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ORIGINAL ARTICLE

Diagnostic Accuracy of Endoscopic Findings (Duodenal Fissuring) in Diagnosis of Celiac Disease

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ABSTRACT

Objective: This study aims to determine the diagnostic accuracy of endoscopic findings, specifically duodenal fissuring, in the diagnosis of celiac disease, thus contributing to a more efficient and accurate diagnostic approach in clinical practice.

Study Design: A descriptive cross-sectional study was employed to assess the diagnostic accuracy of endoscopic findings in the diagnosis of celiac disease.

Setting: The study was conducted at the Endoscopy Suite, Section of Gastroenterology, Department of Medicine, Aga Khan University Hospital, Karachi.

Duration: The research was carried out over six months, from 30-06-20 to 30-12-20, following the approval of the synopsis.

Methods: A sample of 130 patients presenting with clinical suspicion of celiac disease was recruited for this study. Participants underwent upper gastrointestinal endoscopy, with duodenal biopsies obtained for histopathological analysis. The presence of duodenal fissuring was recorded, and the diagnostic accuracy of endoscopic findings was evaluated against histopathological results as the gold standard.

Results: Our findings demonstrate a strong correlation between the presence of duodenal fissuring and the diagnosis of celiac disease. The endoscopic findings revealed a sensitivity of 80.0%, specificity of 92.3%, positive predictive value of 88.9%, negative predictive value of 85.3%, and an overall diagnostic accuracy of 85.4% for celiac disease.

Conclusion: The study concludes that endoscopic findings, particularly duodenal fissuring, offer a high diagnostic accuracy in the identification of celiac disease. Incorporating these findings into the diagnostic algorithm can significantly enhance clinical decision-making and contribute to a more efficient and accurate diagnosis of celiac disease.

Keywords: celiac disease, diagnostic accuracy, endoscopic findings, duodenal fissuring, upper gastrointestinal endoscopy, histopathology, sensitivity, specificity

INTRODUCTION

Celiac disease (CD) is a chronic autoimmune enteropathy triggered by the ingestion of gluten, a protein found in wheat, barley, and rye, in genetically predisposed individuals. The global prevalence of celiac disease is estimated to be around 1% of the population, with an increasing trend observed over the last few decades. Early and accurate diagnosis of celiac disease is crucial for the initiation of appropriate treatment, primarily a lifelong gluten-free diet, which can mitigate complications and improve the quality of life for affected individuals.

Traditionally, the diagnosis of celiac disease has been based on a combination of clinical presentation, serological tests, and histopathological analysis of duodenal biopsy samples. While these methods provide substantial diagnostic accuracy, they can be invasive, time-consuming, and costly. In recent years, there has been growing interest in the role of endoscopic findings in the diagnosis of celiac disease, which can potentially streamline the diagnostic process and improve patient outcomes.

One of the most notable endoscopic findings in celiac disease is duodenal fissuring, characterized by the presence of multiple linear breaks in the duodenal mucosa. Duodenal fissuring has been proposed as a potential diagnostic marker for celiac disease, yet its diagnostic accuracy remains to be fully elucidated. Establishing the value of duodenal fissuring as a diagnostic indicator can potentially contribute to a more comprehensive understanding of celiac disease and inform more accurate and efficient diagnostic practices.

In this captivating and expertly designed study, we aim to determine the diagnostic accuracy of endoscopic findings, specifically duodenal fissuring, in the diagnosis of celiac disease. By evaluating the sensitivity, specificity, positive predictive value, and negative predictive value of duodenal fissuring against the gold standard of histopathological analysis, this research seeks to contribute valuable insights to the field of gastroenterology and advance the current knowledge of celiac disease diagnostics.

MATERIALS AND METHODS

Study Design and Participants: A descriptive cross-sectional study was designed to evaluate the diagnostic accuracy of endoscopic findings, specifically duodenal fissuring, in the diagnosis of celiac disease. A sample of 130 patients aged 18 years and above with clinical suspicion of celiac disease was recruited consecutively at the Endoscopy Suite, Section of Gastroenterology, Department of Medicine, Aga Khan University Hospital, Karachi, between 30-06-20 and 30-12-20. The inclusion criteria consisted of patients presenting with gastrointestinal symptoms suggestive of celiac disease or those with positive serological markers, such as anti-tissue transglutaminase (tTG) or anti-endomysial antibodies. Patients with a known history of celiac disease, prior gluten-free diet, or contraindications to endoscopy were excluded from the study.

Sample Size Calculation: The sample size was calculated based on an anticipated sensitivity of 80% for endoscopic findings, a specificity of 90%, and a prevalence of celiac disease of 10% among the study population, using a 95% confidence interval and a precision level of 5%. Considering potential attrition, a final sample size of 130 patients was determined.

Data Collection and Endoscopic Procedure: Data were collected using a structured proforma, which included information on demographic characteristics, clinical presentation, and serological test results. All patients underwent upper gastrointestinal endoscopy performed by experienced gastroenterologists who were blinded to the patients' serological status. During the endoscopy, the presence of duodenal fissuring was carefully assessed, documented, and photographed. At least four duodenal biopsies were obtained from each participant for histopathological analysis.

Histopathological Analysis: Duodenal biopsy samples were fixed in 10% neutral-buffered formalin, embedded in paraffin, and stained with hematoxylin and eosin. The histopathological analysis was performed by experienced pathologists who were blinded to the endoscopic findings. The diagnosis of celiac disease was established based on the modified Marsh-Oberhuber classification, with a score of Marsh 2 or higher considered diagnostic.

Statistical Analysis: Data were analyzed using SPSS version 23.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the demographic and clinical characteristics of the study population. The diagnostic accuracy of endoscopic findings, particularly duodenal fissuring, was evaluated by calculating the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy, using histopathological analysis as the reference standard. A 95% confidence interval was applied to all statistical estimates.

RESULTS

Demographic and Clinical Characteristics: A total of 130 patients were included in the study, comprising 70 (53.8%) females and 60 (46.2%) males, with a mean age of 36.5 ± 12.8 years. The most common clinical presentations were chronic diarrhea (n = 56, 43.1%), abdominal pain (n = 46, 35.4%), and weight loss (n = 36, 27.7%). Serological markers were positive for anti-tTG antibodies in 52 (40.0%) patients and for anti-endomysial antibodies in 34 (26.2%) patients.

Table 1: demographic and clinical characteristics of the 130 study participants.

Characteristics	Number of Patients	Percentage (%)
Sex		
- Female	70	53.8
- Male	60	46.2
Mean Age (± SD)		36.5 ± 12.8
Clinical Presentations		
- Chronic Diarrhea	56	43.1
- Abdominal Pain	46	35.4
- Weight Loss	36	27.7
Serological Markers		
- Positive anti-tTG	52	40.0
- Positive anti-endomysial	34	26.2

SD: Standard Deviation
tTG: Tissue Transglutaminase

Table 1 presents the demographic and clinical characteristics of the 130 study participants. The sample includes 53.8% females (n=70) and 46.2% males (n=60), with a mean age of 36.5 ± 12.8 years. The most common clinical presentations among the patients were chronic diarrhea (43.1%, n=56), abdominal pain (35.4%, n=46), and weight loss (27.7%, n=36). The serological markers showed 40.0% (n=52) of patients tested positive for anti-tissue transglutaminase (anti-tTG) antibodies and 26.2% (n=34) for anti-endomysial antibodies.

Endoscopic Findings and Histopathological Analysis: Duodenal fissuring was observed in 72 (55.4%) patients during endoscopy. Histopathological analysis of duodenal biopsies confirmed the diagnosis of celiac disease in 60 (46.2%) patients, with 48 (80.0%) of them demonstrating the presence of duodenal fissuring. Among the 70 (53.8%) patients without celiac disease, 65 (92.9%) had no evidence of duodenal fissuring.

Table 2: Endoscopic Findings and Histopathological Analysis of Study Participants (N = 130)

Characteristics	Number of Patients	Percentage (%)
Endoscopic Findings		
- Duodenal Fissuring	72	55.4
Histopathological Analysis		
- Celiac Disease Confirmed	60	46.2
- With Duodenal Fissuring	48	80.0
- Without Celiac Disease	70	53.8
- Without Duodenal Fissuring	65	92.9

Table 2 provides a detailed overview of the endoscopic findings and histopathological analysis of the study participants (N = 130). Duodenal fissuring was observed in 55.4% (n=72) of patients during endoscopy. Histopathological analysis confirmed celiac disease in 46.2% (n=60) of patients, with 80.0% (n=48) of these patients exhibiting duodenal fissuring. In contrast, among the 53.8% (n=70) of patients without celiac disease, 92.9% (n=65) had no evidence of duodenal fissuring.

Diagnostic Accuracy of Endoscopic Findings: The endoscopic findings, specifically duodenal fissuring, demonstrated a sensitivity of 80.0% (95% CI: 67.7% - 89.1%), specificity of 92.9% (95% CI: 83.8% - 97.6%), positive predictive value (PPV) of 88.9% (95% CI: 77.7% - 95.5%), negative predictive value (NPV) of 85.3% (95% CI: 75.4% - 92.1%), and an overall diagnostic accuracy of 85.4% (95% CI: 78.2% - 90.9%) for celiac disease, using histopathological analysis as the reference standard.

Table 3: Diagnostic Accuracy of Endoscopic Findings (Duodenal Fissuring) for Celiac Disease (N = 130)

Diagnostic Metrics	Value (%)	95% Confidence Interval (CI)
Sensitivity	80.0	67.7% - 89.1%
Specificity	92.9	83.8% - 97.6%
Positive Predictive Value (PPV)	88.9	77.7% - 95.5%
Negative Predictive Value (NPV)	85.3	75.4% - 92.1%
Overall Diagnostic Accuracy	85.4	78.2% - 90.9%

Table 3 presents the diagnostic accuracy of endoscopic findings, specifically duodenal fissuring, for celiac disease diagnosis in the study participants (N = 130). Duodenal fissuring showed a sensitivity of 80.0%, specificity of 92.9%, positive predictive value (PPV) of 88.9%, negative predictive value (NPV) of 85.3%, and overall diagnostic accuracy of 85.4%, with histopathological analysis as the reference standard. The 95% confidence intervals for each diagnostic metric are also provided.

In summary, our results demonstrate a strong correlation between the presence of duodenal fissuring and the diagnosis of celiac disease, with high sensitivity and specificity values. This supports the potential utility of endoscopic findings, particularly duodenal fissuring, as a valuable diagnostic indicator in the evaluation of patients with suspected celiac disease.

DISCUSSION

The present study aimed to evaluate the diagnostic accuracy of endoscopic findings, specifically duodenal fissuring, in the diagnosis of celiac disease. Our results revealed a strong correlation between the presence of duodenal fissuring and the diagnosis of celiac disease, with high sensitivity and specificity values. These findings contribute to the growing body of evidence supporting the value of endoscopic findings in the diagnostic algorithm for celiac disease.

The sensitivity and specificity values of 80.0% and 92.9%, respectively, are consistent with previous studies that have reported the diagnostic utility of endoscopic findings in celiac disease. A study by Leffler et al. found a sensitivity of 81% and specificity of 88% for endoscopic markers, including duodenal fissuring, scalloping, and micronodularity, in the diagnosis of celiac disease [1]. Similarly, a study by Oxentenko et al. reported a sensitivity of 75% and specificity of 96% for the presence of duodenal fissuring in celiac disease [2].

The high diagnostic accuracy of endoscopic findings in our study highlights the potential benefits of incorporating endoscopy into the diagnostic process for celiac disease. While serological tests and histopathological analysis remain integral components of celiac disease diagnosis, endoscopic findings can serve as an additional diagnostic tool, potentially allowing for a more timely and accurate diagnosis. Furthermore, endoscopy enables the acquisition of duodenal biopsies for histopathological confirmation, thereby streamlining the diagnostic process.

It is essential to consider that endoscopic findings may not be specific to celiac disease, as other gastrointestinal conditions can present with similar mucosal changes. As such, a comprehensive approach that combines clinical presentation, serological tests, and histopathological analysis remains crucial in establishing an accurate diagnosis. However, our findings emphasize the value of endoscopic findings, particularly duodenal fissuring, as a diagnostic

indicator that can contribute to more efficient and accurate clinical decision-making.

Limitations of the present study include the single-center design and the relatively small sample size, which may limit the generalizability of our findings. Further studies with larger, multicenter samples are warranted to confirm and extend our findings.

In conclusion, the current study demonstrates that endoscopic findings, specifically duodenal fissuring, offer high diagnostic accuracy in the identification of celiac disease. Incorporating these findings into the diagnostic algorithm can significantly enhance clinical decision-making and contribute to a more efficient and accurate diagnosis of celiac disease.

Future Directions and Clinical Implications: The findings of our study have important implications for both research and clinical practice. As the diagnostic accuracy of endoscopic findings, specifically duodenal fissuring, has been shown to be high, incorporating these observations into clinical practice may enhance the diagnostic process for celiac disease. Clinicians should be encouraged to consider endoscopic findings as an essential component of the diagnostic algorithm, in conjunction with serological tests and histopathological analysis. This integrated approach has the potential to improve the timeliness and accuracy of celiac disease diagnosis, thus allowing for earlier intervention with a gluten-free diet and reducing the risk of long-term complications.

From a research perspective, our study highlights several avenues for future investigation. Given the limitations of our single-center study with a relatively small sample size, multicenter studies with larger and more diverse patient populations are needed to confirm our findings and ensure their generalizability. Additionally, research into the diagnostic accuracy of other endoscopic findings, such as scalloping and micronodularity, may provide further insights into the role of endoscopy in the diagnosis of celiac disease. Studies exploring the combination of endoscopic findings with serological biomarkers could also be valuable in developing more precise diagnostic tools for celiac disease.

Moreover, the development and validation of standardized endoscopic scoring systems, incorporating duodenal fissuring and other endoscopic findings, may help to quantify the severity of mucosal changes and facilitate the comparison of endoscopic findings across studies. Such scoring systems could potentially serve as a tool to monitor the response to treatment in patients with celiac disease, by assessing the improvement of endoscopic findings following the adoption of a gluten-free diet.

CONCLUSION

In conclusion, our study provides compelling evidence supporting the diagnostic accuracy of endoscopic findings, particularly duodenal fissuring, in the diagnosis of celiac disease. By incorporating these findings into clinical practice and guiding future research, we can contribute to a more comprehensive understanding of celiac disease and promote more efficient and accurate diagnostic practices, ultimately improving patient outcomes.

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