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# SURGICAL MANAGEMENT FOR COMMON COMPLICATIONS AFTER ANTIREFLUX SURGERY

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*Introduction: Complications after an antireflux procedure are considered when the patient is unable to swallow normally, has recurrence or persistence of reflux symptoms and experiences upper abdominal discomfort during and after meals. The dramatic increase in the number of patients undergoing antireflux surgery and consequently their complications match the advances in the conventional operation and the recent application of laparoscopic fundoplication. The assessment of these symptoms and the selection of patients who need further surgery is a challenging problem. A critical functional assessment of these patients before re-operation is crucial to its success.*

*Objective: To define the common technical defects in operations for gastro-esophageal reflux disease (GERD) responsible for late postoperative complications and their management.*

*Patients and methods: This study was a randomized retrospective study that included 20 patients who presented with various complications following open and laparoscopic antireflux procedures. The study was conducted in Ain Shams University Hospitals, between January 1998 and January 2002. All patients were submitted to radiographic, endoscopic and manometric studies to assist in planning the ideal operative option and to assess the result of the operation postoperatively. The intervention was carried out via open abdominal approach either upper vertical midline or bilateral subcostal incisions.*

*Results: The most common presentation was dysphagia in 14 cases (70%): Tight crura were found to be the cause in 4 patients (20%), tight wrap in 4 patients (20%), torsion of lower esophageal segment in 5 patients (25%) and achalasia in 1 patient (5%). Three patients (15%) presented with reflux: Disruption of the wrap was found in 2 patients (10%), and slipped stomach in 1 patient (5%). The remaining 3 patients (15%) presented with gastric dilatation resulting from pyloroduodenal deformity in 1 patient (5%) and inadvertent vagi severance in 2 patients (10%). Cure was achieved in 16 patients (80%), improvement of symptoms in 2 patients (10%), and dysphagia persisted in 2 patients (10%) suffering motility disorder.*

*Conclusion: A further operation is required in a small proportion of patients who have had prior antireflux surgery. This has a surprisingly good chance for success in properly evaluated patients.*

*Keywords: Dysphagia, failed antireflux surgery, Toupet fundoplication, Floppy Nissen fundoplication.*

## INTRODUCTION

Reflux of gastric contents into the esophagus occurs in many circumstances in patients of all ages and can be categorized in many ways [1].

The symptoms of gastroesophageal reflux are variable and are broadly separated into typical as heartburn, regurgitation, dysphagia, and water brash, and atypical as pulmonary aspiration, severe chest pain, pulmonary asthma, chronic hoarseness, choking and chronic cough [2]. When the frequency, amount, or composition of the reflux exceeds normal values, pathologic reflux is present [3]. The spectrum of the problems that lead to reflux includes a wide range of disease categories, many but not all of them are associated with frank sphincter failure [4]. The epithelial changes, specially the columnar-lined esophagus (Barrett's epithelium) and its risk of cancer, are thought to be an end-stage mucosal response to chronic GERD [5].

In order to obtain long-standing relief of symptoms, patients with moderate to severe reflux must be on medication of one sort or another for life with substantial life style modifications necessary to obtain the full benefit of medical therapy [6]. By contrast, surgical therapy offers complete and long-standing relief by restoring competency to the cardia [7].

Reluctance in the past to use surgical therapy more often was based on the risk and discomfort associated with the performance of the operation and the fear of postoperative complications. However, surgical therapy for GERD has seen dramatic changes because of several important physiologic investigations and the use of minimally invasive approaches [8]. Consequently, surgical therapy should not be looked at as a method of last resort for patients who have failed every other attempt, but as a reasonable alternative for patients with moderate to sever GERD with or without complications [9].

Adequate and complete preoperative evaluation is essential to plan the operation appropriately. The goals of this evaluation are to diagnose reflux and exclude other lesions of the esophagus and stomach, to assess the severity of reflux and define a sort of functional anatomy. In general, to accomplish these objectives; endoscopy, upper gastrointestinal series, 24 hours pH monitoring and manometry are applied [10].

It is now clear that the most effective way to restore the competency of the cardia is to create some form of fundoplication without tension over the esophagus just proximal to the cardioesophageal junction with proper fixation to remain in this position permanently. Using the fundus of the stomach and leaving enough space to accommodate a (60 F) bougie inside the esophagus affords a tension free reconstruction. The integrity of vagi must be guaranteed [11].

Despite of the above-mentioned principles and methods of evaluation, and because of the increased enthusiasm in surgical management of patients with GERD, there are increased numbers of complications necessitating a redo surgery [12].

Several authors have analyzed their experience with redo antireflux surgery and have defined the underlying abnormality responsible for the need for operation [13]. These include a fundoplication that is too tight, too loose, incorrectly positioned, or disrupted. Other problems include tight crural repair, crural disruption with paraesophageal herniation of the stomach into the chest and inadvertent vagotomy [14].

Before any redo surgery, details of the previous surgery should be studied and a thorough assessment should be done including upper gastrointestinal series, endoscopy and manometry. The procedure selected will depend on the reason for reoperation and the nature of the previous surgery [15].

*Aim of the work*

The aim of the present study is to define some of the common technical defects responsible for reoperation after surgery for gastroesophageal reflux disease (GERD) and their management.

## PATIENTS AND METHODS

This retrospective study was carried out between January 1998 and January 2002 at Eldemerdash and Ain Shams University specialized hospitals. The study included 20 patients (13 females and 7 males); median age was 37 years (range 22-53 years).

Five patients (25%) had laparoscopic fundoplication as the primary procedure and the remaining fifteen patients (75%) had open procedure through abdominal approach.

The type of wrap at the primary operation was Nissen fundoplication in 13 patients (65%) (2 laparoscopic and 11open), Toupet (partial wrap) in 3 patients (15%) with previous laparoscopic repair and the procedure was not known in the remaining 4 patients (20%) with previous open antireflux surgery.

The period between the primary operation and the appearance of symptoms was 5-13 months.

All patients had their prefundoplication investigations reviewed. This includes upper GIT endoscopy (20 patients), barium swallow and meal with Trendlenberg's position (16 patients) and esophageal manometry (5 patients).

Assessment of symptoms was made using modified Visick grading [16]: Grade I: complete disappearance of symptoms, Grade II: minimal symptoms present which do not require any life style changes or doctor's advice, Grade III: no improvement of symptoms, Grade IV: worsening of the original symptoms.

Preoperative routine investigations before redo surgery included upper GI endoscopy with biopsy, Barium meal and Manometry for 20 patients (100%). Gastric emptying study was done in 3 patients (15%).

The mean follow up period after redo surgery was 10 months (range 6-12 months).

*Operative details*

General endotracheal anesthesia was used for all patients in the supine position. Midline supra-umbilical incision was used in all patients with failed laparoscopic antireflux (5 patients) and in 8 patients with previous open surgery. Bilateral subcostal incision was used in the remaining 7 patients.

The dissection was started in the hiatal region high up in a non-fibrotic location attempting to separate the left lobe of the liver from the underlying stomach aiming at exposure of the hiatal region. Sharp and blunt dissections were continued towards the cardia and the wrap to free the two crura away from the esophageal wall and then the esophagus was encircled with a tape. At this stage evaluation of the findings was done and the management plan was decided on accordingly. As a routine in all patients, the wrap was sutured to the crus to prevent its possible migration to the posterior mediastinum.

## RESULTS

*Prefundoplication findings*

Endoscopy with biopsy: showed lower end esophagitis in 18 patients (90%) with Barrett's esophagus in 4 patients (20%), and was reported free in the remaining 2 patients (10%).

Barium study with Trendlenberg's position was done for 16 patients (80%) only, showed sliding hiatus hernia in 6 patients, mixed hiatus hernia in 2 patients, reflux without hernia in 5 patients and was free in the remaining 3 patients.

*Patients presentation and pre-reoperative findings*

• Fourteen patients (70%) presented with persistent dysphagia more than 3 months despite several trials of dilatation. Three patients (15%) presented with recurrent reflux symptoms and three patients (15%) presented with postprandial fullness.

• Four patients (20%) were grade III, 13 patients (65%) were grade IV and three patients (15%) were grade 1 Visick grading.

• Manometry was done for all the patients, assessing the lower esophageal sphincter pressure (LESP) and its relaxation (LESR), and esophageal body peristalsis. The LESP was high in the patients presenting with dysphagia (70%). The range of the pressure was 35- 45 mmHg (mean=36.4 and median 40mmHg). In this group aperistalsis and absence of lower esophageal sphincter relaxation (achalasia) was recorded in one patient (5%), weak peristalsis with normal LESR in 5 patients (25%) and normal peristalsis and LESR in 8 cases (40%).

Low pressure with normal peristalsis and LESR was reported in 3 patients (15%) with reflux. The pressure range was 5- 10 mmHg (mean 6.8 and median 7.5mmHg).

The remaining 3 patients (15%) with gastric dilatation showed normal LESP, with a range 23-24 (mean 23.7 and median 23.5 mmHg), normal peristalsis, and LESR.

The results of Barium study and endoscopy before redo operation are presented in (Tables 1 and 2).

Table (1): *Pre-reoperative Radiological Signs.*

| *Signs* | *Number of patients* | *Percentages* |
|---|---|---|
| Dilated esophagus with narrowing of lower esophagus (Fig 1,2) | 5 | 25% |
| Persistent narrowing of lower esophagus | 9 | 45% |
| Reflux | 2 | 10% |
| Reflux with slipped stomach (Fig 3) | 1 | 5% |
| Dilated stomach | 2 | 10% |
| Dilated stomach with gastric outlet obstruction (Fig 4) | 1 | 5% |

Table (2): *Pre-reoperative Endoscopic Signs.*

| *Signs* | *Number of patients* | *Percentage* |
|---|---|---|
| Esophagitis grade II& III | 3 | 15% |
| Narrowing at gastro-esophageal junction | 14 | 70% |
| Dilated stomach | 2 | 10% |
| Dilated stomach with deformed pyloroduodenum | 1 | 5% |

*Operative findings and procedure done: (Table 3)*

*"A" laparoscopic group (5 patients) (25%)*
*1-Patients with dysphagia (4) (20%)*

Tight crura were found in 3 patients (15%) with inability to introduce the tip of the little finger or number (10 F) Nelaton catheter alongside the esophagus. Cutting the crural offending stitch was done to widen the hiatus to admit freely one finger alongside the esophagus (Fig 5,6).

In one patient (5%) with achalasia there was no apparent technical fault in the previous Nissen fundoplication. Heller's myotomy and Toupet re-fundoplication with crural repair were done.

*2- Patient with reflux (1) (5%).*

The stomach was found slipped in this patient with previous Toupet repair. Taking down the previous wrap was done and Floppy Nissen fundoplication was opted as the LESP was low (5mmHg).

*"B" Open fundoplication (15 patients) (75%)*
*1-Patients with dysphagia (10) (50%)*

Only one patient (5%) showed tight crura. The same procedure was done as for the case in the laparoscopic group.

In four patients (20%) the wrap of their previous Nissen fundoplication was long and tight (more than 6 cm). The repair was taken down and replaced with floppy Nissen fundoplication with crural repair.

In five patients (25%) there was torsion of the lower esophagus. Cutting one or two short gastric vessels and undoing of the twist was achieved. As these patients had weak esophageal peristalsis, Toupet fundoplication with crural repair was thought to be the optional repair (Fig 7).

*2-Patients with reflux (2) (10%)*

Both had disruption of their primary repair (Nissen in one patient and the previous repair was not known in the other). They both demonstrated low LESP and were repaired using floppy Nissen fundoplication with crural repair.

*3-Patients with gastric dilatation (3) (15%)*

Though the type of the primary repair was not known in these patients before the redo, they all proved to have had a Nissen fundoplication repair intraoperatively.

One patient was found to have thickened and narrowed pylorus. Vagotomy and gastrojejunostomy was performed.

Vagotomy was attempted in the remaining two patients before performing the gastrojejunostomy. Both vagi were missing and believed to be inadvertently severed in the previous repair.

All these three patients had floppy Nissen refundoplication and crural repair, as their primary complaint was reflux for which they were operated upon for the first time.

Table (3): *Operative Findings, Procedure done and Approach*

*A-Laparoscopic group*

| *Presentation* | *Number(%)* | *Finding* | *Procedure* | *Approach* |
|---|---|---|---|---|
| Dysphagia | 3(15) | Tight crura | Crural widening | Midline |
| Dysphagia | 1(5) | No apparent mechanical fault | Heller's myotomy + Toupet+ crural repair | Midline |
| Reflux | 1(5) | Slipped stomach | Floppy Nissen+crural repair | Midline |

*B-Open group*

| *Presentation* | *Number(%)* | *Finding* | *Procedure* | *Approach* |
|---|---|---|---|---|
| Dysphagia | 1(5) | Tight crura | Crural widening | Midline |
| Dysphagia | 4(20) | Long tight wrap | Floppy Nissen + crural repair | Midline |
| Dysphagia | 5(25) | Torsion of lower esophagus | Cutting short gastric vessels + Toupet + crural repair | -3Midline<br>-2 Bilateral subcostal |
| Reflux | 2(10) | Disrupted wrap | Floppy Nissen + crural repair | Bilateral subcostal |
| Gastric fullness | 2(10) | Dilated stomach + injured vagi | Gastrojejunostomy + Floppy Nissen + crural repair | Bilateral subcostal |
| Gastric fullness | 1(5) | Dilated stomach + deformed pylorus | Vagotomy + gastrojejunostomy + Floppy Nissen + crural repair | Bilateral subcostal |

*Outcome and postoperative complications*

- There was no operative mortality.
- Early postoperative complications were: Wound infection in 4 patients, prolonged ileus in 3 patients, DVT in one patient and chest infection in 3 patients.
- One case with planned vagotomy and gastrojejunostomy developed early dumping that responded to conservative measures.
- Sixteen patients (80%) showed cure of their original complaints, 2 cases (10%) had improvement of their symptoms and 2 cases (10%) had persistence of their dysphagia.

Visick grade was preoperatively abnormal in 17 patients (75%). The postoperative grading was as follows:

-Grade I was achieved in 13 patients (65%).

-Grade II in was achieved in 2 patients (10%) who showed weak peristalsis pre-operatively.

-There was no improvement of the grade (Visick grade III) in two patients (10%). Both complained of dysphagia. One of these two patients was suffering from achalasia; the other patient had weak peristalsis with high LESP. Toupet refundoplication improved the pressure but did not influence the motility disorder.

*Postoperative manometric study disclosed the following:*

- Normalization of the LESP in all the 17 cases with pre- redo abnormal pressures
- In five patients with weak peristalsis preoperatively, 4 had improved motility and one patient had sustained weak peristalsis.
- Patient with preoperative aperistalsis showed no improvement.

Postoperative dye study showed near normal pattern, except for the patient with achalasia, where there was esophageal dilatation.

Postoperative endoscopy recorded correction of anatomical deformities and down grading of the preoperative esophagitis.

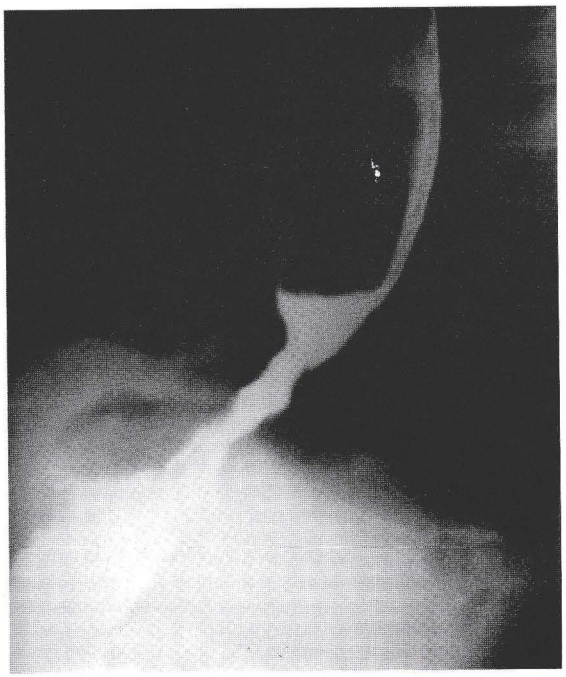

*Fig. (1): Barium swallow showing dilatation of the esophagus due to tight repair.*

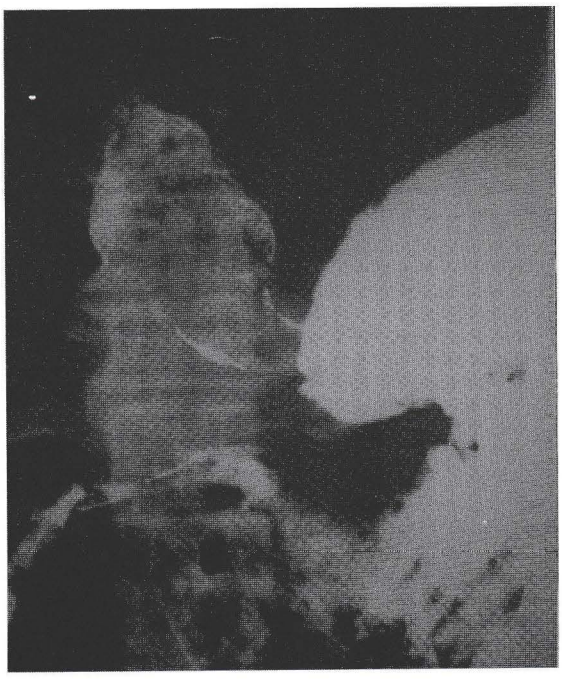

*Fig. (2): Barium swallow and meal showing tight wrap with absent fundic air bubble.*

*Fig. (3): Barium swallow showing disrupted wrap with reflux.*

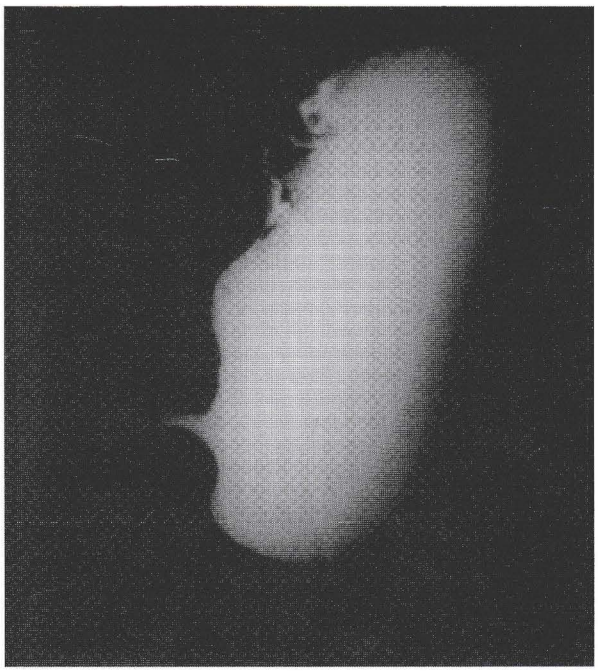

*Fig. (4): Barium meal showing dilated stomach with gastric outlet obstruction.*

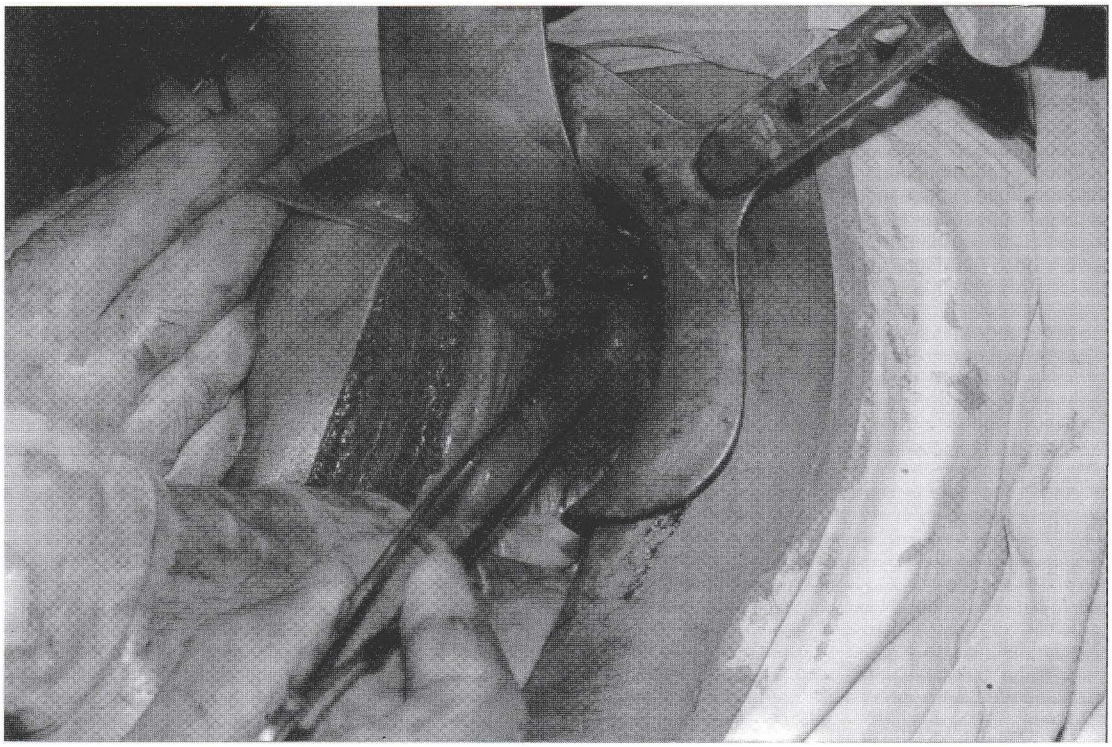

*Fig. (5): Showing the lower end of the esophagus after dissection at the hiatus with the forceps pointing to the stitch narrowing the hiatus (tight crura).*

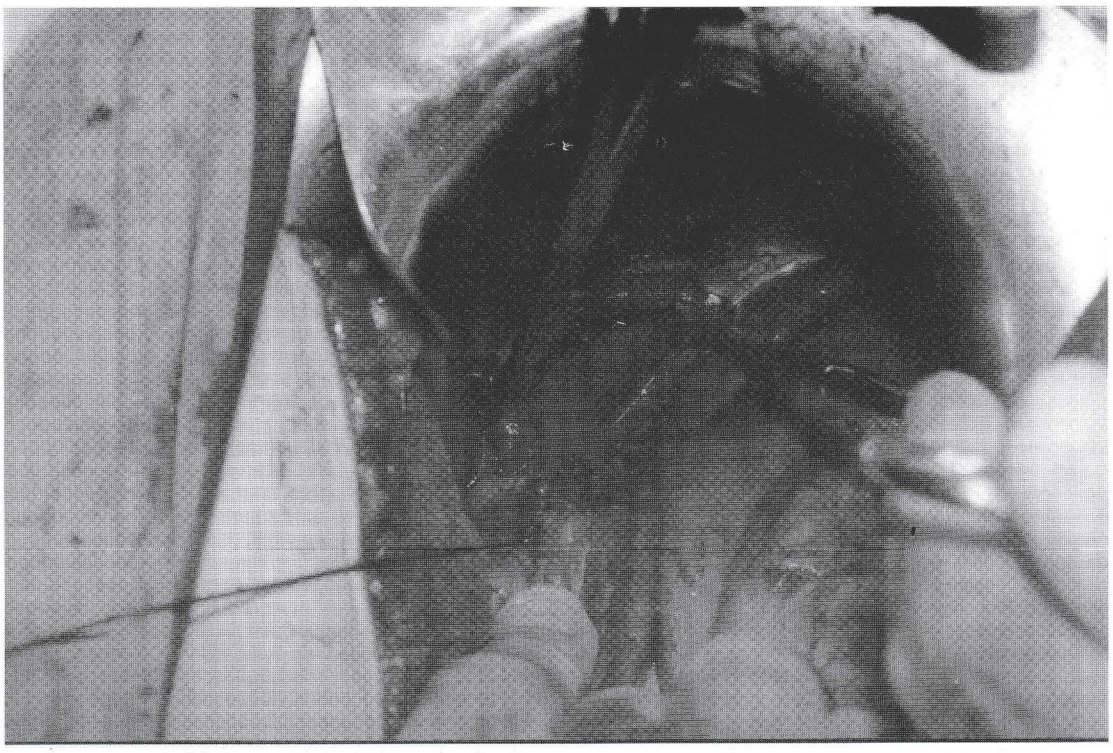

*Fig. (6): Showing widening of the hiatus after removal of the stitch at the crura.*

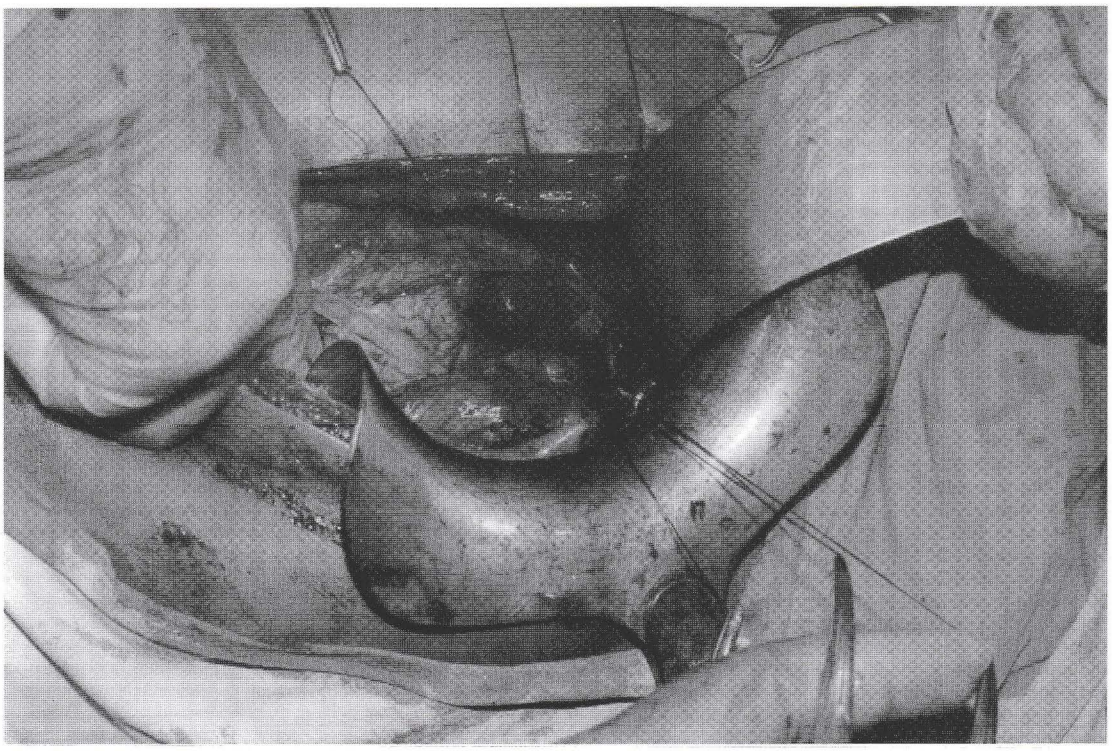

***Fig. (7): Showing Toupet fundoplication (partial wrap).***

## DISCUSSION

Gastroesophageal reflux disease is the most frequent esophageal disorder and scores amongst the most common problems in gastroenterology [17].

The past decade showed important developments in the management of GERD. The emergence of powerful anti-secretory drugs as well as proton pump inhibitors has increased the proportion of patients whose esophagitis can be healed medically. Similarly, there have been equally exciting surgical developments both in open and laparoscopic approach. Indeed, laparoscopic management for GERD has resulted in an increase in the number of patients undergoing such procedure [18].

Although there is general agreement that the Nissen fundoplication creates an effective barrier against pathological GERD, several aspects of the procedure warrant careful considerations [8]. The most important problem is the super competent valve at the gastroesophageal junction. Consequently, there have been several modifications of the original Nissen technique, designed to reduce the incidence of dysphagia, gas bloat and inability to belch or vomit. These modifications decreased but did not eliminate the incidence of troublesome mechanical complications [19]. The most important modifications were the shortening and loosening of the fundoplication. Shortening of the fundoplication (from 4 - 5 cm to about 2 cm) led to substantial improvement in the ability to belch and to swallow without diminishing its antireflux effects. Loosening of the fundoplication was accomplished by dividing short gastric vessels and / or by constructing the fundoplication over a large dilator [11]. The result, the so-called floppy Nissen, markedly decreased the incidence of dysphagia and gas bloat postoperatively [1]. The floppy Nissen fundoplication is the repair of choice for the average patient with GERD and normal esophageal peristalsis [14]. However, for patients with reflux and poor or absent esophageal peristalsis, a (180 degrees) wrap either anterior or posterior (Toupet) is believed to be the operation of choice [20].

In our series, Nissen fundoplication was the primary operation in 16 patients (80%); Toupet fundoplication in 3 cases (15%), and the original operation was not recognized in one patient (5%) with disrupted wrap.

Redo surgery for complicated fundoplication has a lower success rate than the first operation being about 79% as reported by Jamieson and his colleagues. This may explain the reluctant attitude taken by most surgeons when they face this problem. In addition, re-operative surgery has a higher morbidity and mortality than primary surgery, emphasizing the need for careful assessment and technique for the initial operation [21]. Thus, prior to embarking on further surgery for complications after intervention for GERD careful evaluation of each patient should take place [22].

In the present study of 20 patients with previous antireflux surgery there was unequivocal evidence of imperfect previous surgery as was proved radiologically, endoscopically, and manometrically.

Esophageal manometry is an essential step in the evaluation of patients who are symptomatic after fundoplication [12]. The data provided by manometry include the presence of high or low pressure zones at the lower end of the esophagus and the presence or absence of coordinated peristalsis. Also it provides information about whether the lower esophageal sphincter does or does not relax in advance of an arriving peristaltic wave [1]. In evaluating patients who present with complicated antireflux surgery, the manometric results guide the surgeon to the appropriate anatomical repair in attempt to achieve the best possible functional results [12].

High resting lower esophageal pressure (LESP) (>30mmHg), may suggest a tight fundoplication, and a low sphincter pressure (<6mmHg), suggests failure of the fundoplication [23].

Esophageal body motility testing can identify motor abnormalities, weak peristalsis and aperistalsis [23].

Lower esophageal sphincter relaxations occur as the neural inhibitory impulses pass along the esophagus, leading to esophageal peristalsis and lower esophageal sphincter relaxation [23]. Failure or incomplete lower esophageal sphincter relaxation is specific for the diagnosis of achalasia [1].

In the present study, manometry showed high lower esophageal sphincter pressure (LESP) with normal peristalsis and relaxation in 8 patients (40%). The selected re-repair for this group of patients was floppy Nissen fundoplication. The manometry revealed high LESP with weak peristalsis in 5 patients (25%), and consequently they were offered Toupet fundoplication. One case (5%) had high LESP, aperistalsis and no sphincter relaxation (achalasia), Heller's myotomy and Toupet fundoplication were performed for this patient. In three patients (15%), manometry demonstrated adequate peristalsis with low LESP, and floppy Nissen was the repair of choice for this group of patients. In the remaining 3 patients (15%) with gastric dilatation, there were normal peristalsis and pressure readings. Moreover, as a gastrojejunostomy was done to abort the gastric dilatation, their Nissen

fundoplication was replaced with floppy Nissen repair.

The most frequent problem after antireflux surgery is the mechanical complications with its two extremes resulting in dysphagia or re-reflux. The incidence of this mishap, in general, is higher after laparoscopic fundoplication than with the open approach [24].

Approximately 30% to 40% of patients suffer from some form of dysphagia in the early postoperative period. This, however, decreases to around 5% in long-term follow up and is believed to be due to edema at the site of fundoplication [20]. Persistent dysphagia more than 4 weeks, especially if not responding to dilatation or if associated with weight loss, should be considered as abnormal and investigations must be performed to reach the diagnosis [20].

Reoperation for a tight crural repair, long wrap or torsion of lower esophagus, was reported in 14% to 35% of patients after previous antireflux surgery [25,26,27].

In this series, 14 patients (70%) presented with persistent dysphagia, unamenable to endoscopic dilatation. Tight crura were found in four patients (20%), three (2 Toupet and one Nissen) with previous laparoscopic repair (15%) and one with previous open Nissen fundoplication (5%). Widening of the crura for these patients succeeded in resolving their dysphagia.

The Nissen wrap was found long (more than 6 cm) and tight in four patients (20%) and it was substituted with floppy Nissen, as they proved to have normal peristalsis. In one patient (5%) with primary Nissen repair, the dysphagia was due to achalasia, as proved by the manometric results. This patient was reoperated upon with Heller's myotomy and Toupet wrap, with restoration of LESP to normal value. However, there was no improvement in the esophageal motility and the dysphagia was not cured.

Torsion of the lower esophagus was the cause of the dysphagia in 5 cases (25%) with primary Nissen fundoplication. Interestingly, the manometric study in these patients defined weak peristalsis, but normal lower esophageal sphincter relaxation (LESR). The torsion was undone by sacrificing one or two short gastric vessels, and Toupet wrap substituted the previous Nissen fundoplication. Here, again, one patient complained of postoperative dysphagia. The manometric study revealed persistence of the weak motility.

Esophageal replacement has been suggested for such patients with persistent complaint due to motility disorder [14].

Recurrent reflux is the other extreme of the mechanical failure and contrary to the dysphagia it is regarded as a fairly infrequent problem after the antireflux surgery being reported in up to 8% of patients followed up for 10 years after open and, likely, laparoscopic procedure [23]. Commonly seen anatomic findings with recurrent reflux are either the so- called slipped fundoplication or its disruption [14,12]. In these circumstances, if the pre-reoperative investigations in a suffering patient identify a portion of the gastric fundus clearly lying superior to a previous fundoplication or if a significant disruption allows for free reflux, redo surgery is indicated. It is not clear why fundopliction disrupts, but tension seems to be a major factor [23]. Hinder and his colleagues suggested that the natural need of the body to "repair" itself by reverting to normal is a further factor that may participate in this mechanical accident and they have shown that this complication occurs less frequently if short gastric vessels are divided and if a floppy Nissen fundoplication is performed [23]. In addition, the disruption of fundoplication may be due to small bite of tissues taken during creation of the wrap or due to the use of absorbable suture material [26].

In the present series, three patients (15%) presented with recurrent reflux. One patient (5%) was proved to have slipped stomach after laparoscopic Toupet repair, and the other two cases (10%) showed disruption of the fundoplication. The disruption followed an open Nissen repair in one of the two patients whereas we failed to identify the primary repair in the other case. Floppy Nissen fundoplication with crural repair was done for all three cases with excellent post-operative results.

Of special interest in the present study was the three cases (15%) presented with postprandial fullness. One patient was referred from a physician 12 months after his antireflux surgery was done. The bulk of evidence pointed toward the fact that this patient original underlying pathology was an ulcer disease and was misdiagnosed due to improper preoperative evaluation. The response after vagotomy and drainage was satisfactory.

The possibility of inadvertent injury of one or both vagi was highly considered in the remaining 2 patients (10%), whom were also referred with no clear operative data. The posterior vagi in both cases were definitely missing and it was not possible to find the anterior vagi because of marked adhesions in the field. A gastrojejunostomy was performed, and cure was achieved in both patients.

Rieger et al. (1994) reported high incidence of dumping in patients who had some form of drainage procedure. In their series the indication for drainage procedure was delayed solid gastric emptying in 12

patients (20%) and inadvertent intraoperative vagotomy in eight patients (13%). They have not reported gastric dilatation in their series [28]. The good response noted in our patients with drainage may have been because of the dilated stomach, as mentioned. However, more study is needed before crystallizing a conclusion.

The abdominal approach adopted in this series was suitable for all our patients. The bilateral subcostal incision was used in 7 patients (35%), with more than excellent access. It was initially used in patients for whom a drainage procedure was planned, and then it was applied in further four patients for its superior exposure and virgin field.

The thoracic approach is preferred by some surgeons for redo surgery to avoid iatrogenic injury to the esophagus, stomach and vagi [29]. In practice, however, surgeons tend to use the approach with which they are most familiar, but flexibility is needed in the choice of the access for the reoperative procedure [28]. In our study, the bilateral subcostal abdominal approach significantly improved and eased the procedure.

The redo fundoplication in this series was tailored according to the complaint and the manometric results. For patients with motility disorder a Toupet partial wrap was performed, while floppy Nissen was the operation of choice for the remaining patients with normal esophageal motility. We believe that this functional approach is the ideal as it is difficult to differentiate a very tight fundoplication with secondary failed esophageal peristalsis from a primary motility disorder, which has similar manometric, radiologic and endoscopic features.

This is in agreement with the study of Connie and his colleagues [30].

There are some technical points applicable for both open and laparoscopic as well to both partial and complete wrap:

- The needs to free up the fundus by dividing the short gastric vessels.
- The use of a dilator to size the wrap (60F).
- The incorporation of the diaphragmatic crus in the most proximal suture used to hold the wrap to prevent its migration to the posterior mediastinum.
- The length of the wrap being only 1.5-2 cm.
- The pad of areolar tissue that lies on the anterior surface of the gastro-esophageal junction is removed to allow proper identification of the junction and encourage the fusion of the fundic wrap to the esophagus [31].
- The surgeon must take care to maintain the orientation of the greater curvature of the stomach along the left side of the esophagus as the posterior and anterior walls of the stomach are slipped around the esophagus [24].

Two principles have to be respected in the laparoscopic dissection of the esophageal hiatus to decrease the complications:

- Dissection should be kept at a distance from the esophagus, especially at the beginning of the procedure because at that stage the esophagus is hardly visible and prone to be injured by sharp instruments. Dissection should be limited to the hiatal pillars [32].
- Locating the left pillar is of utmost importance before dissecting the meso-esophagus because it marks the boundary between the intra-abdominal and intra-mediastinal retro-esophageal area [19].

In general, surgeons who undertake antireflux surgery need to agree on standardized operative methods and objective criteria to define success, thereby allowing agreement about classification of anatomical, pathological and endoscopic features of the disease.

## CONCLUSION

Long-term reflux control can be achieved by antireflux surgery in expert hands. The remaining area with potential for further improvement is the elimination, as far as possible, of small but definite incidence of troublesome mechanical complications, which is probably both procedure and operator dependent. These complications can be minimized with further patient selection and attention to technical details in construction of the fundoplication.

Redo operation for complicated antireflux procedure is required for some patients who have post-fundoplication complaints. Careful and thorough clinical evaluations with the aid of available investigative techniques are mandatory to define the causative anatomical and physiological defects. Consequently, the surgeon can offer the patient a suitable solution for his suffering. Although redo surgery is associated with high morbidity and mortality and lower success rate than primary operation, good results could be achieved with improved symptoms in 90% of patients. Lower success rate is expected in presence of esophageal body motility disorders, incorrect approach or technique and

inappropriate patient selection. Tight repair and torsion of lower esophagus due to improper liberation of the greater curvature of the stomach are responsible for high percentage of complications occurring after antireflux surgery. Calibrated repair and division of one or two short gastric vessels are important technical points to decrease the incidence of postoperative complications.

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