



Retrosternal Burning and Its Endoscopic Associations: Findings from 5,561 Upper Gastrointestinal Endoscopies

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What's Known

- Retrosternal burning is frequently associated with gastroesophageal reflux disease. However, its diagnostic value for other upper gastrointestinal disorders remains a subject of debate.

What's New

- This large-scale study identified a strong association between retrosternal burning and mucosal or anatomical abnormalities, including esophagitis and hiatal hernia. The finding suggested that the symptom had significant clinical relevance for diagnosing these conditions.

Abstract

Background: Retrosternal burning is often linked to gastroesophageal reflux disease. However, it can also indicate other gastrointestinal disorders. This study aimed to compare and assess upper gastrointestinal (UGI) endoscopic findings in patients with and without retrosternal burning to determine its clinical significance.

Methods: This cross-sectional study analyzed data from 5,561 patients who underwent UGI endoscopy in Khorramabad, Iran (2018–2023). Required data, such as demographics, clinical symptoms, and endoscopic diagnoses, including the grade and severity of esophagitis and sliding hiatal hernia, were collected and compared. Statistical significance was set at $P < 0.05$.

Results: Of the patients, 57.08% were women. The most common indications for endoscopy were dyspepsia and retrosternal burning. Sliding hiatal hernia (49.73%), esophagitis (60.04%), and antral gastropathy (76.53%) were the most frequent endoscopic findings. Grade 2 was the most prevalent type in patients with hernias (74.80%), and among patients with esophagitis, Grade A was predominant (87.36%). Retrosternal burning showed a significant positive association with sliding hiatal hernia, esophagitis, gastric antral gastropathy, and inlet patches ($P < 0.001$). In contrast, the absence of retrosternal burning was associated with gastric ulcers, gastric and esophageal masses ($P < 0.001$), duodenal ulcers ($P = 0.037$), and bulb deformities ($P = 0.015$). A significant association was found between retrosternal burning and the severity of both sliding hiatal hernia and esophagitis ($P < 0.001$).

Conclusion: Retrosternal burning was frequently observed in patients with certain UGI structural abnormalities, such as sliding hiatal hernia and esophagitis, suggesting a possible association. Based on the findings of the present study, a more comprehensive diagnostic approach might be warranted for patients presenting with retrosternal burning to evaluate them for potential structural abnormalities.

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Keywords • Heartburn • Esophagogastroduodenoscopy • Gastroesophageal reflux disease

Introduction

Retrosternal burning, commonly referred to as heartburn, is a prevalent symptom in clinical practice.¹ It is primarily associated

with gastroesophageal reflux disease (GERD), although it may also indicate other conditions, such as esophagitis, peptic ulcers, gastritis, and even non-gastrointestinal (GI) diseases.^{2, 3} Due to its high prevalence, heartburn often prompts diagnostic investigations, such as upper gastrointestinal (UGI) endoscopy to determine its underlying cause.⁴ UGI endoscopy, also known as esophagogastroduodenoscopy (EGD), is a cornerstone diagnostic tool as it allows direct inspection of the esophageal, gastric, and duodenal mucosa. It is crucial for identifying mucosal and structural lesions, such as erosions, ulcers, strictures, and malignancies.^{5, 6} Given the high prevalence and wide variety of GI disorders associated with retrosternal burning, understanding its relationship with specific endoscopic findings is clinically essential. This study aimed to investigate and compare the upper endoscopic findings in patients with and without retrosternal burning to evaluate the clinical significance of this symptom.

Patients and Methods

Study Design and Population

This analytical cross-sectional study examined the association between retrosternal burning and endoscopic findings in patients visiting gastroenterology clinics in Khorramabad, Iran, between 2018 and 2023. The study population included all patients who underwent UGI endoscopy during this period for any indication. This research was approved by the Research Ethics Committee of Lorestan University of Medical Sciences (code: IR.LUMS.REC.1403.121). Written informed consent was obtained from all participants. All patient data were anonymized and securely archived. Ethical guidelines were strictly followed throughout the study.

Inclusion and Exclusion Criteria

The inclusion criteria were patients aged 16 years and older who were referred to gastroenterology clinics, underwent UGI endoscopy, and had no prior history of UGI surgery. The exclusion criteria included patients whose retrosternal burning was attributed to cardiovascular causes, those with previously diagnosed GI malignancies, and patients taking medications that relax the lower esophageal sphincter (LES), such as beta-blockers and calcium channel blockers.

Data Collection Procedure

Data were acquired retrospectively from medical records of patients who visited GI clinics,

with approval from the Ethics Committee of Lorestan University of Medical Sciences. Nearly all UGI endoscopies were performed using Fujifilm EG-530WR flexible video endoscopes connected to Fujifilm VP-3500HD high-definition video processors and XL-4450 xenon light sources (Fujifilm Corporation, Tokyo, Japan). Required data, including age, sex, sliding hiatal hernia size, severity of esophagitis according to the Los Angeles classification (A-D),⁷ presence of an inlet patch, and retrosternal burning, were collected using a researcher-provided checklist.

Statistical Analysis

Data analysis was performed using STATA software (version 18, StataCorp LLC, USA). Descriptive statistics, including means and standard deviations, percentages, and frequencies, were calculated. The normality of continuous variables was assessed via the Kolmogorov-Smirnov test. For inferential analysis, independent *t* tests were used to compare continuous variables, and Chi square or Fisher's exact tests were employed for categorical variables. *P* < 0.05 was considered statistically significant.

Results

Demographic Characteristics

A total of 5,561 patients underwent UGI endoscopy in this study. The mean age of the patients was 46.84±15.51 years. Patients with no retrosternal burning had a significantly higher mean age (50.43±16.36 years) than those with retrosternal burning (45.14±14.55 years), which was statistically significant (*P* < 0.0001). Of the participants, 3,174 (57.08%) were women, and 2,387 (42.92%) were men. The mean age of the female patients was 46.69±15.49 years, and the mean age of the male patients was 47.99±15.52 years.

The indications for UGI endoscopy were evaluated, noting that a single patient could have more than one indication. The most common indications were dyspepsia in 4,044 (72.72%) patients, retrosternal burning in 3,343 (60.12%) patients, abdominal pain in 1,362 (24.49%) patients, dysphagia in 131 (2.36%) patients, sensation of a mass in 61 (1.10%) patients, anemia in 41 (0.74%) patients, positive anti-tissue transglutaminase antibody test in 40 (0.72%) patients, nausea in 19 (0.34%) patients, melena in 8 (0.14%) patients, pre-kidney transplant evaluation in 7 (0.13%) patients, and hematemesis in 1 (0.02%) patient.

Endoscopic Examination Results

Among the patients who underwent

endoscopy, antral gastropathy was observed in 4,256 patients (76.53%), sliding hiatal hernia in 2,766 (49.73%), and esophagitis in 3,339 (60.04%). Additionally, duodenal ulcers were identified in 557 patients (10.02%), gastric ulcers in 198 (3.56%), inlet patches in 63 (1.13%), gastric masses in 32 (0.58%), and esophageal masses in 27 (0.49%). Other findings included gastroduodenopathy in 678 patients (12.19%), pangastritis in 248 (4.46%), bulbar deformities in 154 (2.77%), D2 atrophy in 154 (2.77%), candidiasis in 116 (2.08%), gastric polyps in 63 (1.13%), gastric outlet obstruction in 30 (0.54%), and submucosal lesions in 23 (0.41%). Patients with sliding hiatal hernias were further evaluated on the basis of size and grade. Among these, 654 individuals (23.64%) had Grade 1 hernias, 2,069 (74.80%) had Grade 2 hernias, and 43 (1.55%) had Grade 3 hernias. Esophagitis cases were similarly graded. Among patients with esophagitis, 2,917 individuals (87.36%) had Grade A esophagitis, 309 (9.25%) had Grade B esophagitis, 99 (2.96%) were diagnosed with Grade C esophagitis, and 14 (0.41%) exhibited Grade D esophagitis.

Associations between Retrosternal Burning and Endoscopic Findings

A comparison of endoscopic findings between patients with and without retrosternal burning revealed several significant associations. The prevalence of sliding hiatal hernia and esophagitis was markedly higher in patients with retrosternal burning (78.0% and 99.6%, respectively, $P<0.001$) than in those without (7.0% and 0.3%; $P<0.001$). Similarly, gastric antral gastropathy and inlet patches were

significantly more prevalent in the group with retrosternal burning.

Conversely, the absence of retrosternal burning was associated with a higher frequency of gastric ulcers, gastric and esophageal masses, duodenal ulcers, and bulbar deformities. Other findings, such as submucosal lesions, gastric polyps, and candidiasis, were also more common in patients without retrosternal burning. No significant differences were observed for pangastritis, gastric outlet obstruction, D2 atrophy, or gastroduodenopathy. Full comparisons are presented in table 1.

Associations between Retrosternal Burning and Sliding Hiatal Hernia Grades

Among the 3,343 patients with retrosternal burning, 732 (21.90%) had no sliding hiatal hernias. Endoscopic examinations revealed grade 1 hernias in 555 (16.60%) patients, grade 2 hernias in 2,013 (60.22%) patients, and grade 3 hernias in 43 (1.29%) patients. In contrast, among 2,218 patients with no retrosternal burning, 2,063 (93.01%) had no sliding hiatal hernia. However, endoscopic findings revealed grade 1 hernia in 99 (4.46%) patients and grade 2 hernia in 56 (2.52%) patients. No grade 3 hernias were observed in this group. Statistical analysis revealed a significant association between retrosternal burning and both the presence and grade of sliding hiatal hernia ($P<0.001$, table 2).

Associations between Retrosternal Burning and Esophagitis Grades

Among the 3,343 patients with retrosternal burning, 10 (0.30%) patients had no esophagitis.

Table 1: The association between retrosternal burning and endoscopic findings

Endoscopic findings	Patients without retrosternal burning (n=2,218)	Patients with retrosternal burning (n=3,343)	P value
Sliding hiatal hernia	155 (6.99%)	2,611 (78.10%)	<0.001
Esophagitis	6 (0.27%)	3,333 (99.70%)	<0.001
Inlet patch	6 (0.27%)	57 (1.71%)	<0.001
Gastric antral gastropathy	1,536 (69.25%)	2,720 (81.36%)	<0.001
Gastric ulcer	132 (5.95%)	66 (1.97%)	<0.001
Duodenal ulcer	245 (11.05%)	312 (9.33%)	0.037
Gastric mass	31 (1.40%)	1 (0.03%)	<0.001
Esophageal mass	27 (1.22%)	0 (0.00%)	<0.001
D2 atrophy	64 (2.89%)	90 (2.69%)	0.667
Gastroduodenopathy	275 (12.40%)	403 (12.06%)	0.701
Submucosal lesion	16 (0.72%)	7 (0.21%)	0.004
Gastric outlet obstruction	17 (0.77%)	13 (0.39%)	0.060
Gastric polyp	36 (1.62%)	27 (0.81%)	0.005
Pangastritis	107 (4.82%)	141 (4.22%)	0.283
Candidiasis	59 (2.66%)	57 (1.70%)	0.020
Bulbar deformities	76 (3.43%)	78 (2.33%)	0.015

Chi square test or Fisher's exact test was used, as appropriate. $P<0.05$ was considered statistically significant.

Table 2: The association between retrosternal burning and grades of sliding hiatal hernia

Retrosternal burning	No hernia	Grade 1 hernia	Grade 2 hernia	Grade 3 hernia
Absent	2,063 (93.01%)	99 (4.46%)	56 (2.52%)	0 (0%)
Present	732 (21.90%)	555 (16.60%)	2,013 (60.22%)	43 (1.29%)

All $P < 0.001$; Chi square test or Fisher's exact test was used. $P < 0.05$ was considered statistically significant.

Table 3: The association between retrosternal burning and esophagitis grade

Retrosternal burning	No esophagitis	Grade A esophagitis	Grade B esophagitis	Grade C esophagitis	Grade D esophagitis
Absent	2,212 (99.73%)	5 (0.23%)	1 (0.05%)	0 (0%)	0 (0%)
Present	10 (0.30%)	2,912 (87.11%)	308 (9.21%)	99 (2.96%)	14 (0.42%)

All $P < 0.001$; Chi square test or Fisher's exact test was used. $P < 0.05$ was considered statistically significant.

The vast majority, 2,912 (87.11%) patients, had grade A esophagitis, 308 (9.21%) patients had grade B esophagitis, 99 (2.96%) patients had grade C esophagitis, and 14 (0.42%) patients had grade D esophagitis. In comparison, among 2,218 patients without retrosternal burning, 2,212 (99.73%) had no esophagitis. Endoscopic evaluations revealed grade A esophagitis in 5 (0.23%) patients and grade B esophagitis in 1 (0.05%) patient. No grade-C or grade-D esophagitis was observed in this group. A significant association was found between retrosternal burning and both the presence and severity of esophagitis ($P < 0.001$, table 3).

Discussion

This study included 5,561 participants who underwent UGI endoscopy, with retrosternal burning and dyspepsia being the most frequent indications. Retrosternal burning, a hallmark of symptom of GERD,^{2, 8} was significantly associated with specific UGI tract abnormalities, including sliding hiatal hernia, esophagitis, and antral gastropathy. A strong statistical relationship was also observed between this symptom and both the presence and severity of sliding hiatal hernia and esophagitis.

The pathophysiological link is well-established: sliding hiatal hernias can cause retrosternal burning by displacing the gastroesophageal junction and impairing LES function, key mechanisms in acid reflux.⁹ Furthermore, such structural abnormalities can promote acid reflux, impair esophageal clearance, and cause esophageal stasis, thereby causing esophagitis.^{10, 11} Chronic esophagitis may, in turn, produce further structural alterations, creating a self-perpetuating cycle of injury and scarring.¹⁰

These findings emphasized the importance of evaluating structural factors in patients with retrosternal burning. While this symptom is most frequently attributed to GERD,¹² it may also

indicate underlying structural abnormalities. Notably, the increased empirical use of proton pump inhibitor (PPI) therapy has reduced the utilization of early diagnostic endoscopy, potentially delaying the identification of such anatomical issues.¹³ Although medical management remains the cornerstone of GERD,¹⁴ the findings of this study supported reconsidering earlier endoscopic evaluation for selected patients with retrosternal burning to detect abnormalities that could influence management. Future interventional studies are required to determine the clinical outcomes, cost-effectiveness, and optimal timing of endoscopy in this population.

This study highlighted the utility of endoscopy as a diagnostic tool for patients with typical GERD symptoms, particularly retrosternal burning. UGI endoscopy provides direct visualization of the esophageal, gastric, and duodenal mucosa and is critical for diagnosing conditions such as esophagitis, peptic ulcer disease, and hiatal hernia.^{9, 15-18} Its use has increased in recent years, largely for evaluating nonspecific symptoms, such as upper abdominal pain and retrosternal burning, which are among the most frequent reasons for endoscopic referral.^{4, 15, 19-21}

The appropriate treatment needs to be determined based on the patient's status and the results of the endoscopy. Furthermore, endoscopy enables mucosal biopsy, permitting histopathological assessment. This capability enhances diagnostic accuracy by not only enabling histopathological assessment and the detection of conditions such as Barrett's esophagus or eosinophilic esophagitis, but also assisting in the prognosis and management of premalignant and malignant lesions.²¹⁻²⁴ Consequently, correlating endoscopic findings and clinical symptoms, such as retrosternal burning, can improve diagnostic accuracy and help avoid unnecessary procedures.

Consistent with the findings of the present study, Boghratian and others reported that

esophagitis and gastritis were the most frequent endoscopic diagnoses in patients who underwent UGI endoscopy. The most frequent chief complaints in their study were epigastric pain (51.9%), heartburn (14.2%), and melena (7.1%).²⁵ Similarly, in a study by Domakunti and colleagues, involving 100 patients presenting with UGI symptoms, the relationship between endoscopic findings and GERD symptoms was analyzed. While epigastric pain (78%), regurgitation (71%), and heartburn (63%) were frequently reported, only regurgitation had a significant association with abnormal endoscopic findings, indicating that not all symptoms correlated with pathological changes.²⁶

In a study of 743 patients with dyspeptic complaints, AkbariRad and colleagues found that the majority (85.6%) had functional dyspepsia. Epigastric pain and heartburn were the most frequent symptoms, and peptic ulcer disease (7.2%) was the leading cause of organic dyspepsia.²⁷

Santo and others investigated the role of demographic and clinical factors in the relationship between dyspeptic symptoms and endoscopic findings. Their research demonstrated that factors such as age, sex, smoking status, and appropriate indications for endoscopy influenced this relationship. This study highlighted the necessity of considering these variables when recommending upper endoscopy to enhance the diagnostic yield and establish a more meaningful connection between symptoms and pathological findings.²⁸

Another study indicated that while digestive symptoms, such as epigastric pain, post-prandial fullness, and heartburn, were common symptoms among patients referred for UGI endoscopy, there was no statistically significant association between these digestive symptoms and positive endoscopic findings.⁴ This suggested that the patient-reported symptoms and observed pathologies might not always align.⁴

Collectively, these studies illustrated that the relationship between UGI symptoms and endoscopic findings was complicated, highlighting the challenge of diagnosing UGI disorders based on symptoms alone.

While this study provided valuable insights into the association between retrosternal burning and UGI endoscopic findings using a large sample size, several limitations must be acknowledged. The cross-sectional design established statistically significant associations but precluded inferences regarding causality or predictive accuracy. Furthermore, while retrosternal burning is linked to specific structural pathologies, its definitive clinical significance

requires confirmation through prospective and functional studies. The scope of this study was also limited to structural abnormalities. It excluded functional disorders such as nonerosive reflux disease or esophageal hypersensitivity due to the lack of impedance-pH monitoring. Finally, as symptom reporting was subjective, the results might be susceptible to recall bias.

Conclusion

This study highlighted a strong association between retrosternal burning and UGI tract abnormalities observed on endoscopy, particularly sliding hiatal hernias and esophagitis. The significant association between this symptom and both the presence and severity of these conditions suggested its utility as a clinical indicator for underlying structural pathology.

Although pharmaceutical management remains a mainstay for treating GERD symptoms, our findings indicated that a more comprehensive diagnostic approach might be warranted for patients with retrosternal burning to evaluate for structural causes. Further research, particularly through interventional and cohort studies, is required to establish the clinical significance of addressing these abnormalities. Consequently, any definitive changes to treatment strategies should be guided by evidence from future prospective trials.

Authors' Contribution

Saleh. A: Contributed to supervision, validation, conceptualization, and methodology, and participated in critical review; Saleheh. A: Contributed to data curation, formal analysis, investigation, project administration, and participated in drafting the manuscript; M.A: Provided validation, supervision, and participated in critical review; N.N and B.A: Contributed to analysis, interpretation, drafting the original manuscript, and critical review. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of Interest: None declared.

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