

# **Laparoscopic Anti reflux surgery**

## **An overview**

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## **LAPAROSCOPIC ANTI REFLUX SURGERY**

The first laparoscopic anti reflux procedure was reported by the Belgian surgeon Dallemagne in 1991 (1). Since then, the numbers of patients undergoing LARS continues to increase (2).

### **INDICATIONS FOR LARS**

The following may be the indications for anti reflux surgery:-

- (a) Failure of medical treatment to resolve symptoms.
- (b) Side effects of medical therapy.
- (c) Volume regurgitation.
- (d) Patient preference - sometimes referred to as PPI dependency.

The majority of patients with GORD are managed successfully with proton pump inhibitor therapy and life style changes. Careful questioning of GORD patients reveals that not all symptoms are totally ameliorated by PPI treatment. Klinkenberg Knoll (3) showed a steady increase in PPI dosage required to alleviate symptoms over time. Whether this reflects disease progression or therapeutic tolerance is not known, but this has been the experience of many clinicians.

PPIs are well tolerated: side-effects indicating potential for LARS are:- headaches, mental confusion, skin rashes, diarrhoea and abdominal cramps.

Volume regurgitation is a symptom particularly well served by LARS. Many patients find this a most distressing symptom: it may awaken them at night with a sense of drowning, cause erosion of dental enamel, nocturnal cough and asthma and, during the day, may affect the quality of life by interfering with activities such as gardening, cleaning etc.

Patient preference for surgery: in our series, 23% of patients are well controlled on PPI therapy but do not wish to be dependent on medication. These patients, in particular, need full explanation of the side-effects and possible disadvantages of LARS.

### **References**

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## PRE-OPERATIVE EVALUATION

### (a) History

A full and carefully documented history of reflux is required, the effect on the quality of life of the patient and the effectiveness of medical therapy. The surgeon should document the indications for recommending LARS.

### (b) Endoscopy

This is recommended and should record the presence/absence of oesophagitis and/or hiatus hernia. It is particularly recommended in any patient complaining of dysphagia in order to exclude carcinoma or achalasia.

### (c) OESOPHAGEAL PHYSIOLOGY

(i) Manometry This should be undertaken in all patients in order to exclude the diagnosis of achalasia (fig 1). Some surgeons (4,5,6) have recommended "tailoring" the degree of fundoplication to the manometric findings

ie a partial fundoplication for those patients with poor distal oesophageal motility (>30% of peristaltic waves with amplitude of < than 30mmHg) (7).

A number of studies have shown that outcome post fundoplication bears no relationship to pre-operative manometry (8,9,10,11). Only two RCTs have

addressed this problem - both studies concluded that preoperative oesophageal body motility had little effect on post-operative results (12,13).

## References

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- poor outcome after laparoscopic Nissen fundoplication. *BJS* 1998; 85: 1290 - 1293
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  - 10 Baigre RJ, Watson DI, Myers JC, Jamieson GG. The outcome of laparoscopic Nissen fundoplication in patients with disordered peristalsis. *Gut* 1997; 40: 3815.
  - 11 Monitz V, Ortiz A, Martinez de Haro LF, Molina J, Parrilla P. Ineffective oesophageal motility does not affect the clinical outcome of open Nissen fundoplication. *Br J Surg* 2004; 91: 1010-1014.
  - 12 Fibbe C, Layer P. Oesophageal dysmotility is not associated with poor outcome after laparoscopic Nissen fundoplication: a prospective randomised clinical and manometric study. *Gastroenterology* 2001; 121: 5-14.
  - 13 Booth MI, Stratford J, Jones L, Dehn TCB. Initial results of a randomised trial of laparoscopic total (Nissen) versus posterior partial (Toupet) fundoplication for gastro-oesophageal reflux disease. *Br J Surg* 2002; 89 (suppl 1): 36.

(ii) Oesophageal 24hr pH testing

This is recommended in patients considering LARS. Conventional naso-oesophageal pH is, however, uncomfortable for the patient, may restrict the ability to perform his/her usual work activity and interfere with the eating pattern. A

new development is the Bravo pH capsule (fig 2) (1,2). This is attached to

the oesophageal wall by a suction chamber within the capsule and after four to seven days the capsule drops off into the GI tract. Investigators at Reading (3) have found a significantly better response from patients using the Bravo capsule - all but one of whom was able to work normally by comparison to X out of X using the conventional naso-oesophageal probe. The Bravo capsule provides 48 hours of recording - although the Reading group found this improved the diagnostic rate in only a few patients (4).

It is important to ensure that the patient's symptoms relate to a fall in pH (fig 3). Despite many attempts to calculate a formula that can reduce the effect of chance on the association between reflux symptom and a fall in oesophageal pH,

the symptom index (SI) (number of symptoms with a fall in pH less than 4/total

number of symptoms) remains the most used clinically. A SI of >50% is

generally taken as indicative of pathological reflux.

Reflux symptoms vary from day to day: it is important for GI Physiologists to ascertain from the patient the severity of symptoms on the day of pH testing since a symptom-free day may give a false negative result (5). A number of patients will have reflux symptoms which relate to a fall in pH but not down to pH 4 or less.

If

these patients are retested a proportion will develop a "positive" pH test - some will continue to have symptoms relating to relatively small pH drops - known as an acid sensitive oesophagus. Booth et al (6) demonstrated that these

patients should not be denied LARS.

### References (Oesophageal pH testing)

- 1 Streets CG, DeMeester TR, Peters JH et al. Clinical evaluation of the Bravo probe - a catheter-free ambulatory oesophageal pH monitoring system. *Gastroenterology* 2001; 120:A35.
- 2 Pandafino JE, Richter JE. Ours T, Guardino JM et al. Ambulatory esophageal pH monitoring using a wireless system. *Am J Gastroenterol* 2003; 98: 740-749.
- 3 Gillies RS, Stratford JM, Dehn TCB, Booth MI. Oesophageal pH monitoring using Bravo capsule or naso-oesophageal catheter: comparison of patient discomfort and daily activities. *Gut* 2003; 52 (VI): A24.
- 4 Gillies RS, Stratford JM, Jones L, Sohanpal J, Booth MI, Dehn TCB. Does a 48 hour Bravo pH study facilitate the diagnosis of gastro-oesophageal reflux disease? *Gut* 2004; 53 (III): A30.
- 5 Booth MI, Stratford J, Dehn TCB. Patient self assessment of test day symptoms in 24hr pH-metry for suspected gastro-oesophageal reflux disease. *Scand J Gastroenterol* 2001; 8: 795-9.
- 6 Booth MI, Stratford J, Thompson E, Dehn TCB. Laparoscopic anti reflux surgery in the treatment of the acid sensitive oesophagus. *Br J Surg* 2001; 88: 577-82.

(c) Barium swallow

This is usually unnecessary except in cases of redo surgery and in those in whom pre-operative manometry cannot be performed: barium swallow can then be used to exclude achalasia.

THE TECHNIQUE OF LARS

Consent:- patient information sheets are useful (or use internet - see [www.lapsurg.info](http://www.lapsurg.info))

The patient is starved for four - six hours pre-operatively, blood is grouped and saved. The patient is placed in the reverse Trendelenberg position: the legs are supported in Lloyd-Davies or other appropriate leg supports and appropriate anti-DVT measures are taken. The positions of the VDU, surgeon, camera operator and scrub nurse are shown in fig 4. The instruments may comprise three 10mm re-usable ports, one 5mm re-usable port, a Nathanson or other liver retractor, two soft tissue forceps (eg Johans), a 10mm endo-Babcock, two needle holders, a grasping forceps (suitable for a nylon sling), suction/irrigation device, Harmonic scalpel and a 30° or 45° telescope.

The camera port is placed approximately a third of the way between the umbilicus and xiphisternum: the fatter the patient the further away the port is placed from the umbilicus. Following retraction of the left lobe of the liver the endo-Babcock is placed just below the OGJ. The hernia (if present) is reduced and the scrub nurse retracts the OGJ inferiorly and to the patient's left. Using the Harmonic scalpel or diathermy scissors the gastro-hepatic omentum is divided. The hepatic branch of the anterior vagus is preserved, if possible. Occasionally a large left hepatic artery arises from the left gastric artery: this is preserved. If it has to be divided haemostatic clips are advised. The peritoneum around the right crus is divided, thus exposing the abdominal oesophagus. The crus is cleared to expose the V-shaped decussation posterior to the oesophagus. The OGJ is moved from left to right exposing the appropriate limb of the right crus.

A window is created posterior to the oesophagus and a nylon tape is passed around the oesophagus and posterior vagus nerve and secured using two Liga clips.

*(Tips - 1) if this dissection is "oozey" use of a tonsil swab is recommended (2) do not pass any instrument posterior to the oesophagus until the left limb of the crus has been clearly identified and cleared since it is easy to create a capno-thorax by inadvertent passage of an instrument into the left thorax.*

Division of short gastric vessels. This is optional: the author usually divides the short gastric vessels in order to create a floppy fundoplication. Posterior gastric peritoneal attachments are also divided.

The Endo-Babcock is used to elevate the gastro-splenic omentum, the fundus is retracted inferiorly and to the right and the lesser sac is opened to enable division of the short gastric vessels. In some patients there are two layers of short gastric vessels, both need to be divided to ensure adequate mobility of the fundus.

Repair of the right crus. A 5mm instrument is placed through the left lateral port to grasp the sling. If necessary a 56 Malonie bougie is passed by the anaesthetist. *It is*

*important to observe the passage of the bougie into the stomach.* If the anaesthetist encounters resistance abandon the passage of the bougie since oesophageal perforation may result. The two limbs of the right crus are approximated using interrupted non-absorbable sutures and the tightness tested with the bougie. (*Tip - beware:- the aorta lies immediately posterior to the crus: especially important in thin patients*). Some surgeons recommend buttressing the crural repair with a rectangle of hernia mesh, stapled onto the crura.

Formation of wrap. The bougie is withdrawn partially so that the abdominal oesophagus is no longer intubated. A Johans is passed through the window to grasp the posterior aspect of the fundus high up. The fundus is then brought through the window and both limbs of the wrap are then rocked back and forth to ensure there is no twist on the fundus. The bougie is then repassed into the stomach and the "floppiness" of the wrap is assessed. The two limbs of the fundus are sutured together with two or three unabsorbable sutures, usually incorporating the anterior oesophageal wall, taking care to avoid including the anterior vagus nerve. Some US surgeons use Teflon pledgets on each limb of the wrap.

Post-operative care. A naso-gastric tube is not usually required. The patient is given an anti-emetic in recovery and is allowed liquids and soft diet on the evening of surgery. Patients are usually discharged home the day following surgery with advice to avoid chunky food and carbonated drinks (for post-operative advice sheets see [www.lapsurg.info](http://www.lapsurg.info)). The patient is advised to avoid strenuous activity for two weeks on the basis that this may promote breakdown of the crural repair and/or wrap herniation.

## 2 DIVISION OF SHORT GASTRIC VESSELS

The gastric fundus, like any other part of the anatomy is variable from one patient to another, therefore no hard and fast rules should be made regarding mobility of the fundus. We generally divide the short gastric vessels - unless the fundus is exceptionally floppy - since prolonged early dysphagia is the Achilles heel of LARS. Risks of dividing the short gastric vessels are haemorrhage and thermal injury to the gastric fundus. If haemorrhage occurs from the spleen or a splenic vessel, splenectomy may be required. Operating time is increased by a few minutes by division of the short gastric vessels.

Loustarinen et al (1) and Blomqvist et al (2) reported no difference in outcomes between division/no division in open and laparoscopic ARS respectively. O'Boyle et al (3) reported a five year follow-up of 99 patients randomised to division/no division. There were no differences in outcome between the two groups apart from reduction of flatus, bloating and inability to belch in the non division group. Rates of dysphagia and re-operation remain equivalent.

| <u>Dysphagia for</u> | <u>No division</u> | <u>Division</u> |
|----------------------|--------------------|-----------------|
| Lumpy solids         | 36%                | 31%             |
| Soft solids          | 12%                | 12%             |
| Liquid               | 12%                | 10%             |
| <hr/>                |                    |                 |
| Visick 1             | 44%                | 27%             |
| Visick 11            | 32%                | 43%             |

(from O'Boyle et al)

Other potential disadvantages of division of short gastric vessels include an increased rate of recurrent sliding hiatus hernia, defective wrap and recurrent reflux symptoms (4).

## References (Short gastric vessels)

- 1 Luostarinen MES, Isolauri JO. Randomised trial to study the effects of fundic mobilisation on long-term results of Nissen fundoplication. *Br J Surg* 1999; 86: 614-618.
- 2 Blomqvist A, Dalenback J, Hagedom C, et al. Impact of gastric fundus mobilisation on outcome after laparoscopic total fundoplication.
- 3 O'Boyle C, Watson DI, Jamieson GG, et al. Division of short gastric vessels at laparoscopic Nissen fundoplication. *Ann Surg* 2002; 235: 165-170.
- 4 Watson DI, Pike GK, Baigre RJ et al. Prospective double blind randomised trial of laparoscopic Nissen fundoplication with division and without division of short gastric vessels. *Ann Surg* 1997; 226: 642-652.

DeMeester and colleagues demonstrated that the shorter the wrap and the larger the bougie, the less the postoperative dysphagia (1).

Persistent swallowing difficulties can give LARS a poor reputation. One cause of this is an overtight wrap and to attempt to eliminate this many surgeons construct the wrap over an oesophageal bougie - size 50-60 FG.

Novitsky et al (2) report 102 patients operated on with a 2cm wrap with division of the short gastric vessels and without use of a bougie. Sixty-eight (66%) suffered some dysphagia for a mean of  $4 \pm 2$  weeks: dysphagia persisted in seven, three of whom underwent dilatations. Patterson et al (3) conducted an RCT and concluded that use of a bougie reduced long term dysphagia (31% - no bougie, 17% with bougie).

The author uses a bougie on all cases, except those in whom difficulty is encountered during its insertion: better a slightly tight wrap than a mediastinal perforation (4,5).

## References (Bougie)

- 1 DeMeester TR, Bonavina L, Albertucci M. Nissen fundoplication for gastro-oesophageal reflux disease: evaluation of primary repair in 100 consecutive patients. *Ann Surg* 1996; 204: 9-20.
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In the early development of LARS it was common practice not to repair the right crus unless there was a hiatus hernia. This led to a high incidence of post-operative wrap herniation (1) and the need for subsequent re-operation. Crural repair may, however, result in hiatal stenosis (2). It is now recommended that the crus be repaired in all cases, irrespective of whether there is a crural defect or not. Despite this, there still remains a steady 10% of patients in whom the crural repair breaks down (3,4,5).

The Adelaide group (6) conducted an RCT of anterior (47) vs posterior (55) hiatal repair:- there were no significant differences in the outcome six months postoperatively. The table below illustrates differences between the two techniques.

|                               | Anterior repair | Posterior repair |
|-------------------------------|-----------------|------------------|
| Bloat                         | 67              | 30               |
| Can relieve bloat             | 48              | 62               |
| Inability to belch            | 37              |                  |
| Dysphagia for solids          | 28              | 34               |
| Reoperation within six months | 0               | 15               |

% of patients with problems six months postoperatively

Four patients of the posterior repair group required early reoperation, two for overtight hiatal repair, one for paraoesophageal herniation and one for wrap revision: four required revision of hiatal repair between one and six months postoperatively.

Granderath et al (7) have reported 100% successful results one year post-operatively in 24 patients undergoing refundoplication in whom a circular mesh was used. Use of mesh for primary repair is more controversial. Kamolz et al (8) reported a non randomised vertical experience of 100 patients "without" and 100 patients "with" primary mesh repair of the crus. In the "non mesh" group 9% developed post-operative herniation by comparison to 1 in the mesh repair group. At three months post-operatively moderate/severe dysphagia was recorded in 11.5% of non mesh and 21% of mesh repair patients but, at one year post-operatively, these figures had fallen to 1.1% and 1.2% respectively.

### References (Repair of crus)

- 1 Watson DL, Jamieson GG, Devitt PG et al. Paraoesophageal hiatus hernia: an important complication of laparoscopic Nissen fundoplication. *Br J Surg* 1995; 82: 521-523.
- 2 Watson DI, Jamieson GG, Mitchell PC, et al. Stenosis of the oesophageal hiatus following laparoscopic fundoplication. *Arch Surg* 1995; 130: 1014-1016.
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## **POINTS OF CONTENTION IN LARS**

### 1 Open versus laparoscopic fundoplication

Laparoscopic fundoplication is associated with a shorter hospital stay, earlier return to work and approximately 90% patient satisfaction by comparison to open surgery. One RCT comparing open versus laparoscopic fundoplication was terminated prematurely because of an unacceptably high rate of dysphagia in the laparoscopic group (1). This study has been roundly criticised because the trial surgeons were deemed still to be on the learning curve (2,3).

A Swedish trial (4) randomised patients to open (n=30) or laparoscopic (n=25) ARS. Five patients of the laparoscopic group (25%) required conversion. Hospital stay was 3 (2 - 10) days in the open days and 3 (2-6) (p <0.2) in the laparoscopic group. There were no reported differences in control of reflux symptoms, postoperative dysphagia or difficulty in belching five years postoperatively between either groups.

A recent RCT from Sheffield (5) of 47 patients undergoing open and 52 laparoscopic Nissens showed no statistical significant differences in outcome at one year: At one year proportionally more of the laparoscopic group complained of solid food dysphagia (10/42 vs 6/39) and post prandial fullness (11/42 vs 5/39). Given the benefit of shorter hospital stay and earlier return to work the evidence favours the laparoscopic approach at least in short term results.

A study (6) comparing open and laparoscopic Nissen and laparoscopic partial anterior fundoplication has found no real differences between the three procedures, although LN had the highest rate of inability to belch.

## References (Points of contention in LARS)

- 1 Bais JE, Bartelsman JFWM, Bonjer HJ et al. Laparoscopic or conventional Nissen fundoplication for gastro-oesophageal reflux disease: randomised clinical trial. The Netherlands Antireflux Surgery study group. *Lancet* 2000; 355: 170-4.
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- 5 Ackroyd R, Watson DI, Majeed AW, Troy G, Treacey PJ, Stoddard CJ. Randomised clinical trial of laparoscopic versus open fundoplication for Gastro-oesophageal reflux disease. *Br J Surg* 2004; 91: 975-982.
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## TOTAL OR PARTIAL FUNDOPLICATION?

Because of the obstructive side effects of total (360°) fundoplication some surgeons have recommended partial wraps.

Potential advantages:-

- adequate control of reflux
- less dysphagia
- less "gas-bloat"

Potential disadvantages:-

- inadequate reflux control
- durability of procedure
- any real difference in incidence of dysphagia and "gas bloat"?

Lars Lundell has completed the most comprehensive RCT of open Nissen (n=53) versus Toupet (n=53) funduplications (1): patients were randomised irrespective of their preoperative oesophageal manometry and follow up was for three years minimum. The accompanying table summarises the main results.

|                      |      |      |
|----------------------|------|------|
| Postop symptoms      | 360° | 270° |
| heartburn - none     | 94   | 86   |
| regurgitation - none | 96   | 86   |
| dysphagia - none     | 90   | 94   |
| distension - none    | 44   | 50   |
| flatulence - none    | 39   | 70   |
| 24hr pH % <4         | 2.1  | 2.5  |

(figures in percent)

The only difference recorded was an increase in flatulence in those having a total wrap.

Two excellent RCTs have compared results not only between laparoscopic Nissen and Toupet fundoplication but also patients were stratified according to preoperative oesophageal motility.

The Reading group (2) randomised 127 patients: at one year follow up there were no differences in reflux control or side effects. pH failures occurred in 7, 2/64 in the 360° and 5/63 in the 270° groups. Preoperative dysmotility had no bearing on the clinical or physiological outcome of either group.

Fibbe et al (3) from Hamburg conducted a similar study with 100 patients in each group, but with only a four month follow up. Their study showed a higher rate of symptom recurrence (20% Nissen, 15% Toupet). Postoperative dysphagia (not defined) was not related to preoperative motility but was noted more with Nissen (44%) versus Toupet (17%). In patients with normal motility there was a higher rate of new onset dysphagia following Nissen (15) versus Toupet (4) ( $p>0.005$ ) and in those with dysmotility Nissen (10), Toupet (5) ( $p=NS$ ). Two of three Nissen patients required reoperation for dysphagia.

Both these studies lay to rest the argument for tailoring the antireflux procedure to preoperative manometry - a concept widely publicised by DeMeester (4) and others (5).

Other non-randomised studies have not shown any advantages of a Toupet (6). Horvath et al (7) from Oregon assessed 48 patients following laparoscopic Toupet fundoplication and compared failures ( $n=22$ ) versus successes ( $n=26$ ) at a mean of 22 months postoperatively. By comparison to the success group the failure group had greater number of indices of severe disease (Barrett's, hypotensive LOS, pH value and stricture/oesophagitis) and 8 had postoperative wrap herniation.

Fernando et al (8) followed up 163 laparoscopic Nissens (LN) and 43 laparoscopic Toupets (LT) at 19 months postoperatively. Indication for Toupet was ineffective oesophageal motility. A greater number of LT patients (38%) versus LN (20%) required postoperative PPI: paradoxically the rate of dysphagia was greater following LT (35%) versus LN (15%).

Laws et al (9) performed a small RCT of LN (28) versus LT (16) and short term follow up showed equivalence in the Visick grades. Finally, in the debate over Nissen versus Toupet, Kamolz et al (10) assessed quality of life scores (GIQLI) in 107 LN (normal motility) versus 68 LT (ineffective motility). No differences were recorded in LOSP (LN 13.9mmHg vs LT 12.3mmHg), total 24 hr pH time (LN 12.5% vs LT 12.9%) and GIQLI scores (LN 12.8 vs LT 122.4). Abnormal pH scores were recorded in LN (2.8%) vs LT (10.3%) suggesting a less efficient antireflux mechanism in LT: 3 of the LT group required later revision to LN. Three patients in LN required revision to LT because of dysphagia.

Following work on an animal model (11) which showed equal augmentation of the LOS following a myotomy and subsequent anterior, posterior or total fundoplication, the Adelaide group conducted two RCTs:-

- 1 The first trial (12) compared LN (n=53) vs laparoscopic anterior hemi fundoplication (LAH) (n=54). Postoperative Visick 1 and 2 scores were: LN(78%), LAH(83%), resting LOSP LN (29mmHg) versus LAH (18.3mmHg). Dysphagia for solids six months postoperatively were noted in LN (40%) vs LAH (15%). PH studies were abnormal in three of each group.
- 2 The second trial (13) compared LN (n=52) versus laparoscopic anterior 90° fundoplication (LA90) (n=60). In this multi-centre study, clinical outcomes were very similar between the two groups at six months postoperatively, Visick 1 & II in 77% following both operations: dysphagia for solids in 22% LN, versus 14% LA90; side effects were less in LA90 versus LN - eg ability to belch LN 57% versus LA90 88% six months postoperatively. Heartburn, however, was present in LN (4%) versus LA90 (19%).

Thus, there appears to be a trade off: total fundoplication is more effective in controlling reflux but has more gas related side effects than partial posterior, anterior 180° or anterior 90° partial fundoplication.

## References (Total vs partial fundoplication)

- 1 Tailoring antireflux surgery: a randomised clinical trial. *World J Surg* 1999; 23: 612-8.
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## 6 LEARNING CURVE

Several series have addressed the problem of the learning curve of both surgeon and institution. Watson et al (1) reported a 30% complication rate, 20% conversion rate and reoperation rate of 25% in the first 20 cases: these figures falling to 0%, 7% and 3% for cases 25-80. If the first 20 patients are excluded and "experienced" surgeons perform the surgery the 30 day complication rate falls to 5.2% (2). These authors also show that the early results of surgeons who are "proctored" are superior to the early cases of the surgical pioneers - eg conversion rate of 7% for first 10 cases of "late starters" vs 20% conversion rate in cases 11-20 of "early starters": Soot et al (3) have shown similar learning curves and recognise that problems still persist after the first 100 cases whilst Schauer et al (4) showed a high rate of gastric and oesophageal perforations early in the learning curve. Gill et al (5) from Reading have demonstrated a continued reduction in conversion rate, operating time and length of stay from 1993 - 1999. They highlight the improvements in both training of surgeons and the quality of optical display and instrumentation over this period and reflect that the early pioneers of LARS had much to contend with by comparison to the training available today.

The learning curve must not be underestimated, especially in difficult cases: Schaur et al (4) reported 17 oesophageal and gastric perforations during laparoscopic fundoplication, 10 of which occurred during the first 10 cases performed by the 14 participating surgeons.

References (Learning curve)

- 1 Watson DI et al. A learning curve for laparoscopic fundoplication. Definable, avoidable or a waste of time? *Ann Surg* 1996; 224: 198-203.
- 2 Watson DI, Jamieson GG, Baigre RJ, Matthew G, Devitt PG, Game PA, Britten-Jones R. Laparoscopic surgery for gastro-oesophageal reflux: beyond the learning curve. *Br J Surg* 1996; 83: 1284-7.
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## 7 RESULTS OF LARS - PSYCHOLOGICAL ILLNESS

Two studies (1,2) have shown that poor results following LARS can be related to the preoperative psychological state of the patient. The table shows that patients with a normal psychological profile had few postoperative complaints by comparison to those with a depressive pattern.

| Postoperative | Preoperative psychology |           |
|---------------|-------------------------|-----------|
|               | Normal                  | Depressed |
| Chest pain    | 2.6                     | 44.7      |
| Bloat         | 18.4                    | 68.4      |
| Dysphagia     | 2.6                     | 50.1      |

(figures in percent)

### References (Psychology/LARS)

- 1 Eubanks TR, Omelanczuk P, Richards C et al. Outcome of laparoscopic anti reflux procedures. Am J Surg 2000; 179: 3 91-5.
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## 8 OBJECTIVE ASSESSMENT FOLLOWING LARS

The gold standard should be for all patients to undergo postoperative pH/manometry: Khajanchee et al (1) tested all 209 patients at a mean of 7.7 months postoperatively: pH proven reflux occurred in 17/58 (29%) symptomatic and 18/151 (12%) asymptomatic patients. The true positive and false positive groups had the highest preoperative DeMeester scores. LOS pressures were lowest pre and postoperatively in the true positive group. There was no significant difference amongst the postoperative LOS groups.

| Postop Symptoms | N     | Postop pH DeMeester | Preop pH DeMeester | Postop LOS |
|-----------------|-------|---------------------|--------------------|------------|
| Typical GOR     | - 17  | ABN (38) True +     | 99                 | 16         |
|                 | 58    | N(2) False -        | 41                 | 24         |
| Asymptomatic    | - 133 | N(2) True -         | 46                 | 23         |
|                 | 151   | ABN (38) False +    | 71                 | 18         |

(Adapted from Khajanchee et al)  
(ABN = abnormal, N = normal)

The ideal of objective testing in every patient is difficult to achieve since few asymptomatic patients (and few symptomatic as well) will subject themselves to the discomfort of postoperative naso-oesophageal intubation.

### Postoperative anatomical state of wrap

It has always been thought that anatomical failure equates to clinical failure. A recent Dutch study has refuted that (2). One week and two years postoperatively barium swallows were performed on 47 patients following laparoscopic or open fundoplication. At one week and two years 91% and 45% respectively were claimed as anatomical successes. Of the 27 anatomical failures at two years 19 (70%) had no heartburn and 21 (78%) had no regurgitation.

Of the 27 patients with barium criteria of anatomical failure, 26 (96%) patients deemed their GORD cured or improved by the surgery.

Moral Don't investigate unless the patient is symptomatic!

These results are, nonetheless, disappointing with such a high rate of technical failure. If other centres report similar findings more thought needs to be given to improvements in operative technique.

References (Postop objective assessment)

- 1 Khajanchee US, O'Rourke RW, Lockhart B, Patterson EJ, Hansen PD, Swanstrom LL. Postop symptoms and failure after anti reflux surgery. Arch Surg 2002; 108: 1014.
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## 9 LONG TERM RESULTS OF LARS

Whilst there are numerous reports of the short term results of laparoscopic surgery only a few papers have reported a meaningful five year follow up of laparoscopic anti reflux surgery. The Adelaide group (1) reported a five year follow up of 99% of 176 patients. Further surgery was required in 27 patients (13 for paraoesophageal hernia, 5 because an overtight wrap, 2 for conversion to a partial wrap, 3 because of wrap disruption and 3 for correction of a bilobed stomach). One further patient underwent oesophagectomy for development of high grade dysplasia. 13 of these patients had revision surgery within one year of the original fundoplication.

Of 166 patients for whom clinical follow up was obtained at five or more years, 60% had no, 9% mild and 4% severe heartburn - ie 87% of patients were free of significant reflux symptoms five years post LARS. Eighteen patients (11%) were taking regular acid suppression medication.

The Reading group (2) reported similar results in 175 of 199 consecutive patients at a mean follow up of 48 months. Overall Visick 1 and 11 scores were reported in 91% at one year, 87% at two - five years and 79% at > five years. Heartburn, volume regurgitation and dysphagia were improved in 93%, 91% and 76% at two - eight years following surgery. Postoperative pH tests were performed in 109 patients at six months - 95% of these were normal. Reoperation was required in 6%, nine of which were undertaken within two years of initial surgery. Nineteen patients (14%) were taking anti reflux medication: 17 of these 19 underwent postoperative pH tests and twelve of these were normal.

Results of laparoscopic anti reflux surgery should achieve similar excellence to that reported by Grande (3) from Spain with a twenty year follow up of open Nissen fundoplication. This series (with a 43% follow up at 10 years) demonstrated 92% of patients were free of reflux symptoms at that time.

## References (Long term results)

- 1 Lafullarde T, Watson DI, Jamieson GG et al. Laparoscopic Nissen fundoplication five year results and beyond. *Ann Surg* 2001; 136: 180-4.
- 2 Booth MI, Jones L, Stratford J, Dehn TCB. Results of laparoscopic Nissen fundoplication at 2-8 years after surgery. *Br J Surg* 2002; 89: 1-7.
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#### Ackroyd

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## NEED FOR ANTI REFLUX MEDICATION FOLLOWING LARS

Some take this as a marker of operative failure: Booth et al (1) showed that 19 of 175 (14%) LARS patients were taking anti reflux medication postoperatively: 17 of these underwent pH testing, only 5 showed reflux. The Adelaide group (2) reported use of regular acid suppression medication in 11%: Bloomston et al, (3) questioning some 100 postoperative LARS patients at 1 and 4 years postoperatively, noted an increase in anti reflux medication from 19% to 37% over the time period, largely an increase in PPI medication from 8% to 31%.

Stewart et al (4) reported that there was a significant relationship between the DeMeester symptom score postoperatively and number of patients taking acid suppression therapy (AST) - 8% took AST with a DeMeester score of 1, 34% with a score of 2, 20% with a score of 3 and 47% with a score above 3. More patients took simple antacids after partial fundoplication (26%) compared to open (15%) or laparoscopic Nissen (16%). Whether taking antacids/AST therapy is indicative of failure is uncertain:- Studies by Lord (5) and Booth, (1) both demonstrated that a high proportion of these patients did not have pH confirmed reflux.

Response to postoperative PPIs is an unreliable indicator. Galvani et al (6) studied 127 patients with postoperative reflux symptoms. Sixty-two were taking PPIs - 42 of whom had normal pH. Of the 51 patients with abnormal pH, 35% had a poor response to PPI therapy.

Patti et al (7) have demonstrated that more patients undergoing partial fundoplication (25%) require PPIs postoperatively by comparison to 360° fundoplication (8%) when a tailored approach was made.

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- 1 Booth MI, Jones L, Stratford J, Dehn TCB. Results of laparoscopic Nissen fundoplication at 2-8 years after surgery. *Br J Surg* 2002; 89: 1-7.
- 2 Lafullarde T, Watson DI, Jamieson GG et al. Laparoscopic Nissen fundoplication five year results and beyond. *Ann Surg* 2001; 136: 180-4.
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- 4 Stewart GD, Watson AJM, Lamb PJ et al. Comparison of three different procedures for anti reflux surgery. *Br J Surg* 2004; 91: 724-9.
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- 7 Patti MG, Robinson T, Galvani C, et al. Total fundoplication is superior to partial fundoplication even when oesophageal peristalsis is weak. *J Am Coll Surg* 2004; 198: 863-70.

## 10 LARS - BARRETT'S OESOPHAGUS

Approximately 10-15% of patients undergoing LARS have Barrett's oesophagus (BO). These patients are considered to be at the worst end of the spectrum of reflux disease: by comparison to non BO refluxers they have a greater incidence of hiatus hernia, defective sphincter, dysmotility and greater levels of oesophageal acid exposure by both day and night. They are, therefore, a surgical challenge.

The following questions relate to LARS and BO:-

- 1 Is BO reversed by LARS?
- 2 Can LARS prevent development of dysplasia/adenocarcinoma?
- 3 Are the results of LARS in BO patients any better/worse than non-BO patients.?
- 4 Is BO, per se, an indication for LARS?

### (i) REVERSAL OF BARRETT'S OESOPHAGUS BY LARS

Warning Different definitions of BO exist between USA and UK. USA pathologists require histological intestinal metaplasia for a diagnosis of BO: in the UK the definition is that of usual columnar lined oesophagus. Therefore, American studies often quote reversal of Barrett's as disappearance of intestinal metaplasia: in the UK reversal implies visual/histological conversion of columnar to squamous lined oesophagus.

Oelschlager (1) analysed 203 consecutive BO patients undergoing LARS: regression was recorded in 30/54 (56%) of patients with short segment BO (<3cm) and 0/36 with long segment (>3cm). DeMeester's group reported 19% regression in 79 patients (and progression to low grade dysplasia in 6%). A later paper from the same group (3) reported regression in 28 of 77 (36%) patients.

In practical terms, some patients (especially those with short segment BO ) may have regression, but it is unpredictable and re-epithelialisation over columnar mucosa may harbour potentially malignant Barrett's cells. (Gastrointest Endoscop 1999; 50: 165-172).

## References

- 1 Oelschlager BK, Barreca M, Chang L, et al. Clinical and pathological response of Barrett's oesophagus to laparoscopic antireflux surgery. *Ann Surg* 2003; 238: 458-466.
  - 2 Gurski RR, Peters JH, Hagan JA, et al. Barrett's oesophagus can and does regress after antireflux surgery: a study of prevalence and predictive features. *J Am Coll Surg* 2003; 196: 706-713.
- Hofstetter WL, Peters JH, DeMeester, et al. Long-term outcome of antireflux Surgery in patients with Barrett's oesophagus. *Ann Surg* 2001; 234: 532-9.

## (ii) CAN LARS PREVENT DEVELOPMENT OF DYSPLASIA/OESOPHAGEAL ADENOCARCINOMA?

Intuitively, antireflux surgery should be more effective than medical therapy in limiting continued exposure of the oesophageal mucosa to gastric and pancreatico-duodenal secretions by virtue of the physical barrier of fundoplication. Anti reflux surgery has been promoted for this reason by some US surgeons (1). This study, however, included reports with less than one year follow up.

A meta analysis (2) of development of adenocarcinoma in medical versus surgical treated BO patients with over 8,000 patients year follow up showed a cancer rate of 3.8 (2.4-6.1) per 1,000 patient years in antireflux surgery and 4.3 (2.6-5.8) in PPI treated patients (2).

There are acknowledged biases in this analysis:-

- no RCT
- cohort studies - selection bias for ARS -did patients with more severe symptoms get offered ARS and patients with milder symptoms medical therapy?
- ARS a) variety of procedures b) competency of wrap not assessed post-operatively.
- Medical therapy - no measure of compliance

The University of Southern California group (3) reported results of 77 surgically treated (41 lap Nissens) patients with BO. Outcome determinants were loss of low grade dysplasia (LGD) and/or loss of intestinal metaplasia (IM). Histological regression occurred in 28/37 (36%): 17/25 (68%) LGD to no dysplasia and 11/52 (21%) disappearance of IM. Two progressed to high grade dysplasia (HGD).

Whilst this study shows some benefits of ARS the results should not change practice. LGD is of doubtful clinical significance (Am J Gastroenterol 2000; 95: 1669-70) and can be difficult to differentiate histologically from inflammatory changes with poor concordance between pathologists (Gastrointest Endosc 1999; 50: 23-26). Finally, the majority of "regressions" were recorded in short segment BO.

Patients with BO should be advised that no conclusive evidence exists that LARS can reliably produce histologic regression or reverse long segment BO, prevent cancer and, therefore indications for LARS in BO patients should be similar to those for non-BO refluxers.

## References

- 1 Bammer T, Hinder RA, Klaus A, et al. Rationale of surgical therapy of Barrett's oesophagus. *Mayo Clinic Proc.* 2001; 76: 335-42.
- 2 Corey KE, Schmitz SM, Shaheen NJ. Does a surgical antireflux procedure decrease the incidence of oesophageal adenocarcinoma in Barrett's oesophagus? A meta-analysis. *Am J Gastroenterol* 2003; 98: 2390-2394.
- 3 Gurski RR, Peters JH, Hagen JA, et al. Barrett's oesophagus can and does regress after antireflux surgery: a study of prevalence and predictive features. *J Am Coll Surg* 2003; 196: 706-13.

(iii) ARE THE RESULTS OF LARS IN BARRETT'S OESOPHAGUS PATIENTS DIFFERENT FROM THOSE IN NON BARRETT'S OESOPHAGUS REFLUXERS?

Two papers from the "open" anti reflux era show markedly worse results in Barrett's refluxers by comparison to non Barrett's (1,2). Barrett's oesophagus refluxers have greater incidence of hiatus hernia, sphincter failure, dysmotility, length of history and oesophageal acid exposure time on pH recording than non Barrett's refluxers.

Three centres (3,4,5) with large patient numbers have compared results of LARS in Barrett's oesophagus vs non Barrett's oesophagus reflux patients. Barrett's amounted to 10-15% of the LARS population: preoperative symptom length was greater in Barrett's (98 months) versus non Barrett's refluxers (60 months) (5). Partial LARS were performed because of oesophageal dysmotility in St Louis (4) and Adelaide (4); in Reading (5) laparoscopic Toupet's were performed as part of an RCT in 1 of Barrett's patients. Preoperative pH was recorded and in all patients and in 79% postoperatively in the Barrett's oesophagus patients from Reading: total acid exposure time was 12.8% in Barrett's oesophagus vs 6.7% in non Barrett's patients. This fell to 2.0% and 0.5% respectively six months postoperatively. Desai (3) reported equivalent resolution of heartburn, volume regurgitation and dysphagia: Yau (4) used a visual analogue score, also showing equivalence of results between the two groups.

"Anatomical" failure and reoperation were reported in 12% versus 3% and 5% versus 1.8% (Barrett's versus non-Barrett's) by Desai (3). Reoperation for reflux related problems were reported in 7% of Barrett's oesophagus (3).

The Reading group used modified Visick scores; at one year 90% of Barrett's oesophagus were Visick 1 and 2, versus 91% in non-Barrett's patients. Total acid exposure time greater than 4% were recorded postoperatively in 17.9% of Barrett's oesophagus and 6.1% of non-Barrett's (Reading). The Reading group (5) reoperated on 3 Barrett's oesophagus group for recurrent reflux (+1 for cancer), 5% and 3% for reflux related problems in on-Barrett's (4).

Postoperatively PPIs were taken by 20% of Barrett's oesophagus patients versus 13% of non-Barrett's (4).

These results indicate that following laparoscopic anti reflux surgery there is little difference in the functional results between Barrett's oesophagus and non-Barrett's oesophagus refluxers. Whilst sometimes technically more demanding, Barrett's oesophagus patients should be offered laparoscopic anti reflux surgery for the same indications as non-Barrett's oesophagus refluxers.

## References (Barretts)

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- 4 Yau P, Watson DI, Devitt PG, et al. Laparoscopic antireflux surgery in the treatment of gastro-oesophageal reflux in patients with Barrett's oesophagus. *Arch Surg* 2000; 135: 801-5.
- 5 Pittathankal AA, Sohanpal J, Jones L, Stratford J, Booth MI, Dehn TCB. Outcome following laparoscopic antireflux surgery: do patients with Barrett's fare worse by comparison to non-Barrett's GORD patients.

## II. FAILURE OF LARS

Causes of failure can be due to:-

- development of intolerable side effects (dysphagia, gas bloat)
- return of original symptoms
- incorrect initial diagnosis

### Side effects of LARS

Dysphagia. There are few validated definitions of post fundoplication dysphagia thus making comparison between series is almost impossible. A simple classification is one used by the MRC in oesophageal cancer trials:-

|     |   |  |
|-----|---|--|
| 0   | = | Normal swallowing                                      |
| I   | = | Difficulty with solid food (cooked meat, bread, toast) |
| II  | = | Able to swallow semi solids                            |
| III | = | Able to swallow liquids only                           |
| IV  | = | Aphagia (spits out saliva)                             |

The following factors are important in managing postoperative dysphagia:-

- (a) All patients should be warned that their eating habits will change and to avoid chunky food for the first 4-6 weeks postoperatively (For dietary advice see [www.lapsurg.info](http://www.lapsurg.info))
- (b) Did patient admit to dysphagia pre-fundoplication?
- (c) If new dysphagia - Is it persistent and unrelenting? Does patient have difficulty with liquids? What is percentage weight loss?

### Management of Post fundoplication dysphagia

Early (first postoperative week) dysphagia.

If patient has epigastric/retrosternal/back pain AND dysphagia be suspicious of anatomical failure. The author places ligaclips (2 per side) on the crural repair and on the wrap (3 per side) and X-rays the hiatus on day 1. The fig. shows a wrap herniation on day 1. This was confirmed at surgery that day and repaired. Some centres undertake a barium swallow on day 4. Apart from wrap herniation other causes of early severe dysphagia are:-

- too tight crural repair
- too tight fundoplication
- Slipped fundoplication (stomach slips up through wrap with an "hour glass" effect).

These are few pointers, other than experience, for the "correct" management of early intractable dysphagia since a proportion will resolve with masterly inactivity and barium swallow appearances may not tally with the patient's symptoms. Endoscopy (by an experienced surgeon) may help: a "catch" on passage of the endoscope through the hiatus, may indicate an overtight hiatal repair. A through the scope balloon dilator can be inserted into the stomach and withdrawn - if a size 16 mm FG catches or will not pass through the wrap the latter may be too tight.

### Persistent dysphagia (? to solids) with sustained weight loss

These patients need full reassessment with barium swallow (to exclude wrap herniation), OGD and a review of preoperative manometry to exclude achalasia.

The table shows the rate of postoperative "dysphagia" over time following LARS.

| N    | Preop | Postop |      |     | Dilat. | Reop |
|------|-------|--------|------|-----|--------|------|
|      |       | <3m    | 3-6m | 76m |        |      |
| 4942 | 41%   | 34%    | 14%  | 3%  | 1%     |      |
|      |       | 6%     |      |     |        |      |

(from Wills V et al. Br J Surg 2001; 88: 436-9)

- Nutrition: During investigation adequate nutritional intake must be ensured; seek assistance from dietitian
- Balloon dilatation: Various authors quote a success rate of 50-67% with balloon dilatation. Gaudric et al used a 35/40mm Rigiflex achalasia balloon in 16 patients, reporting good results in 9 with a mean FU of 19m. Of the 7 with poor results 6 required revisional surgery. Of those with good results from dilatation 82% had normal preop peristaltic waves vs 39% of those with poor results.
- Reoperation If a technical failure has occurred reoperation may be required. This can be performed laparoscopically in the majority of cases.

### References (Post fundoplication dysphagia)

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