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Original research

## Outcome of gastro-oesophageal reflux-related respiratory manifestations after laparoscopic fundoplication

Franklin Adaba\*, Chin W. Ang<sup>1</sup>, Anthony Perry, Martin S. Wadley, Charles S. Robertson

Department of Upper Gastrointestinal Surgery, Worcestershire Acute Hospitals NHS Trust, Charles Hastings Way, Worcester WR5 1DD, UK

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## ABSTRACT

**Aims:** Patients with refractory respiratory symptoms related to gastro-oesophageal reflux disease (GORD) such as asthma and cough are being referred for laparoscopic fundoplication (LFP), as recommended by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES). However there are limited data regarding symptomatic response to fundoplication in this group of patients.

**Method:** A 7 year retrospective review was performed to study the efficacy of LFP in the treatment of patients with respiratory manifestations of GORD. Patients were followed up from 4 to 6 weeks (short-term) to 6–12 months (long-term) post-operatively.

**Results:** Of 208 patients who underwent LFP, 73 (35%) patients were eligible for inclusion into the study. 55 (75%) patients had improved respiratory symptoms at short-term follow-up. At long-term follow-up, 7 of these patients had recurrence of respiratory symptoms, while 4 patients had improvement not initially apparent. No significant predictive factor for the success or failure of surgery was identified. 190 (91%) of 208 patients had symptomatic improvement in GORD at short-term follow-up.

**Conclusion:** LFP is effective with the response rates over 75% in the control of respiratory manifestation of GORD, compared to over 91% response rate in the control GOR symptoms alone. More research is needed to identify factors to aid patient selection to improve response rate.

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## 1. Introduction

Gastro-oesophageal reflux disease (GORD) is a known cause of respiratory and intractable extra-oesophageal symptoms such as cough, hoarseness and asthma [4,19,21,24]. It can also exacerbate cough in patients with pre-existing respiratory conditions. Several articles have documented that patients with chronic cough due to reflux disease have improvement of their symptoms after anti-reflux surgery [1–3,6,9,14,16,19,21–24].

The relationship between cough and other symptoms of gastro-oesophageal reflux disease (GORD) and factors which may predict the response of reflux related cough to anti-reflux surgery remain unclear [19,23]. Three mechanisms have been postulated linking GORD with cough and these are the intra-oesophageal reflux, extra-oesophageal reflux and micro-aspiration [4,10]. Each of these mechanisms act by directly stimulating the cough receptors or indirectly causing increased sensitizing to the cough reflex.

Patients with chronic cough due to reflux disease or exacerbation of cough in patients with pre-existing respiratory condition are increasingly referred to Upper Gastrointestinal surgeons in the UK for consideration of laparoscopic fundoplication (LFP) as recommended by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES). However there are limited data to support this practice.

The aim of this study was to evaluate the magnitude of the short-term and long-term effect of LFP on improving gastro-oesophageal reflux related respiratory manifestations particularly cough and to identify any predictive factors.

## 2. Methodology

A retrospective analysis of patients who underwent LFP from January 2005 to January 2012 at a single center was performed. Patients were identified through coding system from Information Technology (IT) department and manual search of consultant's theatre diary. Data was collected from patient's notes and electronic clinic letters. Patients who had LFP for oesophageal motility disorder or gastric volvulus were excluded from the study. All patients included in the study were reviewed for symptom presentation which included heartburn, retrosternal/epigastric pain, dysphagia,

\* Corresponding author. Tel.: +44 07540251770.

E-mail address: [uchiecoche@yahoo.co.uk](mailto:uchiecoche@yahoo.co.uk) (F. Adaba).<sup>1</sup> Shared first authorship.

regurgitation and cough. Patients with pre-existing respiratory disease such as asthma, bronchiectasis and interstitial lung disease were also collected.

Patients underwent investigations to evaluate the severity of the reflux disease pre-operatively, which included pH studies, oesophageal manometry, oesophagogastroduodenoscopy (OGD) and barium meal.

Patients with intractable cough or respiratory symptoms as primary symptom of reflux disease had pre-operative respiratory assessment by the respiratory physicians prior to referral to the Upper Gastrointestinal Surgeons. This included spirometry, lung function test (LFT) and high resolution CT scan of thorax (HRCT).

All patients had either Laparoscopic Toupet or Nissens fundoplication performed by 3 experienced upper gastrointestinal surgeons. Patients were followed up at 4–6 weeks (short term) and then 6–12 months (long term) following surgery to check for the improvement of their cough and reflux symptoms. A reduction in the frequency of cough or resolution of cough was considered as improvement of cough symptoms in this study. Complications from surgery and any post-operative investigations (pH studies, oesophageal manometry, barium meal, OGD) were also noted.

3. Statistical analysis

Comparisons between two groups were made using non-parametric continuity corrected chi-square test or a chi squared test was used when more than two groups were analyzed. Fisher exact test was performed for comparison when the numbers were less than 10. Multivariate Cox regression analysis was conducted using a stepwise forward selection approach starting with the most significant variable on univariate analysis including every variable with a P-value of <0.10 sequentially. All analysis was performed using Statview version 5.01 (SAS Institute Inc.). A P-value of <0.05 was considered significant.

4. Results

There were 208 patients identified for the study (51% females) with median of 53 years (range 17–81 years). Of these 208 patients, 73 (35%) patients underwent LFP for cough and or respiratory symptom due to GORD. Heartburn (84%) was the most common symptom presentation (Table 1) while asthma (14%) was the most prevalent pre-existing respiratory condition (Table 2).

All patients had pre-operative reflux evaluation however, not all results were retrievable. 167 (80%) of patients had documented total reflux time (range 0.6–76.3) while 159 (76%) of patients had documented DeMeester score (range 2.6–317.1) and 189 (90%) of patients had documented oesophageal manometry (96% with hypotonic lower oesophageal sphincter). There were 176 (84%) and 56 (26%) patients who underwent pre-operative OGD and barium swallow respectively. The median length of hospital stay post-operatively was 2 days (range 1–13 days) including the day of surgery.

There were 55 (75%) patients who had improved respiratory symptoms at 4–6 weeks following surgery (Fig. 1) while no short

Table 1 Presenting symptoms of patients who had undergone LFP.

Symptom	Number (%) of patients
Heartburn	176 (84)
Retrosternal/epigastric pain	102 (49)
Reflux/regurgitation	158 (75)
Dysphagia	51 (24)
Cough	55 (26)

Table 2 Number of patients with pre-existing respiratory conditions.

Respiratory condition	Number (%) of patients
Asthma	31 (14)
COPD/bronchiectasis	12 (5)
Interstitial lung disease	4 (1)

term data was available for 4 patients. In comparison, 190 (91.2%) of 207 patients had GOR symptoms improvement at 4–6 weeks following surgery. The 18 (25%) patients with no improvement of respiratory symptoms at 4–6 weeks following surgery had post-operative investigations to exclude technical failure of fundoplication as a cause of persistent respiratory symptoms (Table 3); all of these patients had post-operative pH studies and oesophageal manometry which showed no evidence of significant gastro-oesophageal reflux disease. Ten (55%) patients had OGD, 3 (17%) patients had barium meal while 5 (28%) patients had both OGD and barium meal post-operatively. All of these investigations ascertained intact fundoplication.

At 6–12 months, 44 (62%) had improved respiratory symptoms of which 7 patients had recurrence of respiratory symptoms, while 4 patients had improved respiratory symptoms which were not apparent in the short-term. There were 17 patients whose long term data were not available. The 7 patients with recurrence of respiratory symptoms had pH studies and oesophageal manometry which showed no evidence of significant gastro-oesophageal reflux disease. Two patients had OGD while 2 other patients had both OGD and barium meal, all of which were normal. We therefore found no evidence of fundoplication failure to explain their recurrence of respiratory symptoms.

No significant predictive factor (gender, age, DeMeester score, total reflux time) for improving respiratory symptoms was identified (P > 0.05) upon regression analysis.

Dysphagia (35%) was a common side effect of LFP. There was no mortality.

5. Discussion

The SAGES 2010 guidelines on the management of GORD suggest that patients with intractable cough or worsening of respiratory conditions thought to be attributed to reflux disease are to be

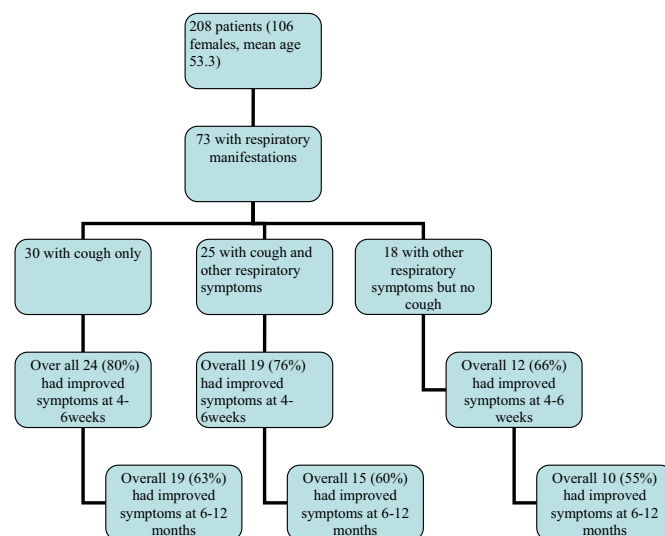


Fig. 1. Summary of outcome of patients with respiratory manifestation following LFP.

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