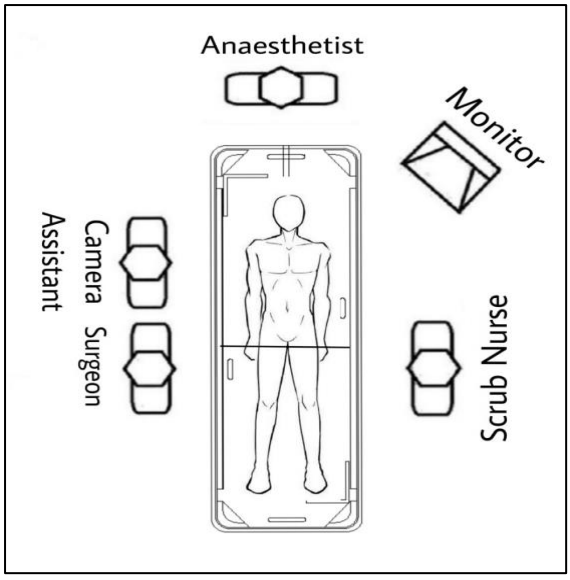

Figure 1: Table set up.

All patients were operated under general anesthesia and in supine position. Prophylactic antibiotic was given intravenously during induction of anesthesia. Figure 1 illustrates the position of the surgeon, camera assistant and scrub nurse during the procedure. Pneumoperitoneum was established by Veress needle method and 10mm camera port was placed 5cm below and lateral to umbilicus on right side. Two 5-mm ports were placed in the right lumbar and hypogastric region to facilitate manipulation of the bowels and stomach (Figure 2). Staging laparoscopy was performed in a reverse TNM manner.

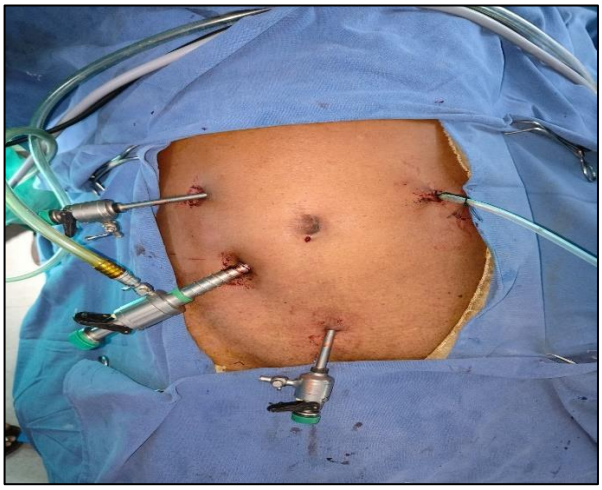

Figure 2: Port position.

Figure 3: Identifying DJ flexure.

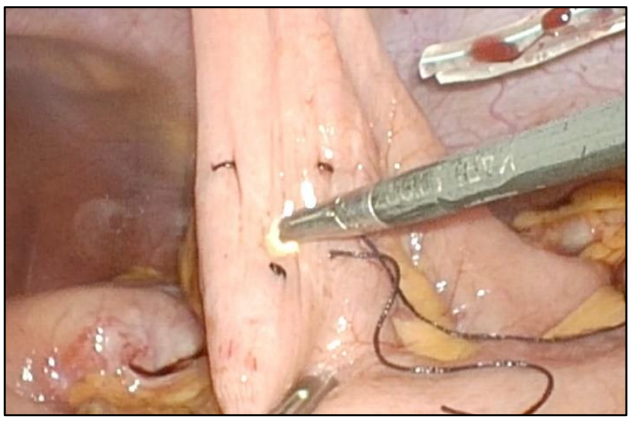

Figure 4: Purse string and enterotomy.

If the tumor was found inoperable during laparoscopy, we proceeded with feeding jejunostomy. The duodenojejunal flexure is identified (Figure 3), and first loop of proximal jejunum 30 cm distal to the duodenojejunal flexure is selected and a purse-string suture was placed on the antimesenteric border. A 16 Fr T-tube, was prepared by filleting its wall and cutting the horizontal limbs into 3 cm on either side of T junction. It was introduced into the abdomen under laparoscopic vision, through a 5 mm incision in left lumbar region at the anticipated site of purse string suture. An enterotomy was made within the purse string using monopolar cautery connected to a Maryland dissector and widened for 5mm diameter using a Maryland dissector (Figure 4). Horizontal limbs of the T tube were introduced through the enterotomy into proximal and distal loops, one after the other using Maryland dissector (Figure 5). Once both the limbs of the T tube were successfully placed into the jejunal lumen, the purse-string suture is secured (Figure 6). Also, jejunum was fixed to parietal wall at the site of T-tube entry, using the same suture material. Two anchoring stitches were made 5 cm proximal and distal to the purse string suture on the antimesenteric border of the jejunum and fixed to parietal wall to avoid volvulus of the jejunum (Figure 7). All stitches were made using 2-0 silk by intracorporeal suturing technique. Then T tube was fixed to skin with gentle traction. Free flow of saline through the tube was checked before deflation and port sites were closed. Figure 8 shows completed picture.

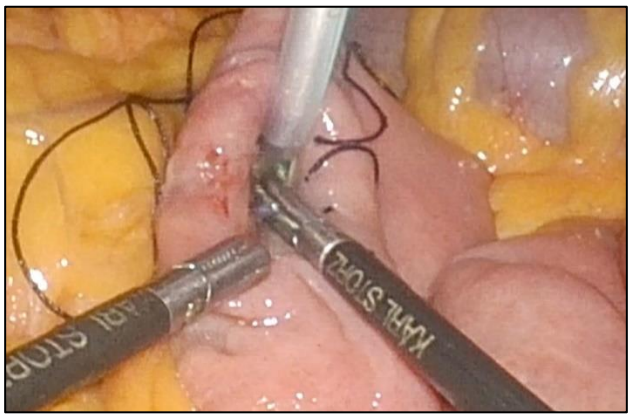

Figure 5: Introducing T-tube.

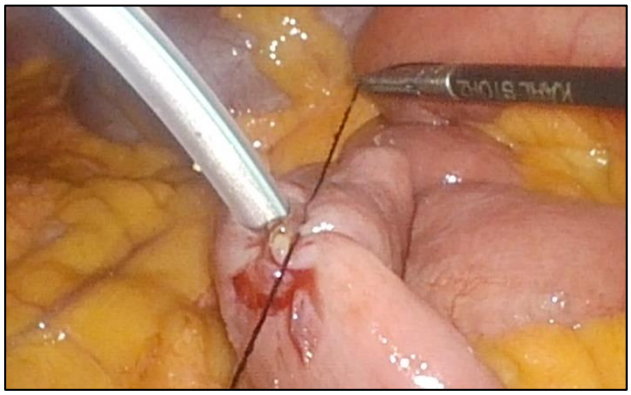

Figure 6: Securing purse string.

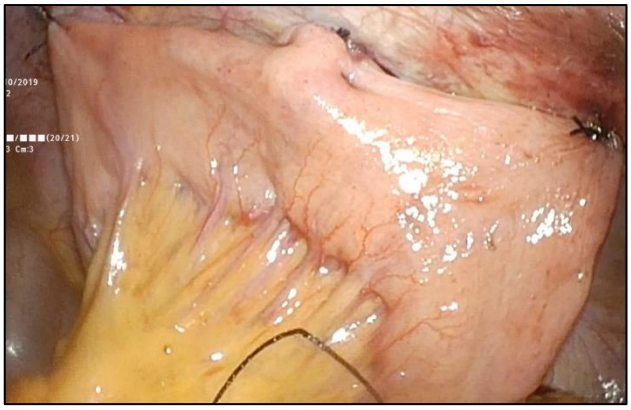

Figure 7: Bowel orientation after fixation.

Figure 8: Final picture

Oral rehydration salt solution was started via the feeding tube on postoperative day 1 or 2, gradually switched to rice kanji, milk, egg white. The feed was administered as a continuous infusion starting at 30 ml/hour with occasional break between feeds. The feeds were gradually increased to 100-150 ml/hour as tolerated. Patients were allowed free oral fluids as tolerated and were discharged

Patient demographics, ECOG performance status, types of malignancy, indications for feeding jejunostomy, operative time, time to start feeds, length of hospital stay and complications were analysed.[9] Complications were categorized as minor (tube occlusion, dislodgement, peritubal leakage, tube site infection, and feed intolerance) and major (intestinal obstruction, peritonitis, volvulus, EC fistula requiring surgical or radiologic intervention). As all the patients were with advanced malignancy, the follow up period was short.

RESULTS

75 patients underwent laparoscopic feeding jejunostomies (51 men and 24 women), with a mean age of 51.6±11.7 years (range 35-72), using this method. ECOG performance status was between 0-2. All patients were diagnosed with malignancy and staged preoperatively by

imaging and endoscopy. Patients who had metastatic or locally advanced tumor on preoperative imaging were planned for feeding jejunostomy followed by definitive or neoadjuvant chemoradiation according to protocol. In patients with radiologically occult peritoneal metastasis during staging laparoscopy, intraoperative decision was made to proceed with feeding jejunostomy at the same sitting. Patient demographics and preoperative clinical data are shown in Table 1.

Table 1: Patient demographics and preoperative clinical data.

Number of patients	75
Sex (male/female)	51/24
Age in years, mean±SD (range)	51.6±11.7 (35-72)
ECOG PS9	
0	6 patients
1	44 patients
2	25 patients
Gastric outlet obstruction	9 patients
Dysphagia8	66 patients
Grade 3	15/66
Grade 4	51/66
Indication	
Metastatic ca stomach	9/75
Metastatic ca OG junction	16/15
Metastatic ca lower third oesophagus	12/15
Locally advanced ca upper third oesophagus	14/15
Locally advanced ca middle third oesophagus	21/15
Locally advanced ca lower third oesophagus	3/15

ECOG PS- Eastern cooperative oncology group performance status; OG junction- Oesophagogastric junction

Table 2: Surgical details.

Surgical details	Results
Laparoscopic feeding jejunostomies, n	75
Operation time in minutes, mean±SD (range)	83±8.8 (70-100)
Hospital stay in days, mean±SD (range)	3.5±0.8 (3-6)
Success rate	100%
Starting enteral feed	
Postop day 1	56/75
Postop day 2	19/75
Follow up in days, mean (range)	94 (60-180)

All the laparoscopic feeding jejunostomies were technically successful, with no conversion to a laparotomy. The surgical details are shown in Table 2. One patient developed peritubal leak with enterocutaneous fistula and underwent laparotomy resection anastomosis of involved segment and redo feeding jejunostomy on postoperative day 14. Nine patients had infection at the tube insertion site and was successfully treated with antibiotics. Enteral nutrition was started 24-48 hours after surgery, once patient had passed flatus.

Table 3: Complications.

Complications	Number
Minor	
Gastrointestinal bleeding	0
Tube occlusion	0
Tube dislodgement	0
Feed intolerance	0
Wound infection	9
Peritubal leak alone	0
Major	
Peritubal leak + EC fistula	1
Intestinal obstruction	0
Peritonitis	0
Volvulus	0
Reoperation	1
30-day mortality	0

Other complications, such as gastrointestinal bleeding, tube occlusion, dislodgement, feed intolerance, intestinal obstruction, peritonitis, volvulus was not observed. There was no procedure related mortality. Mean follow up period was 94 days. It is attributable to the advanced nature of disease and short life expectancy of cohorts.

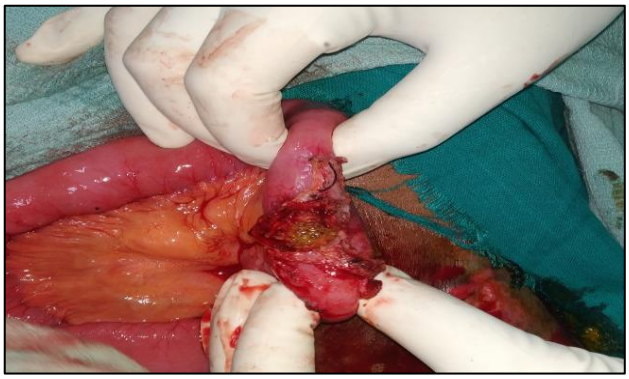

Figure 9: EC Fistula complication.

Figure 10: Too wide enterotomy.

DISCUSSION

Enteral feeding is the preferred option over parenteral nutrition in patients with normal bowel function who require prolonged nutrition support.[1,2,10,11] It is cheaper, safer and associated with decreased septic complications compared with parenterally administered nutrition. Various options include nasogastric, nasojejunal, gastrostomy, and jejunostomy feeding tubes. When feeding for a period of exceeding 6 weeks is expected, gastrostomy or jejunostomy is indicated. This can be accomplished by using a percutaneous, endoscopic, or operative technique. In 1980 when Ponsky and Gauderer reported on their technique of percutaneous endoscopic gastrostomy (PEG) tube placement.[12] Since then, PEG has rapidly become the method of choice for obtaining enteral access for nutrition in most cases. Contraindications for the use of percutaneous endoscopic devices are upper aerodigestive tract malignancies that preclude passage of endoscope, gastric inlet or outlet obstruction and gastroparesis. Also, in oesophageal malignancies stomach is the preferred conduit for restoring alimentary continuity during radical surgery.

In such situations jejunostomy tube is considered ideal. Various techniques of constructing a feeding jejunostomy by open, laparoscopic, and radiologic techniques have been proposed in literature.[5-7,12-16] In 1858, Bush et al first described jejunostomy for feeding purposes in a patient with nonoperable gastric cancer.[15] In 1891, Witzel et al described the serosal tunnel technique for jejunostomy creation, which is the most widely technique.[16]

Direct percutaneous jejunostomy under fluoroscopic guidance was introduced by Gray et al in 1987.[13] It has certain advantages such as, avoiding the need for general anesthesia, the ability to traverse narrow oesophageal strictures or gastric outlet obstructions and a lower likelihood of haemorrhage or long-term fistula on eventual withdrawal of the catheter because of the small catheter size.[17] However, its application is relatively limited, perhaps due to the inherent technical difficulties, including targeting and puncturing of the mobile and compliant jejunum, and maintaining the position of the jejunum during catheter insertion.[18]

Laparoscopic placement of feeding jejunostomy tube has the same advantages as other minimally invasive types of surgery and has a beneficial effect on postoperative recovery, hospital stay, early starting of feeds and chemo radiotherapies.[19,20] Also, it can be done as a part of staging laparotomy, providing nutritional support in neoadjuvant or palliative setting.[25] Considering the minimal invasive nature of the approach, same feeding access can be utilized after a possible oesophagectomy. Minimally invasive access for feeding jejunostomy can be accomplished by a total laparoscopic technique or a laparoscopic-aided technique.[5-7,22-24]

Advantage of the total laparoscopic over laparoscopic aided procedure is the direct visualization and placement of the catheter with commonly used laparoscopic instruments without the need of commercial kits such as T fasteners, needle catheters and avoidance of minilaparotomy.[21,25]

Although the time tested Stamm and Witzel techniques are possible laparoscopically, they are technically difficult and prolong the time of the procedure. Special T-fasteners, suture passers and Endostitch were devised to simplify the process of tacking jejunum to the abdominal wall. Alternatively, a needle catheter kit can be used to puncture the jejunum under laparoscopic vision, guidewire is then passed into the lumen of the bowel followed by a dilator and the feeding tube, much like the Seldinger technique for central venous catheter insertion.[26,28]

Hence, we adopted the technique of total laparoscopic feeding jejunostomy using Kehr's T-tube. The main technical challenge encountered during this procedure was the insertion of the T tube into the enterotomy. Prior to insertion, it is important to fillet the horizontal limb, in order to prevent clogging and to facilitate easier insertion.[27] The common problems described in previous total laparoscopic feeding jejunostomy series are anchoring the jejunum to parietal wall and decision on the type of catheter to be used.[29-31] They are effectively dealt with and we have presented our experience on technique and outcomes

The procedure requires only standard basic laparoscopic instruments such as laparoscopic hook, maryland forceps, needle holder, scissors and monopolar electrocautery. Both anchoring stitches and the purse-string suture are placed intracorporeally, without using transfascial sutures. The only additional requirement is Kehr's T-tube, which is commonly available in any surgical unit. The use of T-tube and silk suture is a cost-effective alternative to commercial kits. In our experience, high technical success rate confirmed that our technique was feasible and it avoids the risk of accidental injury to jejunum as feeding tube is inserted under direct vision.

Regarding complications, EC fistula with peritubal leak requiring reoperation (Figure 9), occurred in one out of 75 patients. This could be explained by the small series but might also possibly be prevented in the future. On reviewing the video, it was found that enterotomy was widened larger than required (Figure 10). In subsequent cases, it was then standardized to widening the enterotomy to a diameter of 5 mm, so that it snugly fits the T-tube. One patient had infection at the T-tube insertion site and was successfully treated with oral antibiotics delivered by jejunostomy on outpatient basis

Limitations include small sample size, which provided insufficient data for comparison with the standard open feeding jejunostomy by Witzel technique. Shorter follow

up period could be attributed to advanced malignancy and short life expectancy of the cohorts. Therefore, in a future study, we would investigate the application of this method with a large sample size and extending the indications to benign strictures of upper GI tract and perform a sufficient comparison.

CONCLUSION

To conclude with, our study shows that laparoscopic feeding jejunostomy can be performed safely with no significant morbidity, as a procedure by itself or as an adjunct to staging laparoscopy. It enables nutritional supplementation for patients with metastatic UGI malignancies as well as patients who require neoadjuvant therapy to downstage their tumors. The approach we propose is relatively simple, reproducible, cost effective and can be widely adopted.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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