

Correlation between Endoscopic and Histopathological Findings of Upper Gastrointestinal Tract Lesions: A Cohort Study at a Tertiary Care Center in Northern India

Authors:

Dr. Nisha Saini¹, Dr. Chetna Mehrol², Dr. Neeraj K Goyal³, Dr. Deepak K Garg⁴

¹MD Pathology, Senior Resident, Department of Pathology, Dr. Balvir Singh Tomar Institute of Medical Sciences and Technology, Jaipur.

²MD Pathology, Associate Professor, Department of Pathology, Mahatma Gandhi University of Medical Sciences and Technology, Jaipur.

³MD Pathology, Associate Professor, Department of Pathology, Mahatma Gandhi University of Medical Sciences and Technology, Jaipur.

⁴MD Pathology, Professor, Department of Pathology, Mahatma Gandhi University of Medical Sciences and Technology, Jaipur.

Corresponding Author:

Dr. Chetna Mehrol, MD Pathology, Associate Professor, Department of Pathology, Mahatma Gandhi University of Medical Sciences and Technology, Jaipur. Email id: mehrol88@gmail.com

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ABSTRACT

Objectives: 1. To study the endoscopic and morphological spectrum of upper gastrointestinal tract lesions. 2. To evaluate the histopathological findings in patients undergoing endoscopic biopsies presenting with signs and symptoms pertaining to upper gastrointestinal tract. 3. To study the distribution of clinicopathological parameters in the above patients

Materials and Methods: This is a hospital based cross sectional observational study from March 2023 to August 2024 (18 months). This study includes a total of 158 cases. All the endoscopic biopsy specimens from upper GI tract lesions including esophagus, gastric and duodenum (1 st part and 2 nd part). Tissue received in formalin was measured and a drop of eosin was added and folded in filter paper and then placed in cassettes for further processing. The entire tissue is processed through automated processing system. **Results:** A total of 158 cases included in our study .The diagnostic concordance rate of 93.7% was observed, reaffirming endoscopy as an effective screening tool. However, 6.3% of cases exhibited discrepancies, highlighting the challenges in accurately diagnosing inflammatory and neoplastic conditions in this region and the need for histopathological confirmation. Malignancies were most prevalent in the esophagus (85.5%), GEJ (85.7%), and stomach (60.6%), while duodenal biopsies were predominantly non-malignant (89.3%), with celiac disease and chronic duodenitis as major diagnoses. While esophageal malignancies show strong endoscopic-histopathological correlation (93.1%), gastric malignancies present higher misinterpretation rates (75%), necessitating careful histopathological evaluation. These findings highlight the crucial role of biopsy in ensuring diagnostic accuracy, especially in distinguishing inflammatory conditions from neoplastic lesions. Endoscopy demonstrated high sensitivity (97.64%), making it effective for detecting malignancies, while its specificity (89.04%) indicates a strong ability to identify benign lesions. Despite a 93.67% accuracy, the presence of false positives and false negatives highlights the need for histopathological confirmation to ensure definitive diagnosis, particularly in cases of reactive or inflammatory changes mimicking neoplasia. **Conclusion:** Thus, we conclude that endoscopy alone is insufficient without histopathological biopsy, and their combined application serves as a powerful diagnostic tool for enhancing patient management and improving clinical outcomes.

Keywords: Endoscopic biopsy, stomach, upper GI tract lesions, duodenum, Histopathology

INTRODUCTION

The upper gastrointestinal (GI) tract is the first part of the digestive system, responsible for the initial stages of food breakdown and nutrient absorption and it includes mouth, esophagus, stomach, and the duodenum. It is a lengthy and complex structure that is frequently affected by various conditions, including congenital abnormalities, inflammatory disorders, and neoplastic (tumor related) diseases.¹ Diseases of the upper gastrointestinal tract are common in medical settings and pose a substantial burden due to their high morbidity and mortality rates.² Hence, proper and prompt diagnosis is must for adequate treatment. The esophagus and stomach serve as potential sites for a diverse range of pathological conditions including many benign and malignant conditions.³ Some common endoscopically identifiable benign lesions of the upper gastrointestinal tract are Esophageal polyps and leiomyomas, Gastric polyps: Hyperplastic polyps, Fundic gland polyps, Adenomatous polyps, Duodenal polyps:- Adenomatous polyps, Brunner's gland hamartomas. Endoscopic evaluation and management can help diagnose and treat benign lesions, reducing the risk of complications. The upper gastrointestinal (GI) tract is a frequent site for neoplastic diseases, particularly malignancies. Globally, gastric adenocarcinoma ranks as the second most prevalent cancer, while esophageal carcinoma is the sixth leading cause of cancer-related mortality.⁴ Differentiating between benign and malignant lesions in the upper gastrointestinal tract remains a common yet challenging diagnostic issue. Given the uncertain prognosis associated with gastrointestinal malignancies, early and precise detection is crucial for effective management. targeted biopsies can be collected during endoscopy, providing tissue samples for histopathological evaluation. The ability of endoscopy to directly visualize lesions makes it an essential diagnostic tool, particularly in the early detection of malignancies and inflammatory disorder. Despite its advantages, endoscopy has limitations in differentiating between benign and malignant lesions solely based on visual inspection.⁵ Conditions such as gastritis, esophagitis, and duodenitis may present endoscopic features that overlap with more serious conditions like dysplasia or carcinoma. Endoscopic biopsy, followed by histological evaluation, is a practical and currently recognized gold standard for the precise and objective assessment of patients presenting with upper gastrointestinal symptoms.⁶ Histopathological examination offers conclusive information regarding the type and characterization of upper gastrointestinal lesions.

MATERIALS AND METHODS

Study Design and Study Period

This was a hospital-based cross-sectional observational study conducted over a period of 18 months, from March 2023 to August 2024. A total of 158 endoscopic biopsy specimens from patients undergoing upper gastrointestinal endoscopic evaluation were included in the study.

Study Population

The study population comprised patients who underwent upper gastrointestinal endoscopy for clinically indicated gastrointestinal symptoms and/or suspected upper gastrointestinal lesions. Biopsy specimens obtained from the esophagus, gastroesophageal junction (GEJ), stomach, and duodenum (first and second parts) were evaluated.

Inclusion Criteria

All adequate endoscopic biopsy specimens obtained from lesions involving the esophagus, GEJ, stomach, and duodenum during the study period were included for histopathological examination and correlation with the corresponding endoscopic findings.

Exclusion Criteria

Specimens that were inadequate for histopathological evaluation or lacked sufficient clinical/endoscopic information for correlation were excluded from analysis.

Endoscopic Evaluation and Biopsy Collection

Upper gastrointestinal endoscopy was performed as clinically indicated. The endoscopic findings and site of the lesion were recorded, and representative biopsy specimens were obtained from the identified lesions. The biopsy sites included the esophagus, GEJ, stomach, and duodenum.

Histopathological Processing

The biopsy specimens received in the pathology laboratory were placed in formalin for fixation. The tissue was measured, a drop of eosin was added, and the specimen was folded in filter paper and placed in a tissue cassette for further processing. The specimens were processed using an automated tissue-processing system. Adequate sections were cut and stained with hematoxylin and eosin (H&E). The stained sections were subsequently examined microscopically for identification and classification of the pathological lesions.

Histopathological Classification

The histopathological findings were classified into neoplastic and non-neoplastic lesions. Neoplastic lesions

were further categorized according to their histological type and, where applicable, degree of differentiation. Non-neoplastic lesions were classified according to the histopathological diagnosis.

Endoscopic Histopathological Correlation

The endoscopic findings were correlated with the corresponding histopathological diagnoses. Concordance was considered when the endoscopic impression was consistent with the final histopathological diagnosis, whereas cases showing disagreement between the endoscopic and histopathological diagnoses were considered discrepant. The overall concordance and discrepancy rates were calculated.

Statistical Analysis

The collected data were compiled and analyzed using descriptive statistical methods. Categorical variables were expressed as frequencies and percentages. The distribution of malignant and non-malignant lesions according to biopsy site was assessed. Endoscopic diagnostic performance was evaluated using sensitivity, specificity, and overall diagnostic accuracy based on

comparison with the histopathological diagnosis as the reference standard. The endoscopic–histopathological concordance rate was also calculated.

Ethical Considerations

The study was conducted in accordance with institutional ethical standards. Ethical approval and patient consent were obtained as applicable according to the institutional requirements for the study.

RESULTS

A total of 158 patients were analyzed with a nearly balanced gender distribution of 83 males (52.5%) and 75 females (47.5%). The study encompassed 158 patients, revealing a slight male predominance of 52.5% compared to 47.5% female representation.. Out of 158 biopsies analyzed, the duodenum being the most frequently sampled site (35.44%), closely followed by the esophagus (34.81%). The stomach accounted for 20.89% of biopsies, while the gastroesophageal junction (GEJ) contributed the lowest proportion (8.86%). See Table 1.

Table: 1. Distribution of endoscopic biopsy sites

Biopsy site	Number (n)	Percentage%
Esophagus	55	34.81%
Stomach	33	20.89%
GEJ	14	8.86%
Duodenum	56	35.44%
Total	158	100%

The distribution highlights a significant emphasis on duodenal and esophageal biopsies, which may reflect higher clinical suspicion of pathological findings in these regions. A total of 158 cases were analyzed across various biopsy sites, revealing a malignant predominance (85 cases, 53.8%) over non-malignant cases (73 cases, 46.2%). See Table 2.

Table: 2. Distribution of malignant and non malignant cases

Site	Malignant	Non malignant	Total
Oesophagus	47	8	55
Stomach	20	13	33
GEJ	12	2	14
Duodenum	6	50	56
Total	85	73	158

The esophagus had the highest malignant burden (47 cases, 85.5% of esophageal biopsies), with only 8 non-malignant cases (14.5%). • The stomach exhibited a more balanced distribution, with 20 malignant cases (60.6%) and 13 non malignant cases (39.4%). See Table 3.

Table: 3. Distribution of lesions in stomach

Stomach biopsies		Number (n)
Neoplastic (20)	Adenocarcinoma	17
	Squamous cell carcinoma	1
	High grade NHL	1
	Neuroendocrine tumor	1
Non-neoplastic (13)	Chronic non specific gastritis	13

The gastroesophageal junction (GEJ) showed a strong malignancy trend (12 malignant cases, 85.7%). • The duodenum had the highest proportion of non-malignant findings (50 cases, 89.3%), with only 6 malignant cases (10.7%). See Table 4.

Table: 4. Distribution of lesions in duodenum

Duodenal biopsies		Number (n)
Neoplastic (6)	Adenocarcinoma	6
Non- neoplastic (50)	Chronic Duodenitis	23
	Celiac disease	26
	Polyp	1

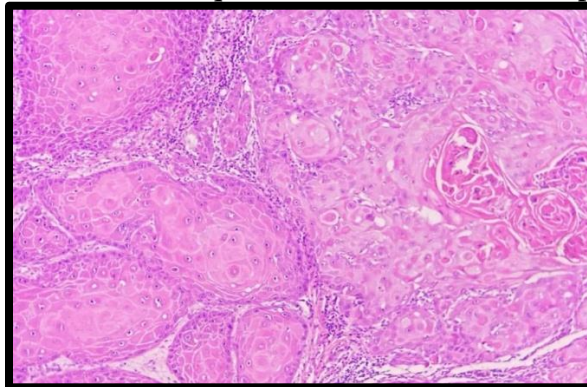
These findings highlight the esophagus, stomach, and GEJ as high-risk sites for malignancy, while the duodenum predominantly presents non-malignant lesions. Esophageal biopsies showed a strong predominance of neoplastic lesions (47 cases, 85.5%) over non neoplastic findings (8 cases, 14.5%). Among neoplastic lesions: Squamous cell carcinoma was the most frequent, accounting for 42 cases (89.4%) followed by Adenocarcinoma and Poorly differentiated malignant neoplasms was observed in only 2 and 3 cases. (See Table 5 and Figure 1 and 2)

Table: 5. Distribution of lesions in esophagus

Esophageal biopsies (33)		Number (n)
Neoplastic (47)	Squamous cell carcinoma	42
	Adenocarcinoma	2
	Poorly differentiated malignant neoplasm	3
Non- neoplastic (8)	Chronic esophagitis	8

Figure: 1. Endoscopic view- Ca Esophagus. Circumferential, grayish white, ulceroinfiltrative lesion.

Figure: 2. H&E stain (10x) - Well Differentiated Squamous Cell Carcinoma Esophagus

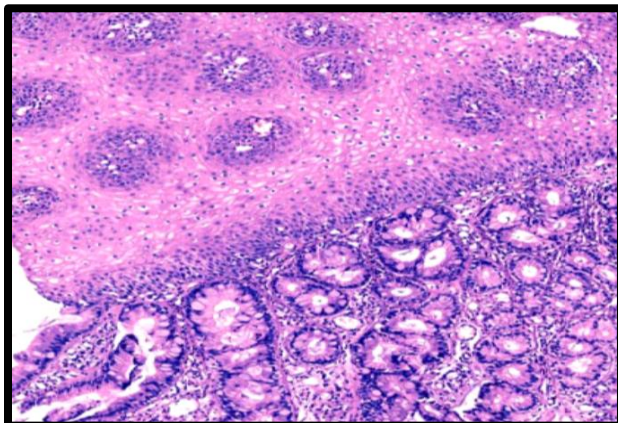


Endoscopic examination also demonstrated a case of Barrett's esophagus, characterized by tongue-shaped, red, velvety mucosa extending into the pale squamous mucosa, with the diagnosis confirmed on histopathological examination (See Figure 3 and Figure 4).

Figure: 3. Endoscopic view- Barrett's oesophagus. Tongue shaped red velvety mucosa extending into pale squamous mucosa



FIG-4-H&E -Barret's esophagus



Among non-neoplastic findings: Chronic esophagitis was found affecting all 8 cases (100%). Among 47 cases of esophageal carcinoma, the majority (89.36%) were squamous cell carcinomas, while adenocarcinomas accounted for 4.24%. The incidence of poorly differentiated carcinoma was 6.38% among the studied cases. Regarding tumor grading: 0 5 10 15 20 25 30 35 40 45 Squamous cell carcinoma (42) Adenocarcinoma

(2) Poorly differentiated malignant neoplasm (3) Chronic esophagitis (8) Esophageal lesion • Moderately differentiated squamous cell carcinoma was the most prevalent, comprising 61.70% of all cases. • A prevalence of 25.53% was noted for well-differentiated squamous cell carcinoma, while the poorly differentiated form was rare, at just 2.12%. • Adenocarcinomas were

evenly distributed between well-differentiated and moderately differentiated grades, each making up 2.12%.

DISCUSSION

The esophageal biopsies showed a strong predominance of neoplastic lesions (47 cases, 85.5%) over non-neoplastic findings (8 cases, 14.5%). This finding correlated with the study of sheik BA et al⁶², and Abhilash et al¹⁴. Among cases of squamous cell carcinoma of the esophagus, moderately differentiated squamous cell carcinoma emerged as the predominant histological subtype, accounting for 61.70% of all malignancies. This observation aligns with the findings of Jonnalagadda et al, Jawalkar S et al, Begum S et al, Rashmi et al, Vidyavathi et al, Krishnapparashmi et al, Mchembe et al, and Abilash SC et al, all of whom

reported moderately differentiated squamous cell carcinoma as the most frequently encountered lesion in their respective studies. 2. Stomach lesions Out of 33 gastric biopsies, 20 were neoplastic (60.6%) and 13 were non neoplastic (39.4%). The all 13 non neoplastic lesions fell under the group of chronic non specific gastritis. Similar observations was made by Rashmi et al¹¹ and Shennak MM et al⁵⁶. In our study Gastric malignancies showed a male predominance, reflecting a higher occurrence in males. Similar male predominance was seen in the study by Khuroo et al⁶³, Mabula et al⁶⁷ and Sheikh et al⁶². Among 17 adenocarcinomas, moderate differentiation was the predominant grade (10) followed by poorly differentiated and signet ring differentiation (3), and well differentiated (1). (See Table 6 and Figure 5,6)

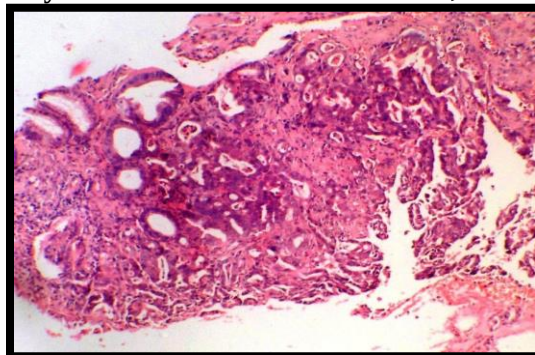
Table: 6. Distribution of type of stomach malignancy

Type	Grade	Number of cases	Percentage %
Adenocarcinoma	Well differentiated	01	5
	Moderately differentiated	10	50
	Poorly differentiated	03	15
	Signet ring differentiation	03	15
Squamous cell carcinoma	Moderately differentiated	01	5
Non Hodgkin's Lymphoma	High grade	01	5
Neuro endocrine tumor	--	01	5
Total		20	100

Figure: 5. Endoscopic view- Carcinoma stomach. Proliferative mass with irregular mucosal thickening.



Figure: 6. H&E stain (10x) - Moderately differentiated adenocarcinoma, Gastric



The common histological variant of gastric malignancy in the present study was Moderate differentiated adenocarcinoma which was similar the study done by sheik BA et al⁶² and Qureshi et al⁸. But in the study done by Deepa rani et al¹⁷- the most common histological variant was signet ring cell adenocarcinoma. 3. GEJ lesion A total of 14 GEJ biopsy cases were analyzed, revealing a strong neoplastic predominance (12 cases, 85.7%) compared to non-neoplastic lesions (2 cases, 14.3%). Adenocarcinoma was the most common malignancy. These finding correlates with Rumana et al. and sheik et al. 4. Duodenum lesion. A total of 56 duodenal biopsy cases were analyzed, with non-neoplastic lesions being overwhelmingly predominant (50 cases, 89.3%) compared to neoplastic findings (6 cases, 10.7%). This finding correlated well with the studies done by Rashmi et al and Jawalkar S et al. Among neoplastic lesions, Adenocarcinoma was the sole malignant entity identified in all 6 cases (100%), which was similar to the study done by Krishnappa R et al¹¹. Celiac disease was the most common diagnosis among non neoplastic lesions followed by Chronic duodenitis which was similar to the study done by Kaur M et al. Correlation between endoscopic and histopathological findings In present study of 158 cases, the high concordance rate (93.7%) between endoscopic and histopathological findings in upper gastrointestinal (GI) lesions underscores the reliability of endoscopic evaluation in diagnosing mucosal abnormalities. These were similar to the findings of Anoja Aparajita et al which was 84.72%. However, the 6.3% discrepancy rate, highlights the challenges in accurately interpreting the pathology through endoscopy alone and stress upon the importance of endoscopic biopsies in complete diagnosis. In esophageal carcinoma, endoscopic findings correlated with histopathological diagnoses in 41 out of 44 cases (93.1%). In contrast, gastric carcinoma showed a lower correlation, with 15 out of 20 cases (75%). This difference may be attributed to the late presentation of esophageal carcinoma, making endoscopic detection more straightforward. Conversely, gastric malignancies, particularly diffuse-type carcinoma in younger individuals, often manifest as ulcers or flat lesions,

increasing the likelihood of endoscopic misinterpretation. Duodenal lesions often present nonspecific endoscopic features, making differentiation between inflammatory, neoplastic, and infectious conditions difficult. Endoscopic misinterpretations may arise due to: • Subtle mucosal changes that are difficult to distinguish visually. • Overlapping features between benign and malignant lesions. • Histopathological confirmation revealing deeper tissue abnormalities not apparent on endoscopy. In our study, endoscopy demonstrated high sensitivity (97.64%), suggesting it is effective at identifying malignancies when they are present. The specificity of 89.04% indicates a reasonably strong ability of endoscopy to correctly identify benign lesions. The overall accuracy of 93.67% reinforces the reliability of endoscopy as an initial diagnostic modality. neoplastic features and highlights the necessity for histopathological confirmation to ensure definitive diagnosis. Comparison with Other Studies Begum et al.²⁶ analyzed 177 endoscopic biopsies and found 100% concordance for esophagitis, gastritis, and duodenitis, while squamous cell carcinoma in the esophagus showed 60% concordance. Adenocarcinoma in the stomach had a 91% concordance rate, emphasizing the importance of histopathological evaluation in confirming endoscopic diagnoses. Patel et al.⁷⁰ analyzed 200 upper GI biopsies and reported an endoscopic-histopathological concordance rate of 85.2%, similar to the findings here. The study noted that duodenal lesions had the highest discrepancy rate. Chag et al.⁷¹ did a prospective observational study spanning two years found that neoplastic lesions had a higher concordance rate (97.3%), while non-neoplastic duodenal lesions showed greater variability. The study emphasized the importance of biopsy confirmation, particularly in cases of duodenitis and neuroendocrine tumors.

STRENGTHS OF THE STUDY

The major strength of the present study is the assessment of endoscopic and histopathological correlation in a well-defined cohort of 158 upper gastrointestinal biopsy cases. The study included lesions from multiple anatomical sites, including the esophagus,

gastroesophageal junction, stomach, and duodenum, thereby providing a broad spectrum of upper gastrointestinal pathology. Another strength is the evaluation of endoscopic diagnostic performance using sensitivity, specificity, and overall diagnostic accuracy, with histopathological examination considered the reference standard. The study also highlights site-specific differences in malignant and non-malignant lesions and emphasizes the complementary role of endoscopy and histopathology in achieving accurate diagnosis.

LIMITATIONS OF THE STUDY

The present study has certain limitations. It was a hospital-based, single-center study with a relatively limited sample size of 158 cases, which may restrict the generalizability of the findings to other populations and healthcare settings. The cross-sectional observational design also limits assessment of long-term clinical outcomes and does not allow evaluation of changes in diagnostic performance over time. The study was based on endoscopic biopsies and therefore may not fully represent lesions with deeper or submucosal involvement. In addition, interobserver variability among endoscopists and histopathologists was not formally assessed. Larger multicenter studies with standardized endoscopic criteria and assessment of interobserver agreement are required to validate the present findings.

FUTURE SCOPE

Future studies should include larger, multicenter cohorts to validate the endoscopic–histopathological correlation observed in the present study and improve the generalizability of the findings. Standardized endoscopic diagnostic criteria and structured reporting may help reduce discrepancies between endoscopic impressions and histopathological diagnoses. The incorporation of advanced endoscopic imaging techniques, including image-enhanced endoscopy, may further improve the detection and characterization of suspicious lesions. In addition, molecular profiling and other ancillary diagnostic techniques may provide additional diagnostic and prognostic information, particularly in lesions with equivocal histopathological or endoscopic findings. Further research integrating endoscopic, histopathological, imaging, and molecular parameters may contribute to improved diagnostic accuracy and better patient management.

CONCLUSION

This study examines the correlation between endoscopic assessments and histopathological diagnoses in 158 upper gastrointestinal biopsies. A diagnostic concordance rate of 93.7% was observed, reaffirming

endoscopy as an effective screening tool. However, 6.3% of cases exhibited discrepancies, highlighting the challenges in accurately diagnosing inflammatory and neoplastic conditions in this region and the need for histopathological confirmation. Malignancies were most prevalent in the esophagus (85.5%), GEJ (85.7%), and stomach (60.6%), while duodenal biopsies were predominantly non-malignant (89.3%), with celiac disease and chronic duodenitis as major diagnoses. While esophageal malignancies show strong endoscopic–histopathological correlation (93.1%), gastric malignancies present higher misinterpretation rates (75%), necessitating careful histopathological evaluation. These findings highlight the crucial role of biopsy in ensuring diagnostic accuracy, especially in distinguishing inflammatory conditions from neoplastic lesions. Endoscopy demonstrated high sensitivity (97.64%), making it effective for detecting malignancies, while its specificity (89.04%) indicates a strong ability to identify benign lesions. Despite a 93.67% accuracy, the presence of false positives and false negatives highlights the need for histopathological confirmation to ensure definitive diagnosis, particularly in cases of reactive or inflammatory changes mimicking neoplasia. Additionally, they emphasize the need for refined diagnostic criteria, advancements in imaging technologies, and molecular profiling to enhance predictive accuracy and improve patient outcomes in upper gastrointestinal pathology. Thus, we conclude that endoscopy alone is insufficient without histopathological biopsy, and their combined application serves as a powerful diagnostic tool for enhancing patient management and improving clinical outcomes.

DECLARATIONS

Ethics Approval and Consent to Participate

The study was conducted in accordance with the ethical standards of the institution and the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee, as applicable. Written informed consent was obtained from the participants wherever required.

Consent for Publication

Consent for publication was obtained from the participants for the use of relevant clinical and pathological information and images, wherever applicable. All identifying information has been excluded from the manuscript.

Availability of Data and Materials

The data generated and/or analyzed during the present study are available from the corresponding author on reasonable request, subject to institutional and ethical restrictions.

Competing Interests

The authors declare that they have no competing interests.

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Authors Contribution

All the authors contributed in research, data collection and manuscript writing and designing

Abbreviations

GI tract-gastrointestinal tract, GEJ- gastroesophageal junction, D2- duodenal biopsy, HPE- histopathological examination, H&E -Haematoxylin and Xylene

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