

## TWO PORT VIDEO-ASSISTED GASTROSTOMY AND JEJUNOSTOMY: TECHNICAL SIMPLIFICATION AND CLINICAL RESULTS

*Gastrostomia e jejunostomia videoassistidas com dois portais: simplificação técnica e resultados clínicos*

Paula **VOLPE**, Carlos Eduardo **DOMENE**, Marco Aurélio **SANTO**, Ivan **CECCONELLO**

From the Hospital das Clínicas, Faculdade de Medicina, Universidade de São Paulo (Hospital das Clínicas, School of Medicine, University of São Paulo), São Paulo, SP, Brazil

**ABSTRACT - Background:** Patients presenting upper gastrointestinal obstruction, difficulty or inability in swallowing, may need nutritional support which can be obtained through gastrostomy and jejunostomy. **Aim:** To describe the methods of gastrostomy and jejunostomy video-assisted, and to compare surgical approaches for video-assisted laparoscopy and laparotomy in patients with advanced cancer of the esophagus and stomach, to establish enteral nutritional access. **Methods:** Were used the video-assisted laparoscopic techniques for jejunostomy and gastrostomy and the same procedures performed by laparotomies. Comparatively, were analyzed the distribution of patients according to demographics, diagnosis and type of procedure. **Results:** There were 36 jejunostomies (18 by laparotomy and 17 laparoscopy) and 42 gastrostomies (21 on each side). In jejunostomy, relevant data were operating time of 132 min vs. 106 min ( $p=0.021$ ); reintroduction of diet: 3.3 days vs 2.1 days ( $p=0.009$ ); discharge: 5.8 days vs 4.3 days ( $p=0.044$ ). In gastrostomy, relevant data were operative time of 122.6 min vs 86.2 min ( $p=0.012$  and hospital discharge: 5.1 days vs 3.7 days ( $p=0.016$ ). **Conclusion:** The comparative analysis of laparotomy and video-assisted access to jejunostomies and gastrostomies concluded that video-assisted approach is feasible method, safe, fast, simple and easy, requires shorter operative time compared to laparotomy, enables diet start soon in compared to laparotomy, and also enables lower length of stay compared to laparotomy.

**HEADINGS** - Gastrostomy. Jejunostomy. Laparoscopic surgery. Surgical technique.

### Correspondence:

Paula Volpe

E-mail: pvolpe@uol.com.br

Financial source: none

Conflicts of interest: none

Received for publication: 18/09/2014

Accepted for publication: 09/12/2014

**RESUMO - Racional :** Enfermos que apresentam obstrução digestiva alta, com dificuldade ou impossibilidade de deglutição, podem necessitar suporte nutricional provisório ou permanente<sup>16</sup>, que pode ser obtido através de gastrostomias e jejunostomias. **Objetivo:** descrever os métodos de gastrostomia e jejunostomia videoassistidas, bem como comparar os acessos cirúrgicos por laparotomia e por laparoscopia videoassistida, em pacientes portadores de neoplasias avançadas de esôfago e estômago, para estabelecimento de acesso nutricional enteral. **Métodos:** Foram utilizadas as técnicas laparoscópicas video-assistidas para a jejunostomia e gastrostomia e os mesmo procedimentos realizados por laparotomia. Foram analisados comparativamente a distribuição dos pacientes quanto à demografia, diagnóstico e tipo de procedimento. **Resultados:** Foram 36 jejunostomias (18 por laparotomia e 17 por laparoscopia) e 42 gastrostomias (21 de cada lado). Na jejunostomia os dados relevantes foram: tempo operatório de 132 min vs 106 min ( $p=0,021$ ); reintrodução da dieta: 3,3 dias vs 2,1 dias ( $p=0,009$ ); alta hospitalar: 5,8 dias vs 4,3 dias ( $p=0,044$ ). Na gastrostomia os dados relevantes foram: tempo operatório de 122,6 min vs 86,2 min ( $p=0,012$  e alta hospitalar: 5,1 dias vs 3,7 dias ( $p=0,016$ ). **Conclusão:** A análise comparativa das vias de acesso laparotômica e videoassistida para jejunostomias e gastrostomias conclui que a via videoassistida é método factível, segura, rápida, simples e fácil, necessita menor tempo operatório em relação à laparotomia, possibilita início de dieta mais rapidamente na jejunostomia em relação à laparotomia, e possibilita menor tempo de internação em relação à laparotomia.

### DESCRIPTORES

- Gastrostomia.  
Jejunostomia. Cirurgia laparoscópica.  
Técnica cirúrgica.

## INTRODUCTION

Patients who have upper gastrointestinal obstruction and difficulties or inability in swallowing, may need temporary or permanent nutritional support obtained by gastrostomy and jejunostomy<sup>16</sup>. These interventions, traditionally made by laparotomy, present high percentage of surgical and respiratory complications, having been reported morbidity rates up to 50% and mortality up to 35%<sup>3,5</sup>. The laparoscopic approach is a promising alternative in performing jejunostomy and gastrostomy, similarly made like conventional interventions through laparotomy<sup>10,18</sup>. However, when performed it alone in the traditional way, have the disadvantage of requiring intra-cavity sutures, which are difficult to perform, imply specific and extensive training, and increase the operative time<sup>9</sup>. Video-assisted laparoscopy allowed the union of the benefits provided by a minimally invasive technique, security, simplicity and effectiveness provided by well standardized laparotomy method<sup>14,20</sup> and allows performing additional diagnostic procedures in case of obstructive esophageal and gastric cancer<sup>5,12</sup>.

This study aims to describe the methods of gastrostomy and jejunostomy video-

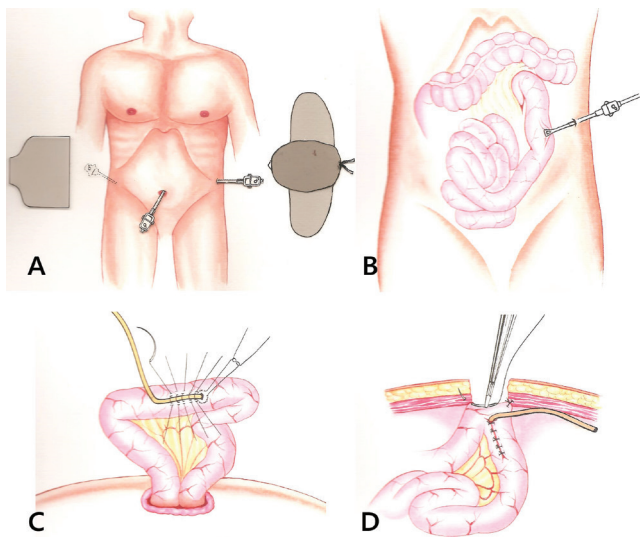
assisted, and to compare video-assisted laparoscopy and laparotomy surgical approaches in patients with advanced esophageal and gastric cancers, for enteral nutritional access.

## METHOD

### Technique of video-assisted laparoscopic jejunostomy

The surgeon's position is to the left of the patient, the assistant and the equipment on the right in front position about the patient's abdomen. The initial abdominal technique preparation approach is as follows: 1) transverse incision of 1 cm in the supra-umbilical region; 2) intra-abdominal pressure of 14 mmHg; 3) use of 30° optics; 4) inspection of the cavity, to complement the staging; 4) another 10 mm trocar on the left side under direct vision at the left axillary line in location that can be further used for jejunostomy externalization; 5) it is possible to introduce an accessory trocar of 5 mm on the right side, in the midclavicular line, to facilitate the exposure of the transverse mesocolon and the localization of duodenojejunal angle.

With the patient positioned in Trendelenburg, the duodenojejunal angle is identified. A jejunal loop is grasped at about 20 cm in order to reach the abdominal wall using forceps and pulling out the trocar and loop, extruding the whole set. Then, pneumoperitoneum is undone and an expansion of the incision about 3 cm is realized to begin the extraperitoneal surgical time, being held Witzel jejunostomy. With four cotton 4-0 sutures the jejunum is fixed. The jejunum is returned to the abdominal cavity and the sutures previously done are used to fix the jejunum to the peritoneum on the left. The pneumoperitoneum is redone to check the jejunostomy position (Figure 1)



**FIGURE 1** - A) Surgeon positioning and location of the trocars; B) grasping in proximal jejunal loop; C) performing the jejunostomy outside the abdominal cavity; D) establishment the jejunostomy fixation

### Technique of video-assisted laparoscopic gastrostomy

Surgeon is positioned on the left of the patient, the assistant and equipment to the right in front at the level of the patient's abdomen. The initial preparation of the abdominal access technique is as follows: 1) transverse incision in the skin, 1 cm in supra-umbilical region; 2) intra-abdominal pressure of 14 mmHg; 3) use of 30° optics; 4) inspection of the cavity to complement the staging; 4) introduction of another 10 mm trocar in the left upper quadrant region, for the externalization of the Stamm-Caricchio gastrostomy. Surgical manipulation starts with the identification of the body/antrum transition of the stomach, on middle point between the large and small

curvatures, and grasping gastric segment with atraumatic forceps introduced through the trocar on left hypochondrium. Follows the externalization to the stomach together with tweezers and trocar through abdominal incision, increased to 3 cm, and undone the pneumoperitoneum. Stamm-Caricchio gastrostomy is realized extraperitoneally. The stomach is returned to the abdominal cavity and secured with four cotton 4-0 sutures. The pneumoperitoneum is redone for evaluation the correct fixation of the stomach (Figure 2).



**FIGURE 2** - A) Positioning of the trocars; B) making the gastrostomy outside the abdominal cavity; C) fixing the gastrostomy

## RESULTS

Were analyzed prospectively 78 patients undergoing surgery in Hospital das Clínicas, School of Medicine, University of São Paulo, São Paulo, SP, Brazil, being 36 jejunostomies (18 by laparotomy and 17 by laparoscopy) and 42 gastrostomies (21 per side). The indication was the establishment of surgical access for enteral nutrition in patients with obstructive and unresectable cancer of esophagus and stomach. The distribution of patients according to demographics, diagnosis and type of procedure, correlating respectively the percentages for the indications by jejunostomy and gastrostomy and through open or laparoscopic approach, follows bellow.

### Jejunostomy: laparotomy vs laparoscopy, or in isolated procedures

The mean age was 65.3 vs 58.8 years. Respectively, the diagnosis was: a) gastric cancer 78.9% vs 76.5%, and cancer of the cardia 5.3% vs 17.6%; b) in isolated procedures, not compared, cancer of the gastric stump 15.8% and cancer of the esophagus 5.9%. Operating time was: 132 min (45-195) vs 106 min (60-150) ( $p=0.021$ ). Intraoperative technique difficulties were nil vs localization of duodenojejunal angle in one case ( $p=0.472$ ). Intraoperative complications: nil vs nil ( $p=1.0$ ). Postoperative complications: nil vs nil ( $p=.0$ ). Postoperative systemic complications: bronchopneumonia + ileum one case vs ileum one case ( $p=0.605$ ). Reintroduction of diet: 3.3 days (2-7) vs 2.1 days (1-4) ( $p=0.009$ ). Discharge: 5.8 days (3-11) vs 4.3 days (2-8) ( $p=0.044$ ). Mortality: zero vs one ( $p=1.0$ ).

### Gastrostomy: laparotomy vs laparoscopy, or in isolated procedures

The age was 60.3 vs 55.9 years. The diagnosis was: cancer of the esophagus 85.7% vs 85.7%; cancer of the cardia 14.3% vs 14.3%. The operative time was 122.6 min (45-190) vs 86.2 min (45-190) ( $p=0.012$ ). Intraoperative technique difficulties to mobilize stomach in one case vs nil ( $p=1.0$ ). Intraoperative complications: nil vs nil ( $p=1.0$ ). Postoperative technical complications: ostomy leakage in one case vs ostomy leakage in two cases ( $p=0.488$ ). Postoperative systemic complications: nil vs liver failure one case and bronchopneumonia one case ( $p=0.488$ ). Reintroduction of diet: two days (1-3) vs 1.8 days (1-2) ( $p=0.327$ ). Discharge: 5.1 days (2-12) vs 3.7 days (2-10) ( $p=0.016$ ). Deaths: zero vs. one ( $p=0.689$ ).

## DISCUSSION

The gastro and jejunostomies are widely used procedures and easy to perform. They are indicated when there is need for prolonged enteral feeding, which can be temporary or permanent. Can be performed by laparotomy, endoscopy, radiology, solely or combined laparoscopy and video-assisted laparoscopy<sup>2,4,6,7,8,13</sup>. They have great durability, do not cause discomfort to the airways, have good tolerance and social acceptability.

The ostomy performing by laparotomy requires surgical center, can be performed under local or general anesthesia and is costly procedure; however, can be performed by one surgeon, with basic surgical instruments, using probe which is easily found in hospital<sup>7</sup>. The laparotomy allows performing additional surgical staging. It is effective for tumor extirpation, when possible, in addition to enabling both procedures as a palliative or definitive treatment in advanced malignancies. However, it has significant values in relation to mortality, major complications, and total number of complications<sup>5,12</sup>. The ostoma morbidity by laparotomy, varies from 13.2 to 50%<sup>3</sup> and the procedure-related mortality from 0.5 to 37%<sup>3,14</sup>. Can cause systemic complications, such as aspiration and pneumonia. In this study, related to postoperative technique and complications, one patient submitted to laparotomic gastrostomy showed leakage around the probe, which also occurred in two patients who were treated via video-assisted; not at all, however, there was not systemic effects and the treatment was only local. There were no such complications on patients who underwent jejunostomy. In this study, there was one case of severe pneumonia in patients with laparotomic jejunostomy, who developed respiratory failure and death on the 16<sup>th</sup> day after surgery.

In patients treated with video-assisted gastrostomy there was only one case of pneumonia diagnosed postoperatively, which was clinically treated with good outcome. In summary, the cases of pneumonia reported in the present study were independent of access used and the probe location.

Access exclusively by laparoscopy has advantages related to minimally invasive surgery, providing less pain in the postoperative period, early feeding, short hospital stay, faster recovery in physical and social activities. It also allows the intraoperative diagnosis and makes the procedure done under direct vision. The exclusive laparoscopic approach has the disadvantage to require four portals, one for the optical, two working tweezers and one for the ostomy externalization. It demands long period for implementation of the operative procedure. Furthermore, the technical procedure is very difficult in regard to the placement of the probe and probe fixation into loop, and also the intra-abdominal fixation particularly in jejunostomies, requiring great skill and training by professional team, being no longer simple intervention, requiring expertise in intra-abdominal sutures<sup>11,15,21</sup>. To alleviate the difficulties imposed by exclusively laparoscopic method, some authors have used T-shaped rods, which help the presentation of the jejunum or stomach, with better exposure to carrying out interventions. Laparoscopy, meets the principle of laparotomy - direct view of the structures - and safe procedure, especially in cases of previous abdominal surgery or adhesion formation, but without the incision complications related to laparotomy<sup>7,20</sup>.

Video-assisted approach has the advantage to put together safety, effectiveness, easiness and the simplicity of laparotomy route associated to the benefits provided by minimally invasive surgery, and does not require special equipment or instruments for their implementation. The video-assisted means has no absolute contraindications and its significant advantage is reducing the incidence of complications related to the surgical wound, being held by

minimal incision under direct vision. It has less pain in the postoperative period, rapid introduction of diet, discharge and early rehabilitation and limits contact between surgeon and patient's blood. It is safe method for easy carrying and demand little time for its realization. It also allows examination of the cavity and complementary surgical staging of malignancies. Other advantages can be attributed to laparoscopic surgery, such as lower rate of pulmonary complications, less compromised immune system related to the surgical trauma and rapid restoration of intestinal transit<sup>17</sup>.

This was also observed in this sample where the restoration of bowel function was delayed in two patients treated by laparotomy, prolonging the beginning of treatment and discharge. Patients treated with video-assisted jejunostomy had earlier diet introduction compared to laparotomic route, but there was no significant difference on diet introduction in patients treated with gastrostomy. This difference can be explained by the type of diet, which is used in gastrostomy and jejunostomy. The jejunostomy is more elaborate, and sometimes more difficult to adapt.

Surgical time for both gastrostomy and video-assisted jejunostomy was significantly lower than those treated by laparotomy. The procedures performed with it were easy to perform, simple, did not require special tools, were performed within a short operative time, since there was no need for the abdominal cavity closure. These data were confirmed in this study. The number of days for hospital discharge was significantly lower in patients treated by laparoscopic surgery compared to those undergoing laparotomy operation, due its minimally invasive access.

The gastro and jejunostomy analyzed in the present study may be added to those already known indications of laparoscopic surgery

## CONCLUSIONS

The comparative analysis of laparotomic and video-assisted access routes for jejunostomy and gastrostomy concludes that video-assisted approach is feasible method, safe, fast, simple and easy, requires shorter operative time compared to laparotomy, enables diet to start sooner in jejunostomy in relationship to laparotomy, and enables shorter hospital stay compared to laparotomy.

## REFERENCES

1. Antonoff MB, Hess DJ, Saltzman DA, Acton RD. Modified approach to laparoscopic gastrostomy tube placement minimizes complications. *Pediatr Surg Int*. 2009 Apr;25(4):349-53.
2. Bobowicz M, Makarewicz W, Polec T, Kopiejć A, Jastrzębski T, Zieliński J, Jaśkiewicz J. Totally laparoscopic feeding jejunostomy - a technique modification. *Wideochir Inne Tech Malo Inwazyjne*. 2011 Dec;6(4):256-60.
3. Franken J, Mauritz FA, Suksamanapun N, Hulsker CC, van der Zee DC, van Herwaarden-Lindeboom MY. Efficacy and adverse events of laparoscopic gastrostomy placement in children: results of a large cohort study *Surg Endosc*. 2014 Oct 8. [Epub ahead of print]
4. Hermanowicz A, Matuszczak E, Komarowska M, Jarocka-Cyrta E, Wojnar J, Debek W, Matysiak K, Klek S. Laparoscopy-assisted percutaneous endoscopic gastrostomy enables enteral nutrition even in patients with distorted anatomy. *World J Gastroenterol*. 2013 Nov 21;19(43):7696-700.
5. Huang K, Wu B, Ding X, Xu Z, Tang H. Post-esophagectomy tube feeding: a retrospective comparison of jejunostomy and a novel gastrostomy feeding approach. *PLoS One*. 2014 Mar 21;9(3):e89190
6. JimenezRodriguez RM, Lee MR, Pigazzi A. Trocarguided laparoscopic feeding jejunostomy: a simple new technique. *Surg Laparosc Endosc Percutan Tech*. 2012 Oct;22(5):e250-3.

7. Liu R, Jiwane A, Varjavandi A, Kennedy A, Henry G, Dilley A, Currie B, Adams S, Krishnan U. Comparison of percutaneous endoscopic, laparoscopic and open gastrostomy insertion in children. *Pediatr Surg Int*. 2013 Jun;29(6):613-21.
8. Liu YY, Liao CH, Chen CC, Tsai CY, Liu KH, Wang SY, Fu CY, Yeh CN, Yeh TS. Single-incision laparoscopic-assisted jejunostomy tube placement. *J Laparoendosc Adv Surg Tech A*. 2014 Jan;24(1):22-7.
9. McCoy AC, Gasevic E, Szlabick RE, Sahmoun AE, Sticca RP. Are open abdominal procedures a thing of the past? An analysis of graduating general surgery residents' case logs from 2000 to 2011. *J Surg Educ*. 2013 Nov-Dec;70(6):683-9.
10. Mizrahi I, Garg M, Divino CM, Nguyen S. Comparison of laparoscopic versus open approach to gastrostomy tubes. *JSLs*. 2014 Jan-Mar;18(1):28-33.
11. Mohiuddin SS, Anderson CE. A novel application for single-incision laparoscopic surgery (SILS): SIL jejunostomy feeding tube placement. *Surg Endosc*. 2011 Jan;25(1):323-7.
12. Nussbaum DP, Zani S, Penne K, Speicher PJ, Stinnett SS, Clary BM, White RR, Tyler DS, Blazer DG 3rd. Feeding jejunostomy tube placement in patients undergoing pancreaticoduodenectomy: an ongoing dilemma. *J Gastrointest Surg*. 2014 Oct;18(10):1752-9.
13. Palmer LB, McClave SA, Bechtold ML, Nguyen DL, Martindale RG, Evans DC. Tips and tricks for deep jejunal enteral access: modifying techniques to maximize success. *Curr Gastroenterol Rep*. 2014 Oct;16(10):409.
14. Patel K, Melhado R, Whiting J. Laparoscopically assisted insertion of feeding jejunostomy. *Ann R Coll Surg Engl*. 2012 Apr;94(3):210.
15. Pili D, Ciotola F, Riganti JM, Badaloni A, Nieponice A. Autoadjustable sutures and modified seldinger technique applied to laparoscopic jejunostomy. *World J Surg*. 2015 Feb;39(2):325-7.
16. Pinotti HW, Oliveira MA, Raia A. Alimentação enteral por jejunostomia: técnica e indicações. *Rev Hosp Clin Fac Med São Paulo*. 1980;35(5):255-7.
17. Sousa AL, Sousa D, Velasco F, Açucena F, Lopes A, Guerreiro H. Rare complication of percutaneous endoscopic gastrostomy: Ostomy metastasis of esophageal carcinoma. *World J Gastrointest Oncol*. 2013 Nov 15;5(11):204-6.
18. Tous Romero MC, Alarcón del Agua I, Parejo Campos J, Oliva Rodríguez R, Serrano Aguayo P, Hisnard Cadet Dussort JM, Pereira Cunill JL, Morales-Conde S, García-Luna PP. Comparison of two types of surgical gastrostomies, open and laparoscopic in home enteral nutrition. *Nutr Hosp*. 2012 Jul-Aug;27(4):1304-8.
19. Vanderlinden K, Van De Winkel N, De Backer A, Delvaux G, De Vogelaere K. Early experience with single-incision laparoscopic surgery for the placement of a gastrostomy in a 10-year-old girl: a case report. *J Med Case Rep*. 2012 Nov 6;6:375.
20. Villalona GA, Mckee MA, Diefenbach KA. Modified laparoscopic gastrostomy technique reduces gastrostomy tract dehiscence. *J Laparoendosc Adv Surg Tech A*. 2011 May;21(4):355-9.
21. Wragg RC, Salminen H, Pachi M, Singh M, Lander A, Jester I, Parikh D, Jawaheer G. Gastrostomy insertion in the 21st century: PEG or laparoscopic? Report from a large single-centre series. *Pediatr Surg Int*. 2012 May;28(5):443-8.