橫膈缺損併慢性胸腔內胃扭轉的腹腔鏡手術治療

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摘要

胃扭轉是一種罕見的疾病，影響多為老年人。它的發生主要是因為先天性固定胃部韌帶鬆弛所引起。它的發生也常伴隨著橫膈缺損的情形。這有時會導致胃部疝入胸腔內而引起呼吸窘迫或疝入部分發生缺血性或壞疽的變化。這種疾病可以為急性或慢性的形式表現。我們過去十三年內曾為十六位橫膈缺損併慢性胸腔內胃扭轉的病人作腹腔鏡手術治療。所有患者均為繼發型。十二位病人屬於器官軸性胃扭轉型、四位屬於腸系膜軸性胃扭轉型。所有患者均接受非急性手術。所有患者手術後均恢復良好且無明顯併發症。患者住院時間多為五天。手術後，所有患者的胃腸道均通暢。同時，所有患者經該次身體異常矯正手術後其肺功能均有改善。儘管在全球以腹腔鏡手術治療橫膈缺損併慢性胸腔內胃扭轉的經驗有限，但是由我們的結果看來以腹腔鏡技術來處理該疾病似乎是安全和可行的。

關鍵詞：橫膈缺損，慢性胸腔內胃扭轉，腹腔鏡手術

Laparoscopic Treatment of Diaphragmatic Defect and Chronic Intra-thoracic Gastric Volvulus

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Abstract

Gastric volvulus is an uncommon disease condition that affects mostly the elderly. It occurs mainly as a result of congenital laxity of ligament attachments of the stomach. It is also accompanied by a diaphragmatic hernia. This sometimes causes the stomach herniation into the thorax, giving rise to respiratory compromise, herniated part ischemic or gangrenous change. This disease could present as acute or chronic condition. We have managed 16 patients with diaphragmatic hernia and chronic intra-thoracic gastric volvulus under laparoscopy over the past thirteen years; all patients are of secondary type. Twelve (12) patients belong to organoaxial type and four (4) were mesenteroaxial type. Elective surgery was performed for all these patients. All patients recovered well from

Received: Oct. 15, 2015; first revised: Jan. 15, 2016; accepted: March, 2016.
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surgery without evident complications. Most of their hospital stays were five days. After operation, patent gastrointestinal tract was noted in all patients. Besides, all patients showed improvement of pulmonary condition after surgical correction of anatomic anomaly. Even though worldwide experience in laparoscopic surgery for diaphragmatic hernia and chronic intra-thoracic gastric volvulus is limited, our results are encouraging. Based on our experience, laparoscopic technique seems to be safe and feasible in treatment of this disease.

Keywords: Diaphragmatic Hernia, Chronic Intra-Thoracic Gastric Volvulus, Laparoscopic Surgery

I. Introduction

Gastric volvulus is a rare clinical condition [1]. It is defined as obstruction of the gastric lumen due to torsion of the stomach that accompanies intrathoracic herniation. It most commonly affects the elderly [2, 3]. Normally, the stomach is fixed with several ligaments, e.g. hepatic, colic, splenic, and phrenic ligaments. Once one or more of them are loosen, this allows for gastric twisting in different degrees [2]. Usually, the attachments must be stretched and weakened in anatomy. This can also occur in connective tissue disorders, diaphragmatic hernias, or anterior abdominal wall defects [1].

Gastric volvulus is defined as an abnormal rotation of the stomach and it is divided into organoaxial and mesenteroaxial types on the basis of anatomical configuration [2]. Intrathoracic organoaxial volvulus is usually associated with a paraesophageal hernia and is identified as an “upside-down stomach” representing rotation of the stomach into the thoracic cavity [3]. Usually the greater curvature rotates upward in front of the lesser so that the posterior gastric surface lies anteriorly [4]. It may compromise the gastric blood supply which, in turn, leads to gastric ulceration, hemorrhage, gangrene, and perforation [3, 5]. The traditional surgical treatment of gastric volvulus involves upper abdominal laparotomy with gastric detorsion, fixation, and, when present, repair of associated diaphragmatic hernia.

Gastric volvulus may lead to a closed-loop obstruction [3, 6, 7, 8]. The rotation is organoaxial (59%), mesenterioaxial (29%), or a combination of the two (12%). Primary gastric volvulus (30%) has no underlying condition but secondary gastric volvulus (70%) is always associated with underlying conditions such as paraesophageal and diaphragmatic hernias, connective tissue disorders, and anterior abdominal wall defects [9]. Intrathoracic gastric volvulus is a rare complication of diaphragmatic hernia, with an incidence of 5-10 per cent [10, 11].

We present our series of 16 patients who were managed under laparoscopy.

II. Materials and methods

1. Patients

We have performed laparoscopic surgery in 16 patients with diaphragmatic hernia with chronic intra-thoracic gastric volvulus from October 2002 to September 2015 (Table 1). There were 9 males and 7 females and the average age was 70.8 (range = 51–85) years. All patients were secondary type. No patient had ischemic change of the stomach, so no resection was indicated. The volvulus was of the organoaxial type in 12 patients and mesentericoaxial type in 4 patients. No patient received emergency surgery. All patients routinely received pre-operative image study for diagnosis confirmation (Figure 1).

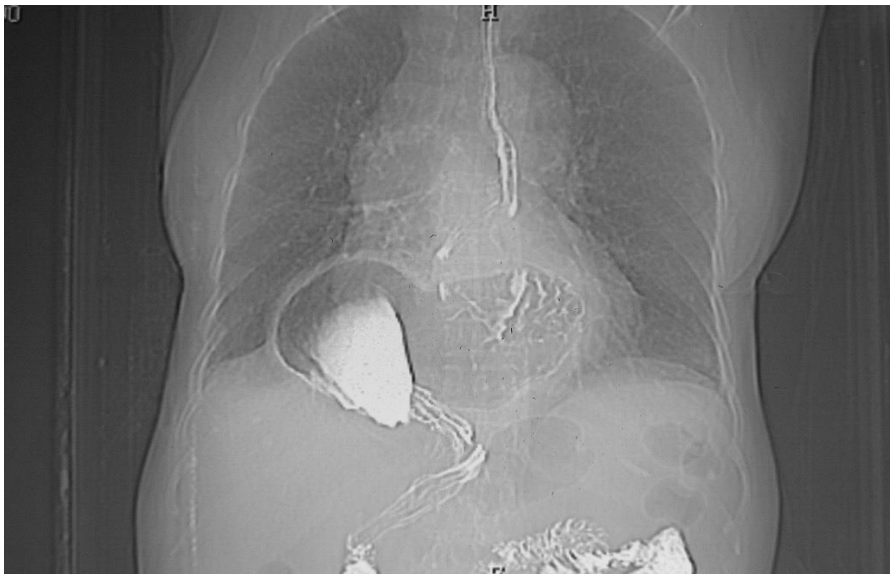

Fig. 1 Upper gastrointestinal series demonstrating diaphragmatic defect with intra-thoracic gastric volvulus

Table1 Patient demographics

Patient No.	Age	Gender	Symptoms	Rotation type	Operation time	Blood loss	Hospital stay
1	68	M	ES/CD	OA	190 min	30 cc	6 days
2	75	M	ES/CD	OA	175 min	30 cc	7 days
3	69	M	ES/DP	OA	180 min	20 cc	5 days
4	72	F	ES	MA	145 min	20 cc	5 days
5	78	M	ES	OA	115 min	30 cc	6 days
6	70	F	D/CD	OA	220 min	50 cc	5 days
7	69	F	DP	MA	110 min	30 cc	6 days
8	73	M	ES/CD/DP	OA	120 min	30 cc	5 days
9	65	F	ES/DP	OA	130 min	20 cc	5 days
10	68	M	CD	OA	90 min	30 cc	5 days
11	85	M	ES/D/DP	MA	100 min	30 cc	5 days
12	76	F	CD	MA	120 min	30 cc	5 days
13	64	F	ES/DP	OA	100 min	50 cc	5 days
14	73	M	ES	OA	120 min	30 cc	6 days
15	77	F	CD	OA	420 min	120 cc	8 days
16	51	M	ES/D	OA	180 min	30 cc	6 days

ps: M: male / F: female OA: organoaxial / MA: mesentericoaxial ES: early satiety / D: dyspnea / CD: chest discomfort / DP: dysphagia

2. Surgical techniques

The patient was placed in a lithotomy position and received general orotracheaI anesthesia. The abdominal cavity was insufflated to a pressure of 12 mmHg using a Veress needle. A total of five ports were placed in the upper abdomen, including supraumbilicus (11 mm) for laparoscope, infraxyphoid area (5 mm) for liver retractor, left and right infracostal margins in the midclavicular lines (5 mm) for operator manipulation and left anterior axillary line (11 mm) for assistant use.

Initially, intra-thoracic stomach and possible intestine or omentum were checked and determined whether they were viable (Figure 2).

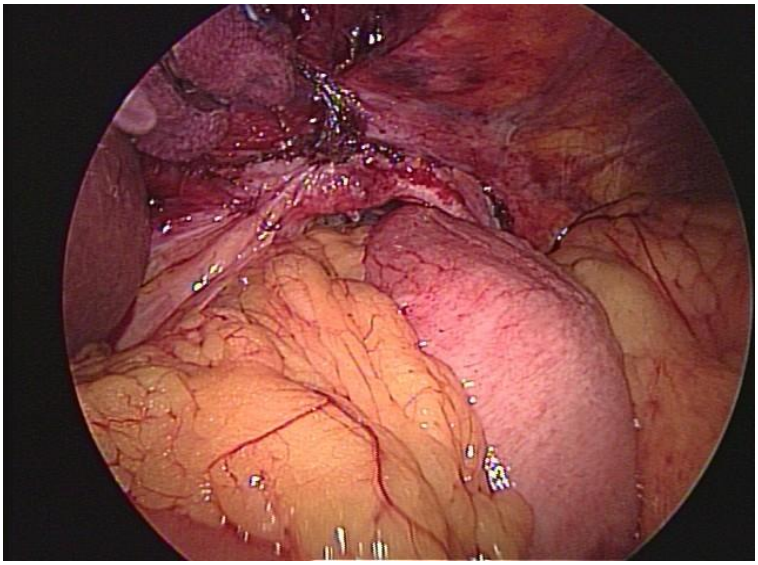

Fig. 2 Laparoscopy showing diaphragmatic defect with part of stomach and omentun herniation

3. Hernia Reduction

The herniated part of stomach was grasped with atraumatic Babcock forceps, detorsed and reduced into the abdomen using a hand-over-hand technique (Figure 3). In Figure 4, we noted a diaphragmatic defect immediately at the esophageal hiatus and a well-developed hernia sac was present within this defect, which ascended into the retrocardiac space.

4. Excision of Hernia Sac

With counter-traction of the esophagus by the assistant, the sac was dissected off the crural edge beginning at the inferior pole of left crus, anterior surface of esophagus and then the inferioposterior pole of the right crus using the hook cautery. The esophagus was mobilized circumferentially after right and left crural muscle fibers were dissected off from the sac, which showed a well-developed musculo-fascial rim.

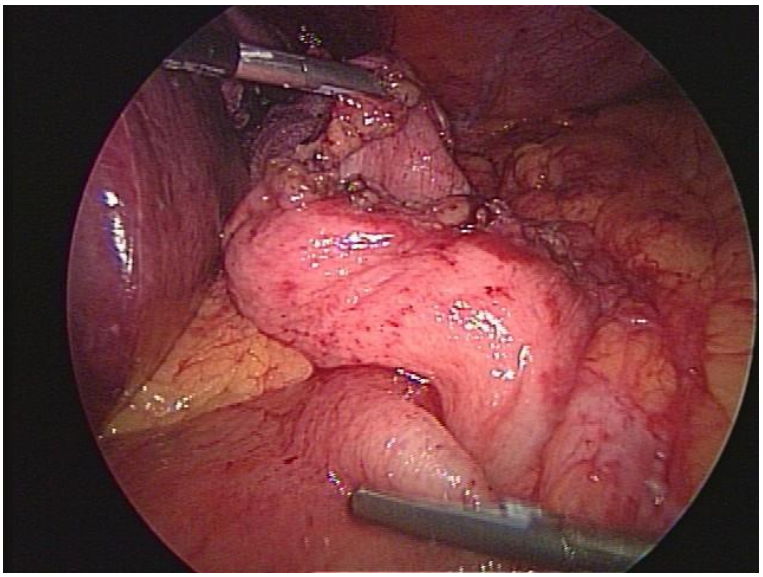

Fig. 3 Reduction of herniated stomach using a hand-over-hand technique

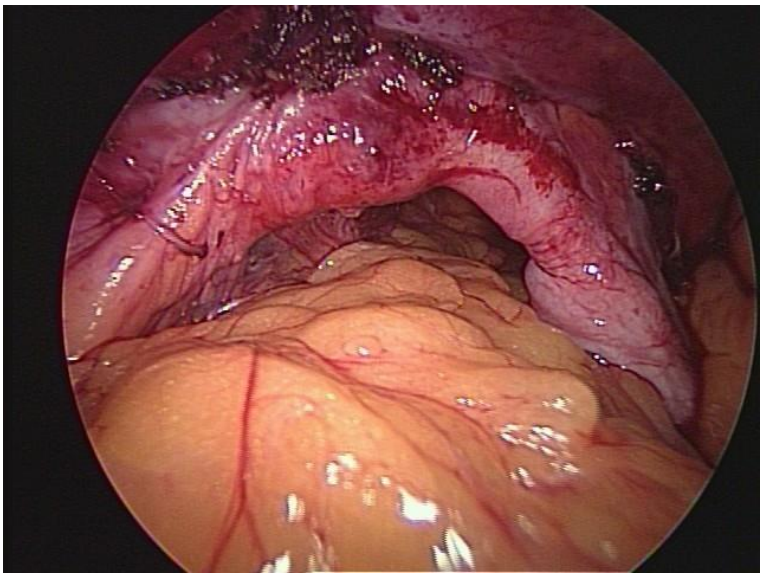

Fig. 4 A diaphragmatic defect over the esophageal hiatus with a well-developed hernia sac at retrocardiac space

5. Mobilization of Fundus

The short gastric vessels were divided along the fundus with a harmonic scapel. A window behind the esophagus was established, with size large enough to accept a portion of fundus for the fundoplication. A piece of tape was put through this window for the assistant to hold with a dissector, sweep the esophagus upward and to the left, which clearly exposed the inferior parts of right and left crura (Figure 5).

6. Crural Repair

The crura were repaired posterior to the esophagus, with several interrupted, non-absorbable sutures and two pieces of mesh (1.5 x 1.0 cm^2) as pledges for enforcement. Edges were approximated without tension as possible (Figure 6).

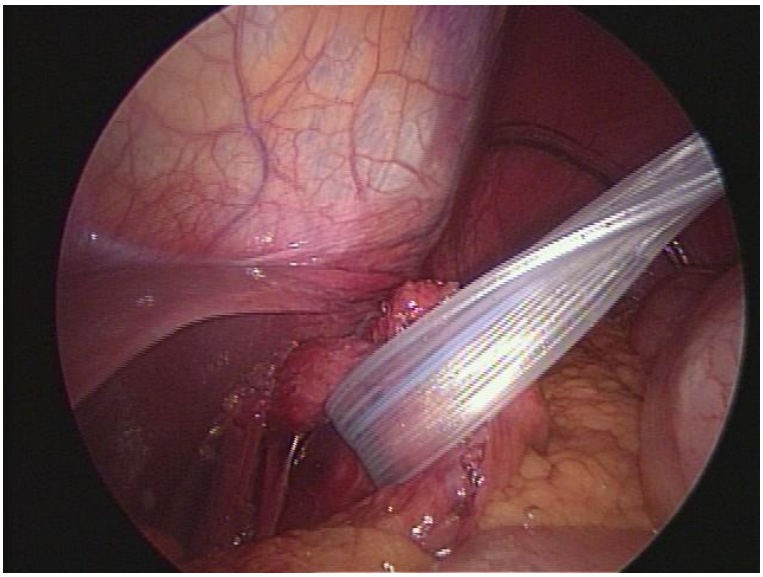

Fig. 5 A piece of tape tracting the esophagus upward and to the left side to expose inferior parts of right and left crura

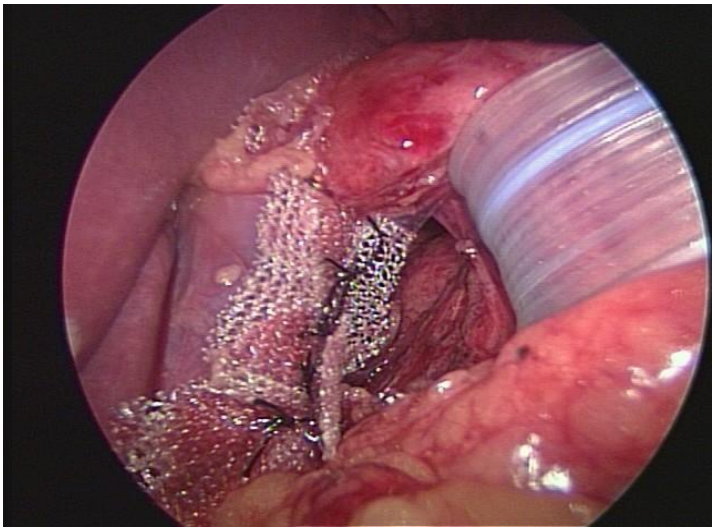

Fig. 6 Stitch fixation of two pieces of mesh (1.5 x 1.0 cm²) as pledges for both crura enforcement during diaphragmatic defect repair

7. Fundoplication and Gastropexy

A panendoscope with diameter of 10.8mm and a 16F nasogastric tube were then passed down the esophagus into the stomach to calibrate the size of the hiatal repair and as stents. A standard Nissen fundoplication employing a short, floppy, 2 cm fundic wrap was performed (Figure 7). Gastropexy was done by suturing the fundic wrap to the right crus, with a non-absorbable suture.

Pneumoperitoneum was released and the ports were removed under vision. Wounds were closed with no drain left in the abdominal cavity.

8. Post-operative course

Postoperatively, no nasogastric decompression was required. Fifteen patients received extubation on the same day of operation except one needed intensive care for one day. A postoperative Hypaque study was routinely performed to ensure adequate stomach position, good gastric emptying and confirmed adequate detorsion and fixation of the stomach (Figure 8). Liquid diet was usually tried on the third post-operative day, and then soft diet on the following day.

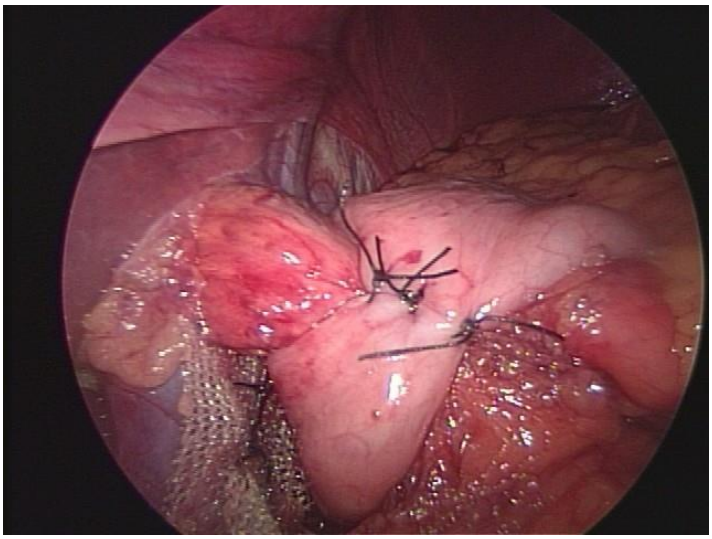

Fig. 7 Nissen fundoplication employing a 2 cm fundic wrap around the esophagus

Fig. 8 Post-operative upper gastrointestinal series demonstrating adequate stomach position, good gastric emptying

III. Results

The average operative time was 157 minutes, with a range of 90-420 minutes. The average blood loss was 36 cc with a range of 20-120 cc. Most patients were discharged on the fifth post-operative day. Patent gastrointestinal tract was noted in all patients with Hypaque study. Besides, all patients had improvement of pulmonary condition and no one experienced evident complication related to surgery.

IV. Discussion

According to the literature, it is difficult to differentiate between partial and complete gastric volvulus, and patients with documented chronic partial volvulus can present with a complete volvulus at a later date [8, 12]. All our patients were chronic partial volvulus type. Gastric volvulus may vary in severity. In a chronic or recurrent gastric volvulus, patients may be asymptomatic for many years [7] or some volvulus is only found by contrast radiology. The presenting symptoms depend on the degree of twisting and the rapidity of onset [9]. Some patients may present with postprandial discomfort, belching, vomiting, bloating, or early satiety [7]. In a partial volvulus, only a portion of the stomach is involved; however, gastric wall necrosis may still occur, depending on the patency of the blood supply and some patients may present with hematemesis due to necrosis from vascular strangulation [7]. In an acute volvulus, gastric obstruction and strangulation may occur [8]. Borchardt described in 1904 the classic triad of acute complete gastric volvulus: (1) severe epigastric pain and distention, (2) vomiting followed by violent retching with an inability to vomit, and (3) difficulty or inability to pass a nasogastric tube [4, 8]. This triad indicates an initial block at the pylorus, then at the cardia, and later gastric distention as closed loop obstruction, possible strangulation, ischemia, and perforation of the stomach [8]. The pathologic spectrum is determined by the tightness and rapidity of the twist [4]. Immediate diagnosis and surgery are imperative in this

situation [8].

The associated high morbidity (13.5-50%) and mortality of gastric volvulus (acute: 42-56%, chronic: 10-13%) has led to the recommendation of early elective repair once a diagnosis has been made [6, 13]. There are reports of nonsurgical correction of gastric volvulus using nasogastric decompression or endoscopic reduction [7, 8, 10]. However, the majority of these reports have been in patients with chronic volvulus [8]. Besides, in the more common organoaxial variety in which the cardia is obstructed and a nasogastric tube cannot be passed in complete instances, immediate operation is mandatory [4].

The traditional surgical treatment of gastric volvulus has been exploratory laparotomy for decompression of the stomach, detorsion of the volvulus, surgical correction of contributing factors and fixation of the stomach in its normal anatomic position [3, 4]. In recent years, these can be accomplished with laparoscopic technique. Several reports confirm that laparoscopic surgery can be performed safely without excessive morbidity or mortality in a group of patients [9, 13, 14]. Besides, visualization of the hiatal structures is excellent with the laparoscopic approach. However, suture repair is technically more difficult in a small space under laparoscopy, and it requires more effort during the learning course. Besides, an important step in making the window behind the esophagus is advoidance of entry into the pleura, which may cause tension pneumothorax. Once it happens, immediate release of the pneumoperitoneum must be done [15].

In some patients of gastric volvulus, the size of hiatal defect may be considerablely large and hernia repair is accepted as a routine by many surgeons [14]. But for fear of ischemic necrosis and subsequent failure of crural repair just by primary suture of weak, attenuated tissue, some studies suggested stapling prosthetic mesh across the hiatal defect was effective for closure of the hiatus in a tension-free manner. However, some adverse criticism against the stapled mesh pointed out the potential of esophageal erosion after mesh repair [13, 16]. Instead, we chose the approximation by stout, nonabsorable sutures with healthy bites into both sides of crura posteriorly, with pieces of mesh reinforcing all crural repairs to outcome these problems.

Many years ago, gastropexy was considered a standard treatment for prevention of gastric volvulus recurrence. A temporary gastrostomy was reported effective by Wichterman et al. and also Ellis et al [17]. Others suggested gastropexy by suturing most of the greater curvature to the anterior abdominal wall. Less invasive techniques such as tube decompression and endoscopic derotation were also reported [3]. Even, some surgeons advocated that gastropexy was not necessary when hiatal hernia was completely repaired [13]. But Agwunobi et al. reported good results without hiatal closure but with simple gastropexy alone [13]. Some suggested that pexing gastrostomy was routinely established for all patients undergoing a transabdominal repair when fundoplication was not performed [18, 19]. We also believe that gastropexy is a useful method to reduce the risk of gastric volvulus. But, as our patients received the antireflux procedure (Nissen fundoplication), excessively mobile greater curvature of the stomach was stricted to some extent. We think that only suturing the fundic wrap to the right crus, with a non-absorbable suture is very enough. Besides, patients may benefit from a good life quality since the gastrostomy is not needed.

In the past, it was thought that aging was associated with a gradual loss of cardiopulmonary reserve. Thus, pneumoperitoneum was not suitable for the elderly, even in individuals without obvious underlying comorbidities [20]. Recent advances in anesthesia, coupled with better patient selection, better perioperative cardiac care have led to laparoscopic procedures being undertaken for the geriatric patients safely. Schwenk et al. concluded that pulmonary complications might be reduced after a laparoscopic procedure compared to open approach in elderly patients [21]. Peters and Fleshman reported postoperative hospitalization was significantly shorter for the former group [21]. Besides, this minimally invasive procedure results in shorter hospitalization, earlier ambulation, decreased postoperative pain, and more rapid return to routine activities. Laparoscopic surgery would appear to be

the ideal surgical choice for elderly patients. Chronological age alone should not be considered contraindication in selecting patients for receiving pneumoperitoneum [20].

Our patients were cases of chronic intra-thoracic gastric volvulus associated with a diaphragmatic defect. Fourteen patients (87.5%) had symptoms of heartburn, regurgitation and occasional vague abdominal discomfort before. No sign of gastric strangulation was noted clinically in all patients.

V. Conclusion

Chronic gastric volvulus often needs a surgical intervention. Laparoscopic management of diaphragmatic defect and intra-thoracic gastric volvulus is an effective method. Patients can benefit from avoidance of the morbidity of a laparotomy, short hospital stay and early return to normality, even in the elderly.

References

[1] T. K. Tsang, Y. L. Johnson, J. Pollack and R. M. Gore. (1998). Use of single percutaneous endoscopic gastrostomy in management of gastric volvulus in three patients, *Digestive Diseases and Sciences, 43,* 2659-2665.

[2] N. Katkhouda, E. Mavor, K. Achanta, M. H. Friedlander, S. W. Grant, R. Essani, R. J. Mason, M. Foster and J. Mouiel. (2000). Laparoscopic repair of chronic intrathoracic gastric volvulus, *Surgery, 128,* 784-790.

[3] K. E. Koger and J. M. Stone. (1993). Laparoscopic reduction of acute gastric volvulus, *The American Surgeon, 59,* 325-328.

[4] R. Carter, L. A. Brewer and D. B. Hinshaw. (1980). Acute gastric volvulus: a study of 25 cases, *The American Journal of Surgery, 140,* 99-106.

[5] M. D. Rodefeld and N. J. Soper. (1998). Parahiatal hernia with volvulus and incarceration: laparoscopic repair of a rare defect, *Journal of Gastrointestinal Surgery, 2,* 193-197.

[6] D. Godshall, U. Mossallam and R. Rosenbaum. (1999). Gastric volvulus: case report and review of the literature, *Journal of Emergency Medicine, 17,* 837-840.

[7] R. L. Yin and T. V. Nowak. (1988). Familial occurrence of intrathoracic gastric volvulus, *Digestive Diseases and Sciences, 33,* 1483-1486.

[8] T. K. Tsang, R. Walker and D. J. Yu. (1995). Endoscopic reduction of gastric volvulus: the alpha-loop maneuver, *Gastrointestinal Endoscopy, 42,* 244-248.

[9] H. Kuwano, M. Hashizume, M. Ohta, K. Sumiyoshi, K. Sugimachi and Y. Haraguchi. (1998). Laparoscopic repair of a paraesophageal hiatal hernia with gastric volvulus, *Hepatogastroenterology, 45,* 303-306.

[10] O. Haas, P. Rat, M. Christophe, S. Friedman and J. P. Favre. (1990). Surgical results of intrathoracic gastric volvulus complicating hiatal hernia, *British Journal of Surgery, 77,* 1379-1381.

[11] M. A. Carlson, R. E. Condon, K. A. Ludwig and W. J. Schulte. (1998). Management of intrathoracic stomach with polypropylene mesh prosthesis reinforced transabdominal hiatus hernia repair, *Journal of the American College of Surgeons, 187,* 227-230.

[12] K. Tsuboi, K. Tsukada, T. Nakabayashi, H. Kato, T. Miyazaki, N. Masuda and H. Kuwano. (2002).

Paraesophageal hiatus hernia, which has progressed for 8 years: report of a case, *Hepatogastroenterology, 49,* 992-994.

[13] P. C. Leeder, G. Smith and T. C. Dehn. (2003). Laparoscopic management of large paraesophageal hiatal hernia, *Surgical Endoscopy, 17,* 1372-1375.

[14] A. Aly, J. Munt, G. G. Jamieson, R. Ludemann, P. G. Devitt and D. I. Watson. (2005). Laparoscopic repair of large hiatal hernias, *British Journal of Surgery, 92,* 648-653.

[15] G. Perdikis, R. A. Hinder, C. J. Filipi, T. Walenz, P. J. McBride, S. L. Smith, N. Katada and P. J. Klingler. (1997). Laparoscopic paraesophageal hernia repair, *Archives of Surgery, 132,* 586-589.

[16] E. M. Targarona, G. Bendahan, C. Balague, J. Garriga and M. Trias. (2004). Mesh in the hiatus: a controversial Issue, *Archives of Surgery, 139,* 1286-1296.

[17] A. S. Geha, M. G. Massad, N. J. Snow and A. E. Baue. (2000). A 32-year experience in 100 patients with giant paraesophageal hernia: the case for abdominal approach and selective antireflux repair, *Surgery, 128,* 623-630.

[18] R. J. Landreneau, J. A. Johnson, J. B. Marshall, S. R. Hazelrigg, T. M. Boley and J. J. Curtis. (1992). Clinical spectrum of paraesophageal herniation, *Digestive Diseases and Sciences, 37,* 537-544.

[19] G. A. Myers, B. A. Harms and J. R. Starling. (1995). Management of paraesophageal hernia with a selective approach to antireflux surgery, *The American Journal of Surgery, 170,* 375-380.

[20] D. M. Weber. (2003). Laparoscopic surgery: an excellent approach in elderly patients, *Archives of Surgery, 138,* 1083-1088.

[21] L. C. Ballesta, J. A. Cid, I. Poves, C. Bettonica, L. Villegas and M. A. Memon. (2003). Laparoscopic surgery in the elderly patient, *Surgical Endoscopy, 17,* 333-337.