

Original Research Article

Perioperative manometric studies in laparoscopic Watson's repair versus Nissen's fundoplication

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ABSTRACT

Background: Hiatus Hernia (HH) and GERD are common upper gastroesophageal disorders, The Nissen's fundoplication is one of the most effective and commonly used surgical techniques in management of both GERD and hiatus hernia (HH). many surgeons are searching for alternative procedures due to the mechanical obstructive effects of Nissen's fundoplication, one of these procedures is partial anterior fundoplication (Watson's repair).

Methods: Eighty two patients, diagnosed to have GERD and/or HH, were scheduled for present study for laparoscopic anti-reflux surgery. They were randomized to either Watson's repair (anterior partial fundoplication) (group I) or Nissen repair (group II) in the period between June 2012 and March 2017. Forty two patients for group I and forty patients were included in group II. Group I had partial anterior fundoplication and group II had Nissen's fundoplication. Follow up for all patients included in our study was scheduled at (2, 4weeks and 3, 6, 12months postoperatively) both subjectively - using a standardized scoring system for reflux symptoms (heartburn, regurgitation and dysphagia), gas bloating and objectively-using esophago-gastroscopy at 6ms and 12ms postoperatively, esophageal manometry, 24hours PH monitoring at 6ms and 12ms post operatively.

Results: Three cases were excluded from the study because they were converted to open procedure, one of group I and two of group II. Mean operative time was significantly shorter in group I. As regarding to reflux symptoms (heartburn and regurgitation) Nissen was significantly higher in control of reflux symptoms at 3months but at 6, 12months Nissen still higher but without a clear significant difference. On the opposite side dysphagia was significantly higher in Nissen group than in Watson group at 3months and remained higher at 6,12months but with no significant difference, also gas related symptoms were higher in Nissen group than in Watson group all the time of follow up. Objectively, esophagitis improved to a similar extent in both groups. Watson was less effective in improving LES characters, and 24hours PH parameters in comparison to Nissen group but without any significant difference in both groups.

Conclusions: Partial anterior fundoplication (Watson repair) can be safe, effective and simple alternative procedure for Nissen's fundoplication with less obstructive symptoms and complications.

Keywords: Gastroesophageal reflux, Nissen's, Watson's repair

INTRODUCTION

Gastroesophageal reflux disease (GERD) and/or Hiatus Hernia (HH) are conditions which may cause troublesome symptoms and/or complications.¹

Retrosternal burning pain (heartburn) is a common presentation for almost all patients with GERD or HH. Regurgitation of either gastric contents or sour or bitter fluid into the mouth is a symptom in some patients.² The major physiologic causes include an increased number of

transient lower esophageal sphincter relaxations (LES), ineffective esophageal motility, and reduced LES tone. Risk factors include obesity, the use of estrogen, nitrates, anti-cholinergic, and tobacco products.³ The treatment goals for GERD include symptom relief, healing of erosive esophagitis, prevention and management of GERD-related complications, and maintenance of mucosal and symptom remission.⁴ Anti-reflux surgery may be required if there is severe symptoms or complications of GERD despite adequate medical therapy, while surgical intervention for Hiatus Hernia is mandatory in almost all cases.⁵ Research studies have established that some patients with GERD have a worse quality of life than those with angina or congestive heart failure.⁶

However, the multiplicity of different anti-reflux procedures indicates that the ideal operations for this condition haven't been established, Surgery for gastroesophageal reflux disease (GERD)/Hiatus Hernia has been in a state of evolution over the last 70 years.⁷ Laparoscopic Nissen fundoplication remains the most commonly performed surgical procedure for the treatment of gastroesophageal reflux disease (GERD), however the reported incidence of dysphagia and sequelae is relatively high in comparison to that with partial fundoplication.^{8,9} Manometric changes from preoperative hypotensive or normotensive measures to normotensive or hypertensive scores, respectively, reflects the success of surgical interference. Severe dysphagia and high LES resting pressure are common outcomes for Nissen's Fundoplication which may interfere with accepted quality of life for patients treated with this procedure. These previous outcomes are rare with partial fundoplication (Watson's Repair).

There is little doubt as to the usefulness of manometry in diagnosing oesophageal motility disorders. Because of the low prevalence of these disorders, manometry has tended to remain in tertiary gastroenterology units even in developed countries. The American Gastroenterology Association and the British Society of Gastroenterology have published guidelines, which define the indications and clinical use of manometry, and the technique is becoming more widely available.¹⁰

Summary of indications for oesophageal manometry

- To diagnose suspected primary oesophageal motility disorders (e.g. achalasia and diffuse oesophageal spasm).
- To diagnose suspected secondary oesophageal motility disorders occurring in association with systemic diseases (e.g. systemic sclerosis)
- To guide the accurate placement of pH electrodes for ambulatory pH monitoring studies.
- As part of the pre-operative assessment of some patients undergoing anti-reflux procedures.
- To reassess oesophageal function in patients who have been treated for a primary oesophageal disorder

(e.g. sub-optimal clinical response to pneumatic balloon dilatation) or undergone anti-reflux surgery (e.g. dysphagia following fundoplication).¹¹

Patients treated with Watson's repair gain the minimally required LES resting pressure, which is less than that gained with Nissen's Repair, to relieve symptoms of reflux without severe dysphagia or gas bloating.

The objective of the present study was to compare the perioperative manometric studies of laparoscopic Nissen fundoplication versus partial anterior fundoplication (Watson's repair) in patients with GERD or Hiatus Hernia (HH) as well as other short clinical outcomes.

METHODS

Eighty two patients with symptomatic GERD and/or Hiatus Hernia were randomized to have laparoscopic partial anterior fundoplication or Nissen's fundoplication at General Surgery Department of Menoufia University Hospitals in the period from June 2012 to March 2017.

Diagnosis of GERD/HH was by typical reflux symptoms of retrosternal burning discomfort and/or acid regurgitation. All patients underwent endoscopy, esophageal manometry, 24hours PH monitoring, prior to surgery and after surgery. Barium swallow was done in all cases before surgery and CT with contrast in doubt cases. In addition to these investigations, response to PPIs was a good sign for the benefit of anti-reflux surgery. Patients included in this study those have approved hiatus hernia. Patients excluded from the study those were with previous anti- reflux surgery, esophageal motility disorders, or those with Barrett's oesophagus with potential dysplasia.

Table 1: Clinical spectrum of GERD (Geoffrey and Jacoby, 2003).

Typical symptoms	Atypical (extra esophageal) symptoms	Complications
Heartburn, Regurgitation	Chest pain, asthma, cough, hoarseness	Ulceration, Stricture, Barrett's esophagus

All patients were divided randomly (enclosed envelope for each patient) into two groups. Group I had undergone laparoscopic partial anterior fundoplication (Watson's repair), while group II had undergone laparoscopic Nissen fundoplication and all patients had been followed at 2, 4weeks and 3, 6 and 12months.

The follow up was by clinical examination using a standardized scoring system of reflux symptoms (heartburn, regurgitation and dysphagia) Table 1 to facilitate comparison between pre and post-operative results in both groups and between the two groups.

Follow up with endoscopy was done for all patients after 3 months and oesophageal manometry and 24hours PH monitoring were done after 6, 12months. The results of both subjective and objective follow up were tabulated and statistically analyzed especially the peri-operative manometric studies and clinical outcomes which were assigned for analysis in this study.

Operative technique

Dissection of the esophageal hiatus was done using harmonic scalpel with dissection of short gastric vessels, preservation of the hepatic branch of the vagus nerve where possible. A 180° anterior partial fundoplication (Watson's repair) was fashioned in (group I) by fixing the anterior wall of the fundus to the side wall of the esophagus and stomach around the gastro-esophageal junction as well as to the right crus of hiatal opening (Figure 5). The short gastric vessels were left intact in Laparoscopic anterior fundoplication (LAF) (Watson's repair in present study).



Figure 1: large hiatal opening with paraesophageal hernia.

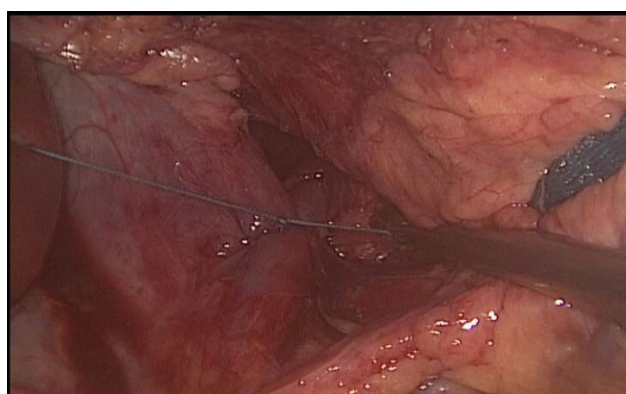


Figure 2: Narrowing of hiatal opening by crurae approximation (3 stitches).

In laparoscopic Nissen fundoplication, routine posterior hiatal repair and the creation of a short, loose 360° wrap over a 24F nasogastric tube. The wrap was secured with 2/0 absorbable or non-absorbable material interrupted sutures (Figure 4). The initial steps for laparoscopic

anterior fundoplication were the same as those for Nissen's fundoplication, starting with hiatal dissection, esophageal mobilization, clearance approximation of both crurae (Figure 2 and 3). These initial steps were applied to the same extension and degrees in both groups. Drains were usually inserted for a couple of days.

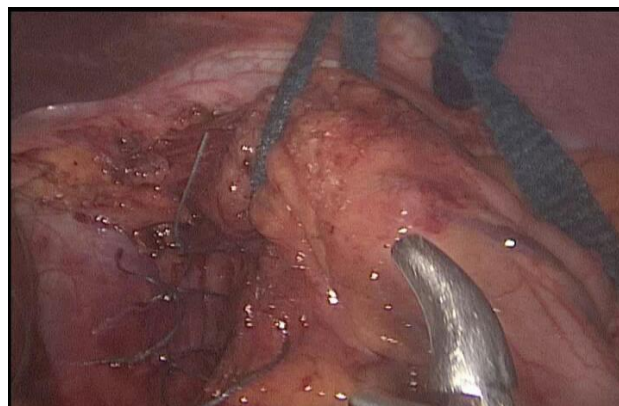


Figure 3: Complete crurae approximation.

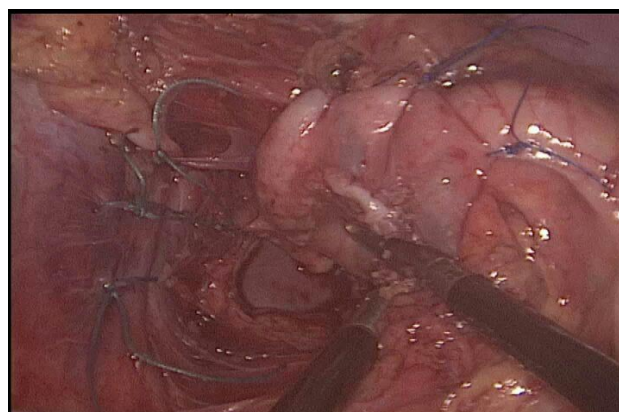


Figure 4: Nissen's complete rapping.



Figure 5: Watson's repair (anterior fundoplication).

All patients are instructed to follow up at the outpatient clinic after 2, 4weeks as a routine post-operative follow up, and at 3months for clinical assessment. Patients were instructed for follow up at 6months for manometric

studies and at 12months for clinical assessment of recurrence of symptoms.

RESULTS

This study included 82/85 patients presented for laparoscopic anti-reflux surgery and hernia repair. Three patients - excluded from statistical analysis- were converted to open procedure (one was excluded from group I and two were excluded from group II. So,

Watson’s repair group consisted of 42 patient and the second group of Nissen’s fundoplication included 40 patients.

After 3months follow up, both Nissen's fundoplication and Partial anterior fundoplication were significantly effective in controlling reflux symptoms in comparison to preoperative results but Nissen fundoplication is significantly more effective in controlling reflux symptoms than partial anterior fundoplication (P <0.05).

Table 2: Demographic data for studied groups.

		Group I (42)	Group II (40)	P value
Sex	Male	11	12	<0.05
	Female	31	28	
Age	Average (years)	22- 48	21- 45	
	Mean±SD	33±9	35±8	
*Clinical presentation	Heartburn	39 (93%)	38 (95%)	
	Regurgitation	28 (66%)	29 (72%)	
	Chest pain	12	14	
	Asthma	3	2	
	Cough	29	28	
Diagnosis	GERD	13 (31%)	12 (30%)	
	Hiatus Hernia (HH)	29 (69%)	28 (70%)	

There is overlapping in clinical presentations and manifestations among studied cases

Table 3: Operative time in both groups.

Operative time (minutes)	Group I (Mean±SD)	Group II (Mean±SD)	T-test	P value
Mean±SD (in minutes)	95±9	116±15	11.81	<0.001

Table 4: Mean and SD of clinical presentation among studied group.

	Heart burn score	Group I (Mean±SD)	Group II (Mean±SD)	T-test	P value
Heart burn	Pre-operative	29 ±8	27± 9	0.33	>0.05
	Post-operative				
	3months	8.21±3.7	3.1±3.6	1.9	<0.01
	6months	4.5±2.5	3.1±6.9	0.65	>0.05
	12months	1.2±0.46	1.1±0.53	0.53	>0.05
Regurgitation	Pre-operative	25±4	21±8	1.1	>0.05
	Post-operative				
	3months	6.1±2.1	3.5±2.2	2.6	<0.01
	6months	3.1±1.9	2.6±1.4	0.89	>0.05
	12months	1.2±0.6	0.9±0.6	0.81	>0.05
Gas bloating	Post-operative				
	3months	7.1±3.1	13±2	0.8	<0.001
	6months	0.2±0.4	6±1.4	15.6	<0.001
	12months	1.2±0.6	2.9±0.6	14.6	<0.001

On the other hand, there was a significant difference between both groups as regards dysphagia in favor of

partial anterior fundoplication as dysphagia is significantly less with partial anterior fundoplication (p

<0.05). After 6 and 12 months follow up, both Nissen's fundoplication and partial anterior fundoplication are effective in controlling reflux symptoms with no significant difference between both operations as regards reflux symptoms (heartburn, regurgitation) but dysphagia still higher in group II but is not significantly different (P>0.05) (Table 4).

Gas bloating was significantly higher (p<0.001) in group II than in group I all over the period of follow up (Table 4).

Table 4 shows that there was a significant difference in favor of partial anterior fundoplication (Watson's repair) as regards gas bloating after 3, 6 and 12 months making gas bloating less common with partial anterior fundoplication (p <0.001).

Postoperative endoscopy revealed that esophagitis had improved significantly in both groups nearly to the same extent, 71.1% and 80% in group I and group II respectively (p >0.05) (Table 5).

Postoperative manometric study and 24 hours PH monitoring showed that both Nissen and partial anterior fundoplication were effective in improving LES characters and 24 hours PH parameters, however Nissen's fundoplication was more superior than Watson's partial anterior fundoplication (Table 6). Lower oesophageal manometric records were corrected to a significant score in post-operative rather than in preoperative in both groups. It was noted that Nissen's fundoplication has a higher scoring in correction rather than partial fundoplication.

This table shows a significant difference between floppy Nissen fundoplication and Watson's repair with more superiority to the Nissen's repair in improving the LES characteristics (LES pressure and LES residual pressure after relaxation) (P <0.05).

Table 7 shows the complication rates in both groups. It was noted that recurrence rate was observed in 3 cases in Watson's repair group while it was observed in one case in second group with no significant difference in both groups.

Table 5: Perioperative endoscopic results.

Grade	Group I			Group II		
	Pre-operative	Post-operative	P value	Pre-operative	Post-operative	P value
0	3	10	<0.001	2	11	<0.001
1	2	4		3	3	
2	5	0		6	0	
3	4	0		3	0	

Table 6: Difference in improvement in manometric study of both groups 6 months postoperatively.

Difference in improvement	Group I (Mean±SD)	Group II (Mean±SD)	P value
LES pressure (mmHg)	8.3±0.13	11.4±0.8	<0.001
LES residual pressure (mmHg)	4.9±0.6	9.3±2.1	<0.001
LES abdominal length (cm)	1.1±0.18	1.9±0.21	>0.05
Amplitude of esophageal body contraction (mmHg)	4±0.61	3±2.8	<0.05

Table 7: Complications.

	Group I (42)	Group II (40)	P value
Bleeding (short gastric vessels)	0	2	<0.05
Splenic injury	0	2	<0.05
Hepatic injury	0	0	<0.05
Recurrence of symptoms (12ms later)	3 (7%)	1 (2.5%)	-

DISCUSSION

The traditional management of GERD with hiatus hernia includes lifestyle modifications, medications, and surgical intervention. Anti-reflux surgery is a "cure" for GERD and hiatus hernia, whereas medication is

palliative. In the field of anti-reflux surgery there is no consensus of expert surgeon, but it is expert surgery. The gold standard anti-reflux operation is undoubtedly the Nissen type of total fundoplication and many studies have affirmed its effectiveness in controlling acid reflux. However, new symptoms after fundoplication such as gas

bloat and dysphagia, which probably result from a hyper-competent lower esophageal sphincter produced by the Nissen operation, are common.¹³

So, surgeons tried to find an alternative with the same efficacy with less side effects. In our study we compared one of these alternatives (partial anterior fundoplication; Watson's repair) with Nissen fundoplication. There were 3 cases (3.5%) converted to open fundoplication because of bleeding. These three cases were excluded from this study. The rate of conversion to open procedure was lower than recorded in Landreneau et al, study, who recorded a conversion rate 6%.¹⁴ In another study performed by Hagedorn et al, he reported 0% conversion rate.¹⁵ Kneist et al, recorded a conversion rate (1.3%).¹⁶

In present study mean operative time in group I was 95 minutes and 116 minutes in group II. There was significant difference between both groups as regards the operative time in favor of partial anterior wrap. This may be due to longer time needed for short gastric dissection.

Authors took a longer time than that recorded in Watson et al, who recorded mean operative time for the two procedures (58min) for Nissen (range 32-184min) procedure versus 60min for anterior fundoplication (range 35-144min), and with that of Chryso et al, who recorded 100±22min for Nissen fundoplication.^{17,18} Kneist et al, reported mean operative time 90 min for partial anterior fundoplication.¹⁶ Peters et al, recorded 202±58 min for Nissen fundoplication.¹⁹

After 3, 6, 12months, a standardized score was used to assess the clinical improvement of the symptoms after operations (heartburn and regurgitation) and revealed that both partial anterior and Nissen fundoplication are effective in controlling heartburn and regurgitation with significant difference between both groups after 3months in favor of Nissen, but after 6 and 12months follow up there was no significant difference between both groups.

After 3months in group I (partial anterior) about 70% of reflux symptoms was controlled but in group II (Nissen) about 90% of reflux symptoms were controlled. The raised percent, in both groups, at the end of the study to reach about 95% in group I, 98% in group II means that Nissen fundoplication is more effective in controlling reflux symptoms in the early postoperative only, while on long-term follow up no significant difference between both groups.

The results of our study match with that of Baigrie et al, who recorded a reflux control of about 90% in anterior partial fundoplication patients after 2 years and nearly 100% after Nissen fundoplication.²⁰

In another study performed by Watson et al, revealed similar clinical outcome after 3 months follow up after both procedures.¹⁷

Postoperative dysphagia was higher in Nissen group (group II) and was significantly different at 3months follow up. At six and twelve months of follow up, onset of dysphagia has decreased in Nissen group but still higher in comparison to Watson's group.

On the same way, Kneist et al, in Germany reported a good reflux control and less incidence of dysphagia after partial anterior fundoplication.¹⁶ In a similar fashion Watson et al, found a lower percent of dysphagia in partial anterior group.⁹

Nijjar et al, published a study, wherein recording no difference in dysphagia scores between the two groups and this was after 5years follow up.²¹ Ma et al, reported at that there was a significant reduction of the incidence of postoperative dysphagia in patients with partial fundoplication ($P < 0.0001$).²²

As regarding to gas bloating, our study found that it was more among patients with Nissen rather than partial anterior group. similar to us Ma et al, study they reported a decreased incidence of inability to blech in partial fundoplication.²² In Broeders et al, study they reported a lower incidence of gas related symptoms (bloating, flatulence, inability to blech) in partial anterior group in comparison to Nissen group.²³

The mean resting LES pressure of group I increased from 6.4±1.9mmHg to 13±2.18mmHg and that of group II increased from 7.1±1.35mmHg to 19±2.21mmHg. The mean residual LES pressure after sphincter relaxation of group I increased from 0.7±1.1mmHg to 5.8±1.8mmHg while that of group II increased from 0.8±0.35 to 10.2±2.8mmHg. Present study results correlate with that of Watson et al, have reported that manometric study after partial anterior fundoplication brings LES parameters to a more physiological state rather than total fundoplication.²⁴ In Watson et al, (1998) in comparative study between (LAF) and (LNF), recorded resting and residual lower esophageal sphincter pressures were lower following anterior fundoplication (29 versus 18mmHg, and 13 versus 6 mmHg).²⁵ In Broeders et al, study reported similar improvement after both procedures with no significant difference unlike to our study but this may be due to the longer period of follow up (5years).²³

Watson et al, at 2012 published a study reporting that partial anterior fundoplication was accompanied with less side effects and achieved similar results to Nissen.²⁶

Subjectively, both partial anterior and Nissen fundoplication are effective in controlling clinical symptoms of GERD (heartburn and regurgitation) with no significant difference between the two procedures with time at (6-12months). The incidence of postoperative dysphagia was higher with floppy Nissen fundoplication, the difference was significant early between the two procedures but with time the difference had decreased but still higher, also partial anterior

fundoplication is more superior with significant difference in decreasing the incidence of gas related symptoms.

Objectively, although partial anterior fundoplication improved the characters of LES on manometric study to the normal level, Nissen fundoplication is more superior with significant difference in improving the characters of LES on manometric study and parameters of 24hours pH monitoring.

CONCLUSION

Partial anterior fundoplication seems safe and effective in treating the symptoms of GERD and/or Hiatus Hernia as Nissen fundoplication including patients with severe forms of the disease. Its technique is simpler and takes shorter time to perform with less complication rate. Lower postoperative sequelae with partial anterior fundoplication as regards dysphagia and gas related symptoms.

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