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Research Article

Laparoscopic Gastrostomy in Children: 10 Years of Experience

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Abstract

Objectives: Laparoscopic gastrostomy is a widely used procedure in children with failure to thrive, feeding disorders, or neurologic impairment. Various methods of laparoscopic gastrostomy and fixing stomach to abdominal wall have been described. Trocar site primary gastrostomy under laparoscopic control is a simple and easy technique that does not require special instruments and a kit. The aim of this study was to present 10 years of experience in laparoscopic gastrostomy.

Methods: The charts of 128 children who underwent laparoscopic gastrostomy between 2006 and 2016 were retrospectively reviewed. The data, including demographics, operative procedures, and complications, were recorded. All children underwent preoperative contrast imaging and 24-hour Ph monitorization. In all patients, the trocar site primary gastrostomy was done. A gastrostomy tube or a button was inserted into the stomach in the center of a purse–string suture loop, and the stomach was fixed to the anterior rectus sheath extracorporeally.

Results: There were 49 girls (38.3%) and 79 boys (61.7%). The mean age was 50 months at surgery (1 day–18 years), and the average body weight was 13 kg (2300 gr–65 kg). Both laparoscopic Nissen fundoplication and gastrostomy were done in 116 (90.6%) patients, and 12 (9.4%) patients had only laparoscopic gastrostomy. Infection at the site of gastrostomy, which was treated by antibiotics, was the most common complication, observed in 14 (11%) patients. Peritoneal leakage within 30 days was seen in 9 (7%) patients. Severe dislodgement of gastrostomy resulting in operative intervention occurred in 5 (3.9%) patients. Granuloma developed in 4 (3.1%) patients and was treated with silver nitrate.

Conclusion: The trocar site primary laparoscopic gastrostomy is a safe and easy technique with complication rates comparable to other gastrostomy methods.

Keywords: Child; fundoplication; gastrostomy.

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Gastrostomy practice provides long-term enteral feeding in children whose energy and nutritional requirements are not entirely achieved by oral nutrition, and it is generally required in patients with cardiac and neurological deficits.[1, 2] The basic approach in gastrostomy for a long time usually consisted of open gastrostomy using the Stamm technique.[3] Since the application of the Stamm technique, minimal invasive procedures such as percutaneous endoscopic gastrostomy and laparoscopic gastrostomy (LG) have been developed.[4]

With the development of laparoscopic surgery in children, application of LG has also gained popularity.[1] The LG application was first cited in the literature in 1991.[5] Since its implementation, LG has undergone different modifications to reduce its complication rates and facilitate the operation technique.[6-9]

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Methods, including percutaneous endoscopic gastrostomy (PEG), fluoroscopy-assisted gastrostomy, and laparoscopy--assisted PEG application are currently used.[3] This study aimed to present a 10-year clinical experience with LG in children.

Methods

For this study, the data of 128 patients who underwent LG with the same technique in our pediatric surgery clinic between 2006 and 2016 were retrospectively reviewed, and sociodemographic data, surgical technique, complication rates, time to full nutrition, and hospitalization period were examined.

The study was carried out in accordance with the Helsinki Declaration of the World Medical Association, and the study approval (No: 93938938) was obtained from the Ethics Committee of our university. An enlightened consent form was obtained from the parents of all patients that would allow the routine use of the patient's data received at all surgeries.

Preoperative Preparation

Before LG, routine 24-hour pH monitoring and contrast-enhanced upper gastrointestinal (GIS) system imaging were performed in all technically feasible patients as a gastroesophageal reflux (GER) scanning.

Surgical Technique

In patients who underwent the Nissen fundoplication, a 4 mm or 5 mm camera trocar, selected according to the weight of the patient, was inserted through an umbilical incision, and intra-abdominal insufflation was performed with CO_2. A 3-to-5 mm working trocar was inserted through the incision made at the lateral aspect of the right lateral rectus muscle, and a Nathanson retractor was inserted under the xiphoid bone to retract the liver. From the left upper quadrant where gastrostomy would be performed, an incision was made approximately 2 cm below the costal arch and lateral to the left rectus muscle, and through this insertion, a 3-to-5 mm trocar was inserted.

Arteriae gastrica breves (short gastric arteries) were lowered to mobilize the gastric fundus. A new abdominal esophagus that was 4 cm in width was constructed. The fundus was passed through the window behind the esophagus and rotated 360 degrees to wrap the esophagus. The first suture was passed between two parts of the stomach, second one between the stomach–esophagus–diaphragm–stomach, and the third one between esophagus–stomach, and finally the fundoplication procedure was completed. The avascular area of the greater curvature was held with an atraumatic grasper, and the left-sided trocar was pulled up. Then the gastrostomy tract was opened, and the trocar was fixed to the fascia. Afterwards, a camera port was inserted to control the gastrostomy tract before the procedure termination.

In patients who would undergo only gastrostomy, after the insertion of a camera trocar, a 3-to-5 mm working trocar was inserted through the incision made on the lateral aspect of the right lateral rectus muscle on the left upper quadrant. The avascular area of the greater curvature was held with an atraumatic grasper, and the left-sided trocar was pulled up. Then the gastrostomy tract was opened, and the trocar was fixed to the fascia. Afterwards, a camera port was inserted to control the gastrostomy tract before the procedure termination.

Postoperative Period

Twenty-four hours after the operation, the patients started to be fed with the infusion of nutrients delivered through the gastrostomy tube, and the amount of nutrition was gradually increased. During the hospitalization period, the parents of the patients were taught to use the gastrostomy tube and nutrition machine, and they were also taught about the gastrostomy care. Patients were discharged after switching to total parenteral diet if they did not have any additional diseases requiring further hospitalization. After discharge, the patients were followed up at home by nutrition nurses, and the families were helped with relevant issues.

Results

Forty-nine (38.3%) patients were female and 79 (61.7%) were male. The mean age was 50 months (1 day–18 years), and the mean patient weight was 13 kg (2300 gr–65 kg). Neurological disease with swallowing dysfunction was detected in 105 (82%), persistent, but unexplained vomiting in 7 (5.5%), long-term esophageal atresia in 5 (3.9%), corrosive esophagus in 3 (1.5%), arthrogryposis multiplex in 2 (1.6%), and vocal cord paralysis and vocal cord paralysis, Pierre–Robin syndrome, multiple congenital anomalies, and glycogen storage disease Type 1 were detected in 1 patient each.

The mean duration of surgery was only 44 min (30–60 min) in LG-treated patients and 80 min (80–210 min) in 116 patients with simultaneous fundoplication. Laparoscopic Nissen fundoplication was performed in all patients. Fourteen patients underwent nasopharyngeal fundoplication and gastrostomy with simultaneous bronchoscopy-guided percutaneous tracheostomy. One patient underwent cholecystectomy, and the Meckel diverticulum of another patient was excised. One patient underwent diagnostic lymph node biopsy, and the other one skin biopsy.

All operations were terminated laparoscopically. Postoperatively, total enteral feeding was delayed on average by 2.5 days (1–4 days), and the mean postoperative hospital stay was 3.7 days (3–5 days) after LG. Patients were called for control within 30 days of discharge. Postoperatively, control contrast-enhanced upper GIS imaging of all patients with GER symptoms was obtained, and GER was not observed in any of the patients. The most common postoperative complication was peristomal infection (n=14, 11%), which regressed with local or systemic antibiotic therapy.

Other complications included peristomal leakage (n=9, 7%), dislodgement of the gastrostomy tube (n=5, 3.9%), and granuloma formation around the gastrostomy tube that regressed with local application of silver nitrate (n=4, 3.1%).The median postoperative follow-up period was 63.8 months (8–120 months). Patients were routinely referred for controls at the 1st, 3rd, 6th, and 12th months. Patients who applied to the departments related to the comorbidities were also followed up in our pediatric surgery clinic.

Discussion

LG is considered to be the gold standard for patients who cannot be fed orally but whose GIS can tolerate nutrition.[10] The majority of this group of patients is fed with the aid of an NG tube before the operation. Although the NG tube provides complete enteral feeding for feeding purposes, it has also some disadvantages.

These disadvantages may occur due to complications experienced during the NG tube placement or due to its long-term use. Complications such as pharyngeal discomfort, nasogastric syndrome, sinusitis, nasotracheal intubation, esophagitis, gastritis, and gastric bleeding may be encountered during and shortly after the insertion of an NG tube. More severe complications in children who have been fed for a long time with a NG tube may be encountered including the erosion of the nasal alae, knotting of the tube in the esophagus or stomach, GER, pneumothorax, and tracheoesophageal fistula.[11–13]

Since the NG tube is not needed after the LG application, these complications are also avoided. Low complication rate, an early onset of full postoperative feeding and a shorter postoperative hospital stay make LG as a preferable technique in a comparison with open technique.[14] Since the clinic has no open gastrostomy experience during the mentioned study period, it could be compared with the literature data instead of the data of the clinic. In the study performed by Bankhead et al.,[15] total enteral feeding was started routinely 2.1 days after the operation on an average; in our clinic, routinely, enteral feeding was started 24 hours after the surgery on an average in the patients who underwent LG. In a study by Collins III et al.,[14] total enteral feeding was initiated 4.78 days on an average after open gastrostomy and 2.5 days following LG. In the same study, the duration of postoperative hospitalization was 10.73 days for open gastrostomy and 3.7 days for LG-treated patients.[14]

Compared with the patients who underwent open gastrostomy, the onset of feeding after operation, the time elapsed from the onset of feeding to total enteral nutrition, and postoperative hospital stay were relatively shorter in patients who underwent LG. Since the LG technique requires basic laparoscopic surgical experience, and basic laparoscopic instruments, it can be easily and more widely applied in most centers.[16]

Compared to other gastrostomy insertion techniques, the incidence of complications is lower in the LG application.[17] In one of the studies conducted, the following complications after the insertion of an open gastrostomy tube were detected: peristomal infection (17.1%), leakage (20%), and dislodgement of the gastrostomy tube (17.1%).[18] In the present study, post-LG peristomal infection (11%), leakage (7%), and dislodgement of the gastrostomy tube (3.9%) were detected. One of the major advantages of LG application is that it can be easily applied in esophageal atresia or corrosive esophageal strictures unsuitable for PEG.[16] Since the gastrostomy balloons used in the LG technique can be easily removed, the patient does not need to receive general anesthesia for the second time at the time of tube replacement.[17]

In the studies performed, local peristomal infections were observed in 3.3%–11% of PEG patients, 6.5%–18.5% of the patients during fluoroscopy-assisted gastrostomy, and in 9%–10% of the patients who underwent laparoscopic-assisted PEG, while in this study, peristomal complications were seen in 11% of the patients who underwent laparoscopic-assisted PEG.[3, 19, 20] In these studies, peristomal leakage was observed in 3%–17% of the patients who had underwent PEG and 3%–26% of the patients who received the fluoroscopy-guided gastrostomy. On the other hand, peristomal infection was detected in 3–4.5% patients who had undergone fluoroscopy-assisted gastrostomy and 3%–26% of the patients who had received laparoscopy-assisted PEG, while 0%–41% of the patients in our series had peristomal leakage.[7, 19, 20]

In the studies, major complications such as colonic placement of the gastrostomy tube and pneumoperitoneum were detected in various gastrostomy methods mentioned, while they were not observed in any of our patients. Minor complications such as peristomal infection and leakages are similar to those mentioned in other methods, and LG

application may be preferred with the intention to refrain from major complications.[3, 19, 20]

The LG application is not technically compelling and can be done by all pediatric surgeons who have laparoscopy experience. Because of the low rate of postoperative complications and a small number (if any) of contraindications, primary LG can be performed easily and safely through the trocar entry site in all children with malnutrition compared to other techniques.

Disclosures

Ethics Committee Approval: The study was carried out in accordance with the Helsinki Declaration of the World Medical Association, and the study approval (No: 93938938) was obtained from the Ethics Committee of our university.

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