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Laparoscopic Percutaneous Endoscopic Gastrostomy Is Useful for Elderly

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ABSTRACT

Background: In recent years, enteral nutrition has become relatively easy to perform through the penetration of percutaneous endoscopic gastrostomy (PEG). However, there have been reports of complications, such as mispuncture of other organs at the time of performing PEG. Previously, we had constructed a gastrostomy under the laparotomy for difficult PEG cases, and 2 years ago, we introduced laparoscopically assisted PEG. This study aimed to clarify the feasibility and safety of LAPEG for elderly people over 65 years old.

Methods: We evaluated the perioperative outcomes in 7 elderly patients who underwent LAPEG during these 2 years. In these subjects, the safety of LAPEG was evaluated retrospectively based on the surgical outcomes, perioperative complications, and postoperative course using the clinical archives.

Results: The subjects' mean age was 81.1 ± 8.03 years. LAPEG was successful in all 7 patients. The median operation time was 38 minutes (range, 31–71 minutes). Intraoperative and postoperative early or late complications from LAPEG were not observed in our cases. Enteral nutrition was commenced 2 days after PEG placement in all cases without complications.

Conclusion: We summarized the LAPEG cases performed at our institution for the elderly, and have reported its feasibility and safety. The strongest advantage of LAPEG was that it allowed placement of the PEG without any complication under direct observation of the intraperitoneal cavity to confirm the safety of each organ.

Key Words: PEG; Laparoscopy; Elderly.

INTRODUCTION

Tube enteral nutrition is a useful method when an oral diet is either insufficient or impossible.[1] Since percutaneous endoscopic gastrostomy (PEG) was first reported as an optional procedure of tube feeding by Gauderer et al[2] in 1980, it has been performed relatively safely to improve the quality of life of patients who have difficulty eating. Therefore, we first perform PEG for patients who require tube feeding. However, the major complications related to PEG include the following: colonic perforation, small bowel and hepatic injury, gastrointestinal bleeding, and local or generalized infection. In some cases, such as colonic injury, emergency surgery is essential.[3–6] To avoid these complications, we introduced laparoscopically assisted PEG (LAPEG) involving insertion of the PEG Kit under the direct observation of the abdominal cavity by laparoscopy. Currently, when PEG placement is difficult, LAPEG is performed in our institution.

To date, of the several reports on LAPEG, the majority concern pediatric patients.[7] Despite the fact that society is expected to become an aging society in the future, there is no report that has evaluated the effectiveness and safety of LAPEG in the elderly. We aimed to determine whether LAPEG is safe and useful in elderly patients over 65 years old who were unable to undergo PEG placement by reviewing 7 cases of LAPEG that were performed in our institute over a period of 2 years.

PATIENTS AND METHODS

We select LAPEG if the risk of complications due to PEG is thought to be high based on computed tomography (CT) and gastrointestinal fiberscope (GIF) findings, which are determined before performing PEG. Thus, we diagnosed 42 cases as PEG indication, 35 of them

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Informed consent: Dr. Tanaka declares that written informed consent was obtained from the patient/s for publication of this study/report and any accompanying images.

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performed PEG and 7 patients performed LAPEG at our institution from April 2017 to March 2019. We retrospectively reviewed the medical records on patient characteristics (**Table 1**) and surgical outcomes (**Table 2**) of 7 cases of LAPEG performed. PEG could not be performed in these cases due to the findings of the GIF or CT. We examined the principles of safe placement by observing endoscopically visible focal finger invagination sign and transillumination sign[5,6] in order to determine whether PEG is possible (**Figure 1a**). Furthermore, CT examination confirmed the presence or absence of overlap of other organs, such as the transverse colon over the anterior gastric wall. Informed consent was collected from all patients before performing LAPEG. Comparisons among the PEG placement in difficult cases and prevalence of kyphoscoliosis, in which the spine bends back, were evaluated.

Procedure of LAPEG

All patients underwent general anesthesia after preoperative evaluation by anesthesiologists. A 12-mm umbilical trocar was placed for the laparoscope using Hasson's open technique (**Figure 2X**).[8] Pneumoperitoneum was established via a trocar using carbon dioxide, and the intra-abdominal pressure was maintained at 8 mm Hg, and the abdominal cavity could be sufficiently observed. A 5-mm trocar was used to gain access to the abdominal cavity in the right upper quadrant so that it was on the opposite side of the PEG placement (**Figure 2Y**). The state of the abdominal cavity was observed through the laparoscope (**Figure 3A**), and the translocation of the stomach or the displacement of the transverse colon over the anterior gastric wall were corrected appropriately (**Figure 3B**). Additional ports were placed as necessary for the retraction of organ lysis of adhesion. After insertion of the gastrointestinal fiberscope into the stomach and air insufflation, the abdominal incision position for gastrostomy was decided under endoscopic and laparoscopic guidance (**Figure 2Z**). After the abdominal wall and the stomach wall were fixed with Funada-kit II® device (Create Medic Co., Ltd. Kanagawa, Japan), the PEG kit was pushed into the stomach and placement was performed under complete laparoscopic and endoscopic visualization. The needle and guide wire were inserted through the abdominal wall and punctured into the stomach (**Figure 3c**). Thereafter, gastropexy was performed using this guide wire (**Figure 1, B and C**). Finally, the placement of the PEG was checked by laparoscopy and endoscopy (**Figure 3D; Figure 1D**).

In this study, we followed the principles outlined in the Declaration of Helsinki and obtained the informed consent from all patients whom we investigated.

RESULTS

LAPEG was successful in all 7 patients. **Table 1** shows the characteristics of the patients who underwent LAPEG. Of the 7 patients, 4 were men and 3 were women, and the mean age of the patients was 81.1 ± 8.03 years. The most common identified reason for failed PEG placement was the negative findings of GIF, such as finger invagination sign and transillumination sign, which were shown in 5 cases. In addition, these 5 patients were suffering from severe kyphoscoliosis. The remaining 2 cases were assessed through CT findings such as the displacement of the transverse colon over the stomach. In fact, the view, similar to CT findings,

Table 1.
Patients Characteristics

Case	Age	Gender	Past History	Complaint	GIF Findings	CT Findings	Scoliosis
1	85	F	CH	DS	Finger sign	—	Positive
2	78	M	CI	DS	Finger sign	—	Positive
3	80	M	CI	DS	Finger sign	—	Positive
4	65	F	CI	AP	Finger sign	—	Positive
5	89	M	Perkinson syn	AP	—	Colon	Negative
6	86	M	Disused syn	AP	—	Colon	Negative
7	85	F	CH	DS	Finger sign	—	Negative

AP, aspiration pneumonia; CH, cerebral hemorrhage; CI, cerebrai infarctin; CT finding, colon; colon in front of the stomach; DS, difficulty swallowing; GIF finding, finger sign; abdominally high position of the stomach.

Table 2.
Surgical Outcomes

Case	Number of Ports	Operative Time (Minutes)	Manupiration	Blood Loss	TSE (Days)	Complication
1	2	37	Traction	A little	2	Nothing
2	2	46	Traction	A little	2	Nothing
3	3	71	Adhesiolysis	A little	2	Nothing
4	2	38	Traction	A little	2	Nothing
5	2	64	Traction	A little	2	Nothing
6	2	31	Traction	A little	2	Nothing
7	2	34	Traction	A little	2	Nothing

Traction, traction of organs (stomach or colon) with endoscopic forceps; TSE, time to start enteral feeds.

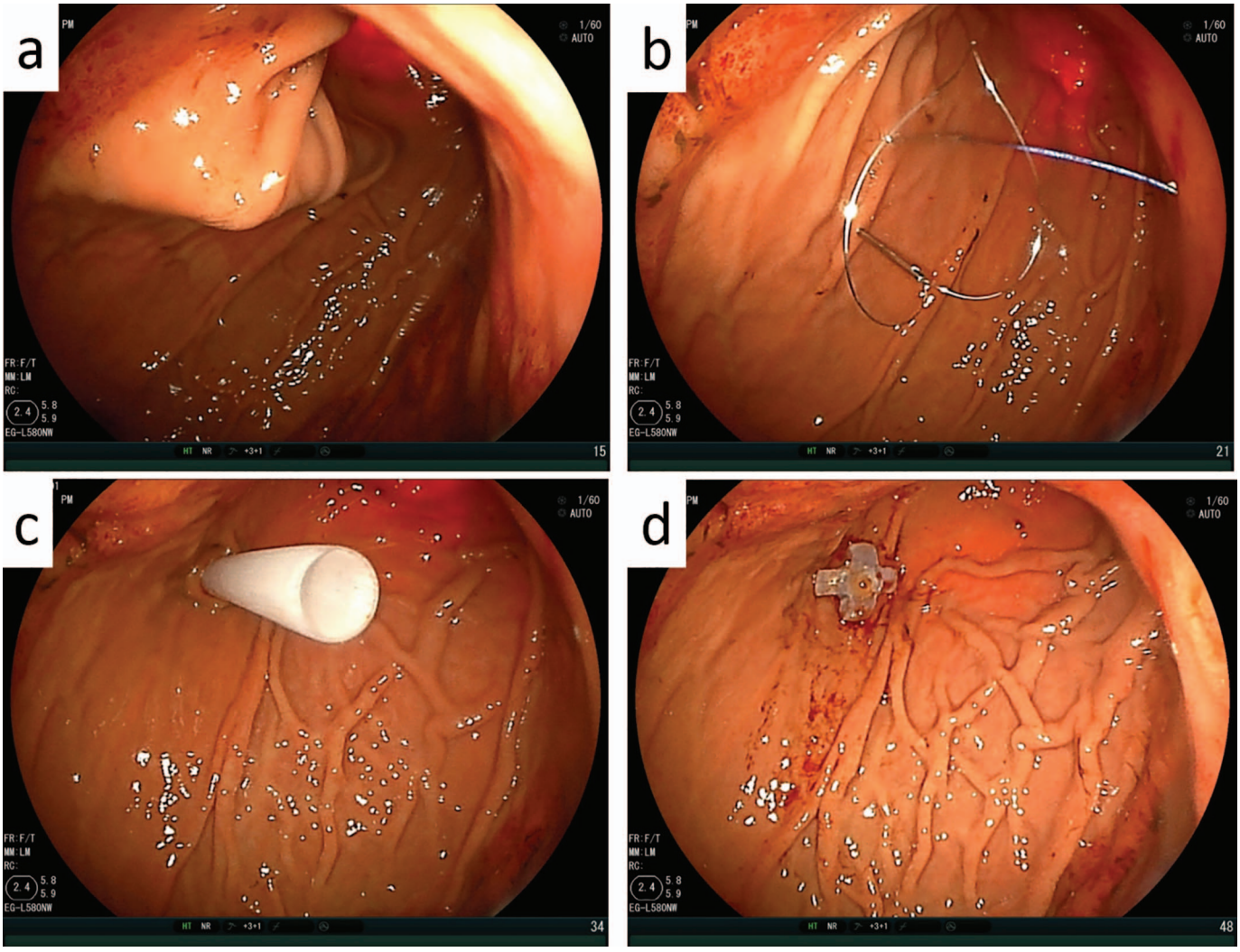

Figure 1. Endoscopic findings. **A**) The stomach wall is pushed from inside the abdominal cavity. **B**) Guide wire puncture into the stomach wall. **C**) Insertion of sheath for the gastrostomy tube. **D**) PEG is performed in the standard fashion.

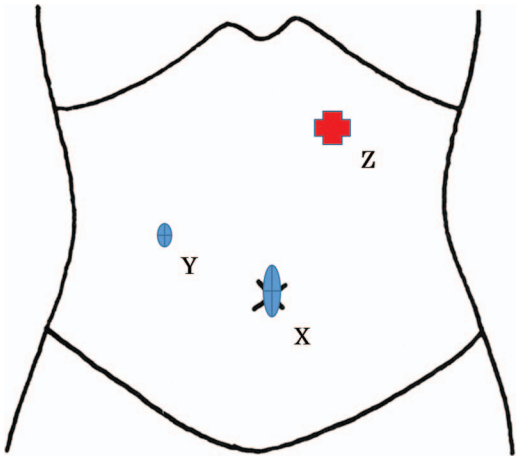

Figure 2. X) Trocar position for the laparoscope. **Y**) Trocar position for the working port. **Z**) Position of the gastrostomy.

was observed with laparoscopy. **Table 2** shows the surgical outcomes of these patients.

In most cases, only 2 ports (i.e., laparoscope port and working port) were required. The median operation time was 38 minutes (range, 31–71 minutes). The case with a previous abdominal surgery (cholecystectomy) required 3 ports and a longer operation time owing to adhesiolysis. The amount of bleeding was extremely small in all cases and no intraoperative complications were observed. One day after the surgery, observation of the presence or absence of complications was performed, and enteral nutrition was commenced 2 days after PEG placement in all cases.

Postoperative early or late complications from LAPEG were not observed in our cases.

DISCUSSION

PEG was first performed on children with severe physical and mental disorders by Gauderer et al[2] in 1980. PEG is commonly applied owing to its convenience of use and safety as well as the improved nutrition management outcome in patients who have difficulty in ingesting food orally, resulting in significantly improved quality of life.

However, there is also a risk of serious complications such as mispuncture of other organs associated with PEG.[9–11] In order to avoid these complications, we attempted to conduct examinations (GIF and CT) in all cases before performing PEG in order to examine the position of the stomach and grasp the positional relationship between the stomach and other organs, such as the intestinal tract, and then decide whether PEG was possible. As a result, there were 7 cases in which PEG placement was difficult out of the 42 cases.

Conventionally, surgical gastrostomy was performed in our institution for PEG difficult cases. However, open surgery was necessarily not a minimally invasive procedure for the elderly. Laparoscopic surgery for gastrostomy can be classified as laparoscopic PEG and LAPEG.[12] LAPEG is a relatively recent technique and was first described in 1993 by Raff et al.[13] Presently, laparoscopic surgery is regarded as the standard operation in cholecystectomy, with indications expanded to other abdominal surgeries, and regarded as a general procedure. To date, we widely performed cholecystectomy, gastrectomy, colon resection, and other abdominal surgery laparoscopically, and the surgical technique and safety was thereby established. We introduced LAPEG in 2017 at our institution. LAPEG can be performed more quickly and easily than laparoscopically assisted PEG and laparoscopic gastrostomy.[14] Although not a new concept, we believe that LAPEG is an interesting option to avoid invasive procedures such as gastrostomy by open surgery in patients in whom PEG cannot be performed, particularly for the elderly.

The usefulness of LAPEG in children with congenital diseases is well known[15–17] and this procedure has been reported to be safe even for adults.[18,19] However, there is no report yet on the safety and usefulness of LAPEG evaluation for the elderly. In an aging society, the number of cases wherein oral intake is difficult is increasing due to the sequelae after cerebrovascular disorder and various neurodegenerative disorders such as Parkinson's disease and severe dementia. Because of swallowing disorder and aspiration pneumonia from these diseases, there is an increasing number of cases in which it is difficult to ingest the necessary nutrition orally, although they have a normal digestive function; therefore, parenteral nutrition management is critical in such cases. With the aging society, the demand for PEG is increasing at present. In this study, it was difficult to place PEG in 7 out of 42 patients. The rate of difficult PEG cases was higher than usual at our institution.[9] Our hospital is located in an aging area and PEG placement for the elderly has often been performed. We considered that kyphoscoliosis, which was often noted in the elderly patients, was the reason for the higher rate. Under laparoscopic observation, PEG tube cannot be placed due to the translocation of the stomach in 5 out of 7 patients with kyphoscoliosis. Kyphoscoliosis has been implicated in the elevation of the stomach toward the head side.[20,21] In the present study as well,

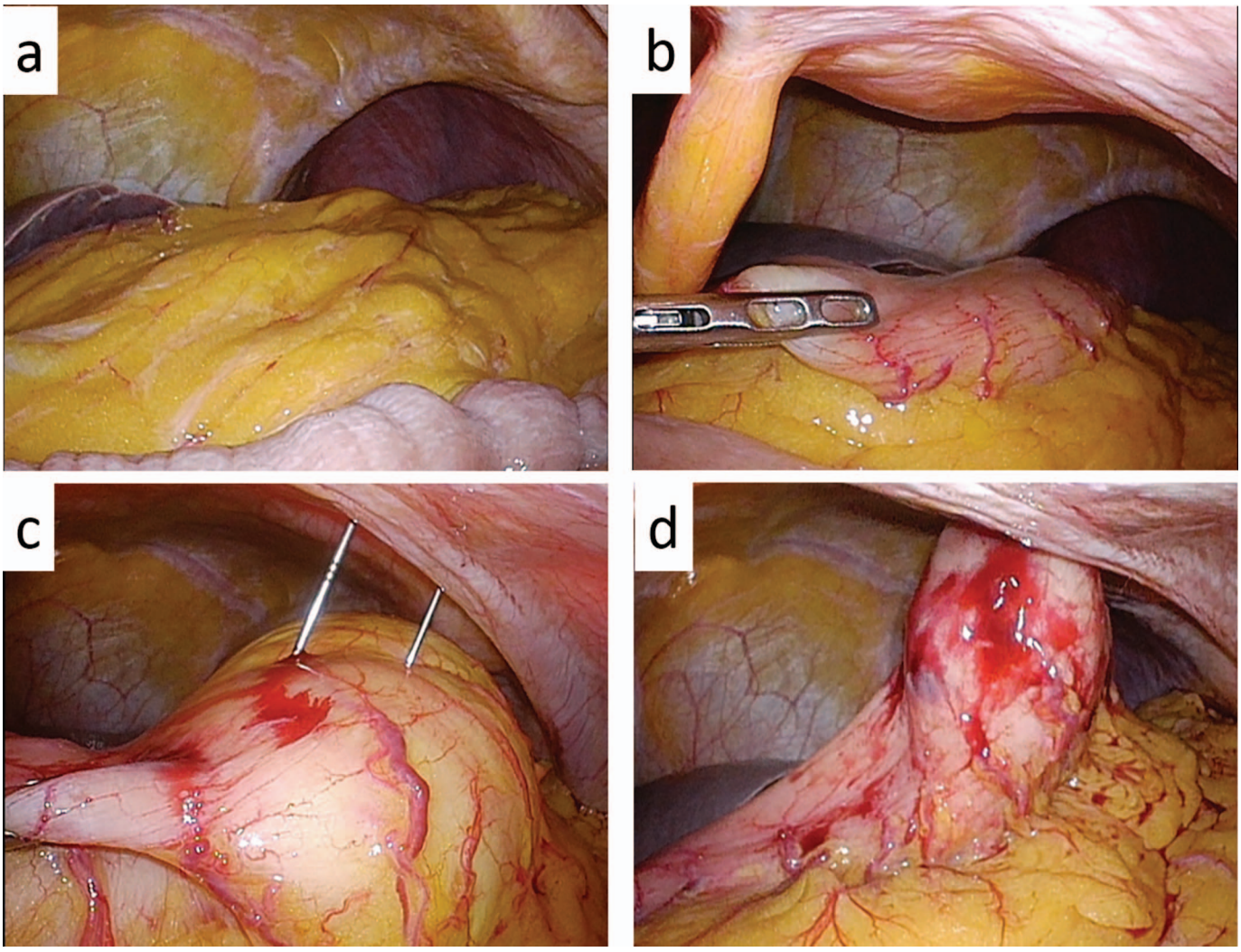

Figure 3. Intraperitoneal findings. **A**) The omentum is overriding the stomach. **B**) Towing of stomach with a pair of forceps for exposing the stomach wall. **C**) The needle is inserted through anterior abdominal wall in the left upper quadrant. **D**) Final result.

kyphoscoliosis was reported in 4 of 5 cases with translocation of the stomach.

In considering the reason why LAPEG can be safely applied in the elderly with organ translocation, the advantage of this method was that the abdominal cavity could be observed directly. Therefore, it was possible to pull the stomach to a normal position as well as to exclude the other organs overlying the stomach under direct observation through laparoscopy.

Continuous laparoscopic monitoring ensured that the omentum, colon, and other organs were not interposed between the stomach and abdominal wall during gastrostomy fixation. Before performing PEG, the positional relationship of organs can be grasped by CT examination and GIF, which makes it possible to avoid mispuncture of organs. However, it is difficult to avoid hemorrhage due to the erroneous puncture of blood vessels, which are present on the surface of the stomach or the grater omentum since it is impossible to comprehend the position of the blood vessels in these examinations before PEG. On the other hand, it is possible to avoid vessel puncture with LAPEG by direct observation of the intraperitoneal cavity.

Indeed, gastrostomy by open surgery is an alternative method when conventional PEG is difficult, and we have performed the same until the introduction of LAPEG. However, we believe that LAPEG is more useful than open surgical gastrostomy because of its short length of

skin incision and minimally invasive features. Moreover, the postoperative pain and superficial skin infection risk is low in LAPEG.[19] In fact, we did not notice any wound infections and no cases required postoperative analgesics. Therefore, we believe that LAPEG is safe for the elderly and considered to be a convenient and minimally invasive method.

However, we consider that there are some problems involved with LAPEG. In this method, we performed general anesthesia for pneumoperitoneum. In cases with poor respiratory function, general anesthesia may be dangerous. We, therefore, believe that there is a room for improvement in the current method. For example, there is a need for a facility to investigate the entire body condition of individual cases and consider the applicability of LAPEG with lumbar anesthesia or epidural anesthesia. Since the observation of the abdominal cavity is sufficiently possible with the current pneumoperitoneum pressure (8 mm Hg), we believe that the reduction of the pressure is possible in the future.

Furthermore, in some cases, position displacement of the stomach was improved only by pneumoperitoneum,[19] which suggests the possibility of reducing the working port for pulling the organ in these cases. In addition, one of the main disadvantages of the LAPEG is its cost, which remains higher than that for other procedures.[22] Since PEG is a standard technique that can be performed safely with a high success rate, LAPEG should be considered for selected cases where PEG cannot be performed safely.

There are some limitations to this study. First, this study was conducted in a single center with a small number of cases. Second, this study is not a direct comparison of LAPEG and other procedures, such as open surgical gastrostomy or LPEG.

CONCLUSION

We have summarized the cases of LAPEG that were performed at our institution for the elderly. This is the first study conducted on the safety of LAPEG for the elderly. The strongest advantage of LAPEG was the ability to place PEG without any complication under observation of the intraperitoneal cavity and confirmation of the safety. Therefore, before the open surgical feeding tube placement, it is simple, safe, and useful for elderly patients to avoid medical invasion. LAPEG is considered to promote further the enteral nutrition in the aging society, which is expected to grow in the future.

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