



## **CASE STUDY**



# **Laparoscopic feeding jejunostomy with longitudinal serosa tunnelling**

Sorin Cimpean<sup>1\*</sup> | Megan Raes<sup>1</sup> | Marechal, Marie-Therese | Cadiere Benjamin<sup>1</sup>  
| Cadiere Guy-Bernard<sup>1</sup> | Byabene, Gloire à Dieu<sup>2</sup>

<sup>1</sup>Centre Hospitalier Universitaire  
Saint-Pierre rue aux Laines  
Bruxelles, BE 1000 Tel/  
0253555115 Fax/ 025353166

<sup>2</sup>Panzi Hospital Bukavu, D.R.  
Congo

### **Abstract**

**Background:** Laparoscopic feeding jejunostomy is an intervention that consist in placement of a feeding tube into the proximal jejunum. This tube allows to nourish a patient who is unable to have a sufficient oral intake. The digestive tract needs to be functional.

**Methods:** A retrospective review was performed on 15 patient who underwent our technique of laparoscopic feeding jejunostomy with longitudinal serosae tube tunnelling as Witzel technique from January 2018 to January 2020. We evaluate the results in term of postoperative complications and morbidity. The surgical follow up of the patients was of 2 months. We evaluate the postoperative results of the operative technique, not the nutritional or the oncological outcomes. Statistical analysis was performed using Microsoft Office 2019.

**Results:** The analysis of the result revealed that postoperatively 2/15 patients presented tube obstruction and 2/15 patients presented accidental removal of the tube, 1/15 patient presented a local skin inflammation around the tube and 1/15 patient presented an intolerance to the enteral fluid.

**Conclusions:** The results of the study reveals that this operative technique is feasible and safe with low morbidity, but due to the small number of patients included, further studies are necessities to validate our results.

**Keywords:** feeding jejunostomy, operative technique, laparoscopic approach

## **1 | BACKGROUND**

**L**aparoscopic feeding jejunostomy is a surgical intervention that consist in the placement of an alimentary tube into the proximal jejunum. The placement of the tube requires the creation of a trajectory though skin, abdomen wall and wall of je-

junum. Connected directly to the patient's digestive tract, the tube feed can provide water, nutrients or medication. Feeding gastrostomy or jejunostomy is essential when the patient is unable to have sufficient oral intake for a period of time longer than 4-6 weeks. The choice between a gastrostomy or a jejunostomy will depend on the functional capacity of the diges-

tive tract, the accessibility and the absorption capacity of the digestive tract. It is also indicated in case of excessive loss of nutrients i.e. in malabsorptive syndromes. It is also indicated in case of excessive loss of nutrients i.e. in malabsorptive syndromes. Anorexia, which is a disorder characterized by loss of appetite and insufficient oral intake can occur in several situations (i.e. senility or pathological aging with deterioration of physical capacities, gastrointestinal or head and neck cancers, but also in diverse mental illnesses, etc.). [1]

We performed a retrospective study on 15 patients in a period of 2 years. The patients underwent our original technique of feeding jejunostomy by laparoscopy and we report the post-operative results in term of complications and morbidity with a surgical follow-up of 2 months.

## 2 | METHODS

A retrospective study was performed on 15 patient who underwent our technique of laparoscopic feeding jejunostomy with longitudinal serosae tube tunnelling from January 2018 to January 2020. We evaluate the results in term postoperative complications and morbidity. The surgical follow up was of 2 months. We evaluate the surgical outcomes of the operative technique, not the nutritional or the oncological outcomes. The statistical analysis was performed using Microsoft Office 2019. A major limitation of the study is the small number of patients included and the short period of follow up.

### 2.1 | Operative indications

7 patients presented an obstructive oesophageal cancer with Severely reduced oral intake. For 1

**Supplementary information** The online version of this article ([12389](#)) contains supplementary material, which is available to authorized users.

**Corresponding Author:** *Sorin Cimpean*  
+32 464 37 40 77 *Saint Pierre University Hospital*  
*Rue Haute 322, 1050, Brussels, Belgium*  
Email: [sorin.cimpean.md@gmail.com](mailto:sorin.cimpean.md@gmail.com)

patient, the operative indication was malnutrition in a context of oeso-jejunal stenosis after a total gastrectomy for adenocarcinoma. This stenosis was treated by repeated endoscopic dilatations with partial results. 1 patient presented a pancreatic cancer with loco-regional metastasis in palliative treatment. 1 patient presented cardiac cancer with impossibility of oral intake for solid food. This patient was unable to have an oral alimentation due to a profound altered general status. 3 patients were operated previously by the ENT team and had total laryngectomy for cancer with reconstruction.

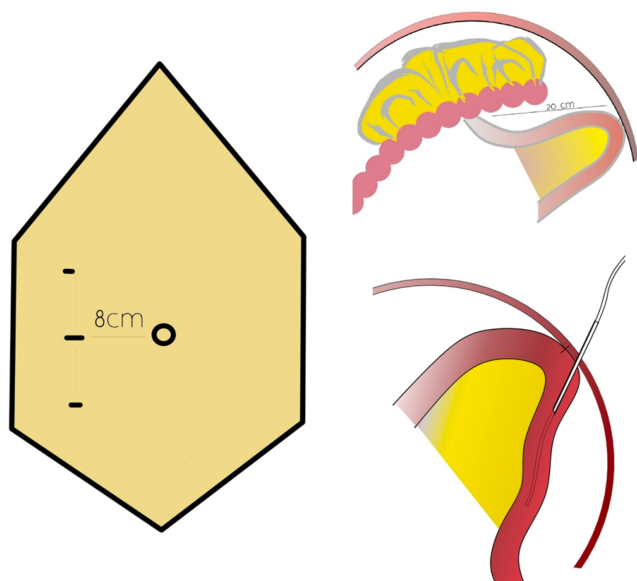
The exclusion criteria of the laparoscopic approach were related to the incapacity of the patient to support pneumoperitoneum or multiple previous intervention performed by laparotomy. The good selections of the patients for the laparoscopic approach lead to no conversion to laparotomy. In the period of reference a number of 25 jejunostomies were placed. We do not include the feeding jejunostomies that were combined with other surgeries, the jejunostomies performed by laparotomy or by other surgical techniques.

### 2.2 | Operative technique

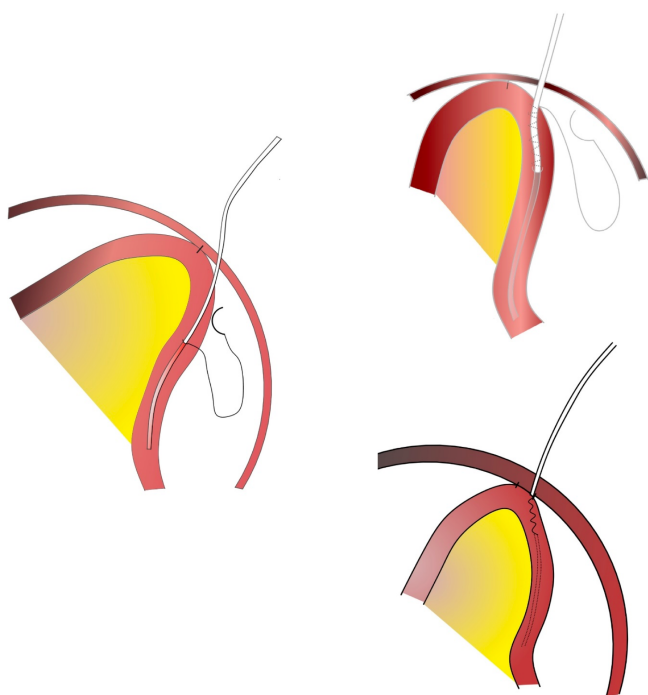
The first trocar of 10 mm is placed near the umbilicus by open laparoscopy. Two trocars of 5 mm are placed on the right flank, cranially and caudally on the same line, at 8 cm or 4 fingers each. The proximal jejunal loop and the Treitz angle is identified. The first 20 cm of the proximal jejunal loop are measured and the jejunum is anchored to the abdominal wall using a absorbable stitch. The jejunostomy tube is placed at the middle line between the left flank and the epigastric area. An incision is performed using the electric hook on the antimesenteric side of the small bowel at 2 cm to 3 cm distally from the parietal fixation site. The feeding tube is inserted into the bowel lumen for approximately 20 cm. Figure 1 The insertion site of the tube into the bowel is secured with a “U” stitch. The same stitch is used to perform a serosae tunnel around the feeding tube to ensure a correct sealing of the tube and to avoid a peritoneal contamination with intestinal content or with enteral nutrition fluid. A running suture with a longitudinal serosa tunnelling is performed and anchored to the

## LAPAROSCOPIC FEEDING JEJUNOSTOMY WITH LONGITUDINAL SEROSA TUNNELLING

abdominal wall. Figure 2 The permeability of the tube and the sealing is tested by the injection of 50ml of physiological serum on the feeding tube. A per operative test is made before and after the exsufflation to test the permeability and the sealing.



**FIGURE 1:** Trocar disposition, parietal fixation of the proximal bowel and tube introduction



**FIGURE 2:** Serosa tunnelling of the tube and final view

### 2.3 | Clinical protocol

In our institution the same postoperative clinical protocol is applied for feeding jejunostomies and for feeding gastrostomies. On the operative day no administration of fluid is allowed. If the patient presents a parenteral nutrition, then the administration is resumed.

On the first postoperative day, we administer 500 ml of water using an automatic feeding system (administration by gravity) or a programmable pump. The pump is a preferable option for enteral feeding (diminution of reflux, lower risks of diarrhea). The utilisation of the feeding tube is started by the administration of water to test the permeability of the tube or the presence of an abdominal symptomatology related to the use of feeding tube, like the presence of an extra digestive leak.

On the second postoperative day the enteral feeding fluid administration is started. To test the digestive tolerance, 500 ml of enteral feeding formula is administered, with a slow rate (20 ml/hour). In our institution, the first formula administered in jejunostomies is an oligomeric formula, for the patient's comfort is administered. If the patient presents abdominal pain, nausea or diarrhoea, due to a high osmolarity or fluid formula

On the third postoperative day, 1 L of oligomeric formula is administered. The administration rate is increased progressively to obtain 125 ml/hour in the end. The automatic pump is programmed to 125ml/h (standard administration rate). If necessary, this rate can be lowered if the patient doesn't tolerate it.

On the fourth postoperative day, the volume of enteral feeding can be increased to fit the nutritional needs of the patient. The oligomeric solution can also be replaced by a more adequate formula for the patient (polymeric, high energy, high protein, diabetic-specific, rich in fiber). The tolerance is tested in the hospital, to ensure the patient can be discharged with the correct formula.

For patients with moderately impaired digestive functions, an oligomeric formula is not proved to be tolerated well than a polymeric formula, with some exceptions (severe acute pancreatitis, severe malabsorptions). The dietitian will suggest the best

formula and calculate the volume necessary per day for the patient. The volume of enteral feeding fluid per day will depend on the patient’s nutritional status, his weight, his weight loss, his disease, the ability to eat. Enteral nutrition can be combined with oral food intake. Depending on the nutritional status and the disease, the caloric intake varies from 20-45 kcal/kg/J , the protein intake varies from 0.8 to 2 g/kg/J, the hydric intake varies from 25-40 ml/kg/J.

### 3 | RESULTS

We analysed retrospectively 15 patients from January 2018 to January 2020 with laparoscopic feeding jejunostomy placement. Most of the patients were males 9 (69.23 %) and the median age was 63 years (with limits between 40 and 80 years). The distribution of the operative indication was: 7 (53.85 %) patients with oesophageal cancer, 3 (23.08 %) patients with ENT cancer, 1 (7.69 %) patient with gastro-oesophageal anastomosis stenosis, 1 (7.69 %) patient with a poor general condition in context of advanced pancreatic cancer. Figure 3

The medium weight of the patients was 66.1 kilograms (limits between 41 and 120 kgs ) and the median BMI was 22.1 kg/m<sup>2</sup>(limits between 16kg/m<sup>3</sup> and 41 kg/m<sup>3</sup>). Most of the patients were heavy smokers, 4 (30.77 %) of them smoked more than 20 cigarettes/ day for more than 30 years. The ASA score (American Society of Anaesthesiologists) was 3 for 10 (76.92 %) patients, ASA score 2 for 2 (15.38 %) patients and ASA score 1 for 1(7.69 %) patient.

On the time of surgery 8 (61.54 %) patients were under chemotherapy, 4 (30.77 %) patients under association between chemotherapy and radiotherapy and 1 patient under clinical follow-up. Abdominal multiples previous surgeries by laparoscopy were presented in 3 (23.08 %) patients; 1 (7.69 %) patient had a total gastrectomy and 2 (15.38 %) patients had a laparoscopic appendectomy. Concerning the preoperative difficulties, adherential syndrome was present particularly in patients with previous abdominal surgeries. There was a statistical correlation between the presence of abdominal previous surgeries and the presence of adherential syndrome. (P- 0,044). No perioperative incidents were recorded.

1 (7.69 %) patient presented abdominal pain and nausea on the third postoperative day that were successfully managed by changing the enteral standard fluid to a soy based fluid.

During the follow-up period 2 (15.38 %) patients accidentally removed the feeding tube; 1 patients removed the tube 2 weeks after the surgery and other patient 1 month postoperatively. For both patients, laparoscopic surgical replacement of the feeding tube was necessary. 2 (15.38 %) patients presented an occlusion the tube probably due to an incorrect use. Surgical replacement was also necessary. Figure 4.

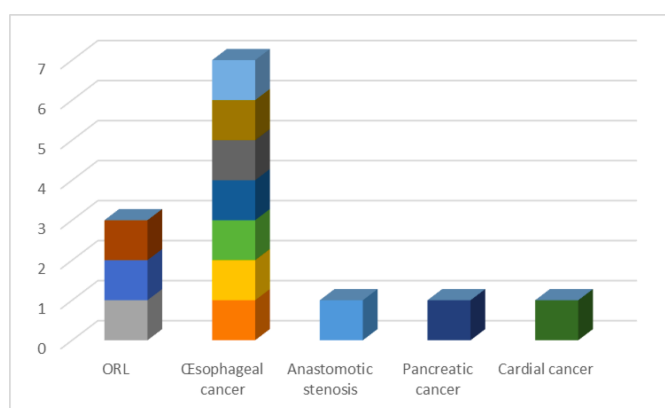


FIGURE 3: Distribution of the operative indication

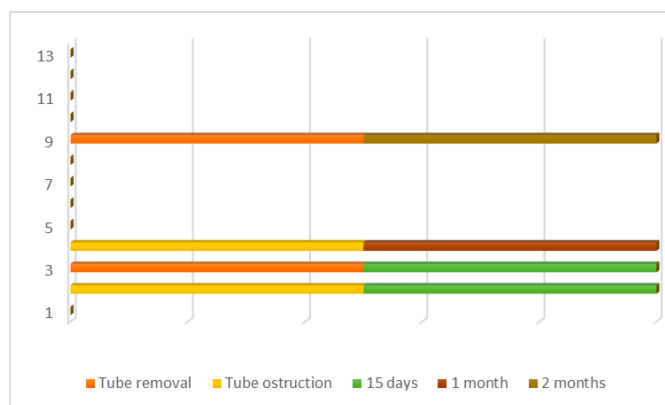


FIGURE 4: Distribution in time of tube removal and tube obstruction

### 4 | DISCUSSIONS

The study was performed on 15 patients operated from January 2018 to January 2020. The indications for jejunostomy were determined by a poor



nutritional status of the patients, in a context of an impossible or an insufficient oral intake, mostly due to gastro-oesophageal tumours or ENT surgeries. In one case the patient presented a oeso-jejunal anastomotic stenosis after total gastrectomy, under endoscopic treatment. Multiple dilatation were performed by the gastroenterologists with partial result and inadequate oral alimentation with secondary weight loss and nutritional deficiencies. For one patient with advanced pancreatic cancer and poor general status (BMI 16 kg/m<sup>3</sup>), the feeding jejunostomy was placed in a palliative context. The chemotherapy and radiotherapy planning was not modified for the surgery.

Concerning the ASA score of the patients, most of the patients presented ASA 3 score. For these patients the amelioration of the nutritional status is particularly important. Most of the patients were at risk of undernutrition or undernourished (low BMI, poor oral intake, acute disease...)

The complications of the feeding jejunostomy are well described in the literature. Enteral nutrition can cause complications, such as diarrhoea, inhalation pneumonia, refeeding syndrome, NaCl deficit. Several factors can explain the occurrence of diarrhoea with enteral nutrition, such as: treatments (i.e. antibiotics, chemotherapy, gastric antisecretory...), undernutrition, short bowel syndrome, Crohn's disease, Clostridium difficile infection, or the enteral nutrition itself (administration rate, incorrect placement of the feeding tube, enteral fluid deterioration). The risk of diarrhoea is high when antibiotics or antifungal treatments are combined with enteral nutrition. Investigating these factors, lowering the administration rate or using anti-diarrheic medication can provide successful management. [2] In our study, 1 patient presented abdominal pain and diarrhoea. We reduced the rate of fluid administration and we prescribed anti-diarrheic medication, with no amelioration of symptomatology. In concertation with the nutritionist a soy based enteral fluid was administered. Secondly, the patient presented a complete resolution of the symptoms.

Accidental removal of the feeding tube can occur frequently especially if the feeding tube is used for long periods of time. The tube ablation in the early postoperative period makes very difficult to replace

the tube by local approach and the lack of trajectory maturation. If the feeding tube has been removed for more than 3-5h, then the local access can be is also very difficult due to the muscular contraction and loss of the parietal trajectory. Surgical repositioning of the tube can be necessary. In the study, the accidental tube removal occurred after the patients were discharged. The patients returned the same day to the hospital, but a percutaneous replacement was not possible due to the loss of trajectory.

The occlusion of the tube can be secondary to instillation of medication that is incompatible with the enteral tube, improper or insufficient preparation of the medication but also to a incorrect technique of administration with not flushing of the tube after the instillation. Enteric-coated tablets tend to clump and clog easily the feeding tubes, and alternatives like the use of sublingual medication should be used. The gastrostomy tubes due to their larger calibre are more adapted for the administration of medication. A solution to unclog the tube can be offered by injection on physiological serum, bicarbonate of Na or the use of a metal guidewire. The failure of these manoeuvres will lead the surgical replacement of the tube. In our study for the occluded tubes we recorded that the obstruction was on the distal part of the tube with a zone of obstruction more than 10 cm.

The patients with tube accidental tube removal or tube obstruction, were re-operated by laparoscopy in the same manner, using the same operative technique. For the placement of the new tube, a site was chosen on the antimesenteric side of the small bowel, 5 cm distally from the previous placement. The previous fixation of the small bowel on the abdominal wall was not mobilized, due to the potential risk of fistula. The new skin incision was positioned close to the precedent incision. We do not use the previous skin incision to avoid a parietal infection. [3]

Intra-abdominal leakage can occur in case of loss of sealing between the bowel and the abdominal wall, improper fixation of the tube to the bowel wall, or loose fixation of the bowel to the abdominal wall. This situation can be accompanied by abdominal pain, fever and inflammatory syndrome on the laboratory exam. [4] For the diagnostic, a fistulography can be performed with the injection of a radiocontrast

agent on the tube, followed by radiological control. An abdominal CT scan can reveal the presence of intraabdominal free air or fluid. The presence of an extradigestive leak which will impose a surgical intervention in emergency. [5]

1 patient presented an inflammation around the feeding tube 2 weeks postoperatively, that necessitate local care. No antibiotherapy was necessary. The evolution was uneventful with the resolution of the local inflammation.

The postoperative follow up was performed at 1 week, 1 month and 2 months. The multidisciplinary approach and the close collaboration with the dietician is very important, mostly if a problem related to the intolerance to the enteral liquid occurs, and to ensure that the total caloric intake is adequate to the patient's needs. We did not record significant complications directly related to the surgical technique as a sealing problem, infections, kinking of the tube and early loss of permeability. [6]

The results of the study reveals a low morbidity and most of the complications were not related to the surgical technique, but to the tube use. This operative technique is feasible and very reproducible. [7]

## 5 | CONCLUSION

Laparoscopic feeding jejunostomy with longitudinal serosa tube tunnelling is a feasible technique with no direct complications related to the surgical technique. The complications like tube obstruction of tube removal are common to all techniques. Further studies on larger number of patients are necessarily to validate this operative technique.

### Declarations

Ethics approval and consent to participate

Study approved by the Commission of Ethics of Saint Pierre University Hospital, Brussels

### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### Competing interests

The authors declare that they have no competing interests

### Funding

No funding to declare

### Authors' contributions

Sorin Cimpean: conception of the work, data collection, work draft

Marechal Marie Therese: data collection, data analysis

Benjamin Cadiere: data analysis, work draft

Guy-Bernard Cadiere : review of the manuscript

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