

Pulmonary Function Test in Endoscopically Proven Cases of GERD**A. Sivaraman¹, Harish V. K.², Balasubramanian³, Manoj Mali⁴, Dhiraj Jain⁵**¹Senior Assistant Professor, Department of General Medicine, IGMCRI, Puducherry²Assistant Professor, Department of Pulmonary Medicine, JIPMER, Karaikal³Associate Professor, Department of General Medicine, IGMCRI, Puducherry⁴Associate Professor, Department of General Medicine, JLN Medical College, Ajmer, Rajasthan⁵Associate Professor, Department of General Medicine, IGMCRI, Puducherry

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Abstract:**Background:** To assess the Pulmonary function in endoscopically proven cases of Gastroesophageal reflux disease (GERD). PFT (Pulmonary function test) is done in patients with GERD, irrespective of their respiratory symptoms (in both asymptomatic and symptomatic patients).**Methods:** It is a cross-sectional study conducted at the Department of General Medicine, Jawahar Lal Nehru Medical College, Ajmer, Rajasthan. 50 cases of endoscopically proven GERD patients were enrolled in our study. The severity of GERD is graded according to the endoscopic findings. Then Pulmonary function test was done in all 50 patients irrespective of their respiratory symptoms (in both asymptomatic and symptomatic patients) to assess the lung function in these patients.**Results:** Out of 50 patients, 30 were male and 20 were female. The mean age group of the study population was 39 years. Among 50 patients 32 (64%) patients had no respiratory symptoms and 18 (36%) were presented with respiratory symptoms. Out of 50, only 3(6%) patients had abnormal findings on chest X-rays. PFT showed abnormal patterns in 24 (48%) patients. The restrictive pattern is the commonest abnormality observed in our study.**Conclusion:** Early lung function tests in all GERD patients irrespective of their respiratory symptoms may be useful in identifying subclinical loss of lung function.**Keywords:** GERD, Pulmonary function test, Endoscopy.

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Introduction

Gastroesophageal reflux disease (GERD), is defined as the presence of symptoms or lesions that can be attributed to the reflux of gastric contents into the esophagus with or without tissue damage.[1] GERD is classified into 2 classes based on tissue damage if tissue damage is present, the individual is said to have esophagitis or erosive GERD and if there is no evidence of tissue damage but with the presence of symptoms of GERD is referred to as non-erosive GERD.

Gastroesophageal reflux disease (GERD) is the most common esophageal disorder, accounting for nearly 75% of all patients with esophageal disorders. The prevalence of GERD in the Indian population is 7.6% to 30%, being <10% in most of population studies and higher in cohort studies[2]. The dietary factors associated with GERD include the use of spices and non-vegetarian food. *Helicobacter pylori* are thought to have a negative relation with GERD, *H.pylori* negative patients have higher grades of symptoms of GERD and esophagitis. In

Western studies, 15-20% of the General population suffers from GERD. The prevalence of GERD in Asia is lower (2.3% to 8%), probably due to the higher prevalence of *Helicobacter pylori*, lower body mass index, low-fat consumption in diet and genetic diversity. It also occurs in children.

Symptoms of GERD vary from person to person. Symptoms may be local (related to oesophagus and stomach) and sometimes patient may present with extra oesophageal symptoms which results in various complications. Most common symptom in GERD is heart burn followed sour or bitter taste due to acid reflux. The majority of people with GERD have mild symptoms, with no visible evidence of tissue damage and little risk of developing complications. If extra esophageal manifestations are taken into consideration, it is believed that the real prevalence of pathological reflux might be underestimated. There are some anatomical and physiological factors like mucosal resistance, acid clearance and oesophago-gastric barrier which protects

oesophagus from any injury. The main pathogenesis of GERD is when refluxate from the stomach comes in contact with oesophagus leads to tissue injury. Refluxate composed of acid, pepsin, bile and duodenal contents[3]. Among these components acid plays a major role in causing local and as well as extra oesophageal complications like oesophagitis, barretts oesophagus, malignancy, bronchial asthma, chronic persistent cough, chronic bronchitis, laryngitis, pulmonary aspiration complications (Lung abscess, bronchieactasis, aspiration pneumonitis), Idiopathic pulmonary fibrosis, chronic obstructive pulmonary disease etc[4].

The exact aetiology of extra-oesophageal manifestations of GERD remains unknown. However, two main hypotheses have been proposed: direct contact of aspirated gastric refluxate with the upper airway and a vago-vagal reflex. The larynx and pharynx are in close proximity to the oesophagus, increasing the likelihood that these organs may be exposed when gastric refluxate is aspirated. Laryngeal mucosa is believed to be more sensitive than oesophageal mucosa to exposure to gastric refluxate, because of a lower expression of carbonic anhydrase, an enzyme which contributes to provide mucosal protection against acid exposure via acid neutralization. This fact suggests that laryngeal tissue may be more susceptible to acid-induced injury. A vago-vagal reflex is another potential mechanism responsible for extra-oesophageal manifestations. The reflex is triggered by acidification of the distal portion of the oesophagus and by micro-aspiration: stimulation of vagal afferents triggers a vago-vagal reflex that induces bronchospasm.

Endoscopy is one of the important diagnostic procedure done in evaluation of GERD patients. The presence of typical findings of reflux esophagitis on endoscopy is diagnostic of GERD with a specificity of 90% to 95%. At least 50% of patients with reflux symptoms have normal

esophageal endoscopic findings (nonerosive reflux disease [NERD]) or uncomplicated GERD. Endoscopy should also be considered in the evaluation and management of patients with suspected extra-esophageal manifestations of GERD who present with symptoms such as choking, coughing, and hoarseness. Additionally, endoscopy may be necessary for the detection or exclusion of erosive esophagitis, peptic strictures, esophageal cancer, gastric outlet obstruction, and other potentially significant upper-GI tract findings[5].

Pulmonary function test is an underutilised diagnostic tool which helps in screening and diagnosing airway involvement (both obstructive and restrictive airway disease) in patients with GERD. Treatment is typically via lifestyle changes and medications such as proton pump inhibitors, H₂ receptor blockers or antacids with or without alginic acid and anti-reflux therapy.

Materials and Methods

This is a cross sectional study conducted in the department of General Medicine at JLN medical college and hospital. The time taken to complete the study was 1year, from January 2019 to January 2020. After taking proper written consent, relevant clinical history and clinical examination, we enrolled 50 patients with endoscopic proven diagnosis of GERD who has not taken any treatment previously for their symptoms.

Before doing endoscopic evaluation routine blood investigations like complete hemogram, blood sugar, liver function test, renal function test, HIV and HBsAg were done. After endoscopy, the subjects were classified according to their endoscopic findings with the help of Los Angeles' classification(Figure 1). This is the most thoroughly evaluated and accepted classification for esophagitis⁶ and GERD as mentioned below(Table 1).

Table 1: Endoscopic grading of esophagitis and GERD

Grade A	≥ 1 isolated mucosal breaks ≤ 5 mm long
Grade B	≥ 1 isolated mucosal breaks > 5 mm long
Grade C	≥1 mucosal breaks bridging tops of folds but involving < 75% of circumference
Grade D	≥ 1 mucosal breaks bridging tops of folds but involving >75% of circumference

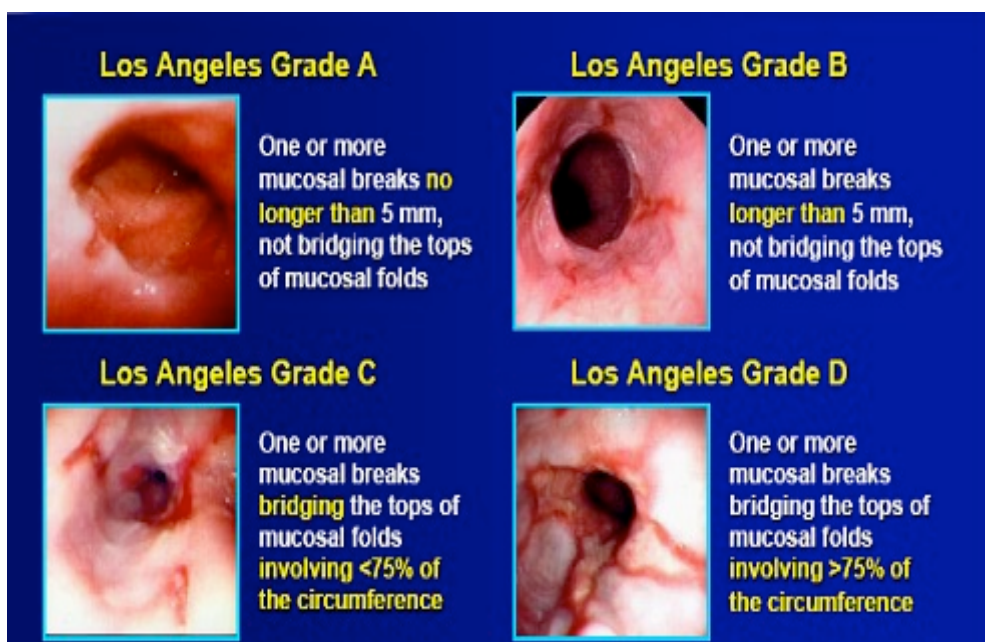


Figure 1: Los Angeles classification system for Oesophagitis

During the time of initial presentation while collecting history, patients were assessed for respiratory symptoms in addition to GERD symptoms. But patients were enrolled in the study irrespective of their respiratory symptoms (both asymptomatic and symptomatic). Once the diagnosis of GERD was confirmed after endoscopic evaluation, pulmonary function test was done for all irrespective of their respiratory symptoms.

Inclusion Criteria

1. Endoscopic proven cases of GERD
2. Age more than 18 years

Exclusion Criteria

1. Pediatric cases
2. Pregnant women
3. Subjects with underlying chronic respiratory illness

4. Subjects with chronic organ dysfunction
5. Smokers
6. Diabetics and hypertensive individuals
7. Immunocompromised subjects

Results

After getting proper written consent from 50 patients with endoscopically proven GERD were enrolled in our study. They have not received any treatment at the time of evaluation. Among these 50 patients, 30 (60%) were males and 20 (40%) were females. The mean age group of the study population was 40 years.

The most common symptom was heartburn seen in 34 (68%) patients followed by regurgitation seen in 23 (46%) patients, indigestion seen in 18 (36%) patients, and chest pain seen in 5 (10%) patients (table 2).

Table 2: UGI Endoscopy grading of GERD

Endoscopic Grade of GERD	Sex				Total	
	M	%	F	%	T	%
A	19	38	15	30	34	68
B	4	8	4	8	8	16
C	4	8	1	2	5	10
D	3	6	0	0	3	06
Total	30	60	20	40	50	100

The maximum number of patients were in grade A - 34 (68%), 8 (16%) had grade B, 5 (10%) had grade C and 5 (10%) had grade D. Gender-wise distribution also shows the maximum number of cases were in Grade A, male (38%) and female(30%). Out of 50 patients, 18 (36%) patients were presented with respiratory symptoms, and 32 (64%) patients doesn't have any respiratory

symptoms. Among these 18 patients, 9 (50%) were male, and 9 (50%) were females. The most predominant respiratory symptom observed was non-productive cough (dry cough) seen in 12 (67%) patients. Chest x-ray was done for all 50 patients, 47 (94%) was normal and 3 (6%) showed abnormal findings (fibrotic changes). Pulmonary function test (PFT) was done for all 50 patients, 24 (48%)

patients had abnormal PFT, and 26 (52%) patients had normal PFT. Among 24, 15 (62.5%) were male, and 9 (37.5%) were females (Table 3).

Table 3: Distribution of cases based on the PFT test

PFT	Sex				Total	
	M	%	F	%	T	%
Abnormal	15	50	9	45	24	48
Normal	15	50	11	55	26	52
Total	30	100	20	100	50	100

Table 4: Distribution of Cases based on GERD & Abnormal PFT

PFT Report	UGI Endoscopy Grading of Cases				
	A	B	C	D	TOTAL
Mild Obs.	2(12.5%)	0(0%)	1(33.33%)	0(0%)	3(12.5%)
Mod. Obs.	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Severe Obs.	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Mild Res.	8(50%)	2(66.67%)	1(33.33%)	1(50%)	12(50%)
Mod. Res.	3(18.75%)	1(33.33%)	0(0%)	0(0%)	4(16.67%)
Severe Res.	2(12.5%)	0(0%)	1(33.33%)	0(0%)	3(12.5%)
Mixed	1(6.25%)	0(0%)	0(0%)	1(50%)	2(8.33%)
Total	16(100%)	3(100%)	3(100%)	2(100%)	24(100%)

- In grade A mild obstruction was 12.5%, mild restriction was 50 %, moderate restriction 18.75, Severe restriction 12.5%, mixed pattern was 6.25%.
- In grade B, the mild restriction was 66.67%, and the moderate restriction was 33.33%.
- In grade C, mild Obstruction was 33.33%, mild restriction was 33.33%, mixed pattern was 33.33%.
- In grade D, mild restriction was 50%, and the mixed pattern was 50%.
- This study shows that, as the severity of GERD increases, the severity of pulmonary disorder also increases (Table 4).

Table 5: Relation between GERD Grading and FVC

GERD Grade	FVC Mean \pm S.D.
Grade A GERD	90.07 \pm 17.81
Grade B GERD	81.03 \pm 06.88
Grade C GERD	76.84 \pm 17.64
Grade D GERD	75.10 \pm 06.53

Table 6: Relation between GERD Grading and DLCo

GERD Grade	DLCo
Grade A GERD	Normal
Grade B GERD	Normal
Grade C GERD	Reduced
Grade D GERD	Reduced

Discussion

The results of the present study show that there was impaired lung function in patients with GERD. Similar findings were observed in a study conducted by Manjunath H et al [7]. He assessed the pulmonary function in GERD patients and concluded that there was a statistically significant reduction in FEV1, FVC, and PEFr in GERD patients. In our study, we also observed that more Grade A GERD patients were found to have altered pulmonary lung function when compared to other grades. Both obstructive and restrictive pattern was observed but the most common pattern was restrictive. This finding shows the importance of early lung function testing is indicated in all GERD patients irrespective of their respiratory symptoms

so that we can detect subclinical loss of lung function in patients with GERD (Table 5).

In the present study, the diffusion capacity was also done for all patients. Only grade C and D patients showed reduced diffusion capacity (Table 6). The reason may be severe chronic repeated inflammation secondary to micro-aspiration of gastric contents which resulted in pulmonary fibrosis [8]. In a study conducted by Schachter et al also showed gas exchange impairment was noted in GERD patients but they have not correlated with GERD grading [9].

The possible explanation for the impaired lung function in GERD patients is the micro-aspiration of gastric contents into the lung parenchyma and vagally mediated reflex which results in

bronchoconstriction, airway obstruction, and gas exchange impairment. Over a period of time, repeated inflammation of the lung parenchyma by the aspirated gastric contents may result in fibrosis[10].

Conclusion

It is a well-known fact that gastroesophageal reflux is a risk factor that will worsen the underlying respiratory problem. Sometimes GERD itself is directly responsible for some respiratory symptoms. In both conditions, GERD should be adequately treated to prevent exacerbation of respiratory symptoms and the development of fibrosis.

Limitations

Small sample size

Gold standard investigation for GERD was not done (24 hours pH monitoring)

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