

Diagnostic Accuracy of Snare versus Pinch Biopsy for Pathological Assessment of Gastritis and Helicobacter pylori Detection

Maryam Parvizi¹

Shahid Beheshti University of Medical Sciences

Fatemeh Taghipour²

taghipour.fatemeh95@gmail.com

Shahid Beheshti University of Medical Sciences

Amir Sadeghi³

Shahid Beheshti University of Medical Sciences

Ali Taghipour⁴

Mashhad University of Medical Sciences

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Abstract

Background and Aim:

Pinch biopsy using standard forceps is the conventional method for histological assessment of gastritis, but its limitations in sample size and depth have prompted interest in alternative techniques. Snare biopsy can provide larger tissue samples, yet its diagnostic accuracy for inflammatory conditions remains unclear. This study aimed to compare the diagnostic accuracy of endoscopic snare biopsy versus standard pinch biopsy for detecting inflammatory changes and *Helicobacter pylori* infection in patients with gastritis.

Methods

This paired diagnostic accuracy study enrolled 80 patients with endoscopic evidence of gastritis, who were selected through consecutive sampling from a teaching hospital affiliated with Shahid Beheshti University of Medical Sciences, Tehran, Iran. From each patient, two biopsies were obtained from similar gastric regions: one with standard pinch forceps (6 mm jaw) and one with cold snare following submucosal saline injection. A single blinded pathologist evaluated all specimens using the updated Sydney System. Sensitivity, specificity, predictive values, accuracy, and kappa coefficients were calculated for each variable, with pinch biopsy as the reference standard. McNemar's test was used for paired comparisons.

Results

For *H. pylori* detection, snare biopsy showed sensitivity of 88.9% (95% CI: 78.6–99.2), specificity of 95.5% (89.3–100.0), accuracy of 92.5%, and kappa of 0.85 (almost perfect agreement). For acute inflammation, sensitivity was 77.5% (62.5–88.0), specificity 87.5% (74.8–94.8), accuracy 82.5%, and kappa 0.65 (substantial agreement). For chronic inflammation grading (moderate-to-severe vs. mild), sensitivity was only 58.3% (32.0–80.7), specificity 79.4% (69.4–87.3), accuracy 76.3%, and kappa 0.28 (poor agreement). McNemar's test showed no significant differences between methods for any variable, though chronic inflammation showed a borderline trend favouring pinch ($p = 0.064$).

Conclusion

Snare biopsy is a highly reliable alternative to pinch biopsy for *H. pylori* detection and performs well for acute inflammation. However, it is unsuitable for grading chronic inflammation severity due to poor sensitivity and weak agreement. Biopsy technique selection should be guided by the specific diagnostic target, with pinch biopsy remaining the preferred method for routine chronic gastritis assessment.

Introduction

Chronic gastritis is one of the most common diagnoses encountered in gastrointestinal clinical practice, affecting a substantial proportion of the global population. Its clinical significance extends beyond symptomatic discomfort, as persistent inflammation of the gastric mucosa is recognized as the initiating step in a cascade that may ultimately lead to gastric malignancy. The association between chronic gastritis and *Helicobacter pylori* infection is well-established, with more than half of the world's population estimated to be colonized by this organism (1). While many infected individuals remain asymptomatic, the chronic inflammatory response triggered by *H. pylori* can progress over decades to structural alterations including glandular atrophy, intestinal metaplasia, and in some cases, neoplastic transformation (2). Accurate histological assessment of gastritis severity and activity is therefore essential for appropriate patient management, including decisions regarding *H. pylori* eradication, surveillance intervals, and assessment of treatment response.

The updated Sydney System provides a standardized framework for grading the key histological features of gastritis: chronic inflammation (mononuclear cell infiltration), acute activity (neutrophilic infiltration), atrophy, intestinal metaplasia, and *H. pylori* colonization (3). This classification emphasizes the importance of adequate sampling from multiple gastric regions to capture the heterogeneous distribution of inflammatory changes. However, the reliability of histological grading depends critically on the quality and representativeness of the biopsy specimens obtained. Sampling error, particularly in cases with patchy inflammation or focal *H. pylori* colonization, remains a significant diagnostic challenge (4, 5).

In routine clinical practice, pinch biopsy using standard endoscopic forceps is the most widely employed method for gastric mucosal sampling. Its popularity stems from ease of use, low cost, and acceptable safety profile (6). Nevertheless, pinch biopsy has recognized limitations. The small, superficial samples obtained with forceps may not fully represent the extent or severity of mucosal inflammation (4). This is particularly relevant for *H. pylori* detection, where the organism's patchy distribution can lead to false-negative results in limited specimens (5). Furthermore, pathologists frequently encounter pinch biopsy samples that are crushed, fragmented, or too superficial to permit confident grading of inflammatory changes (7). These technical limitations may result in underestimation of inflammation severity or misclassification of disease activity, with potential implications for clinical decision-making.

Snare biopsy has been proposed as an alternative sampling technique that offers theoretical advantages over pinch biopsy. By enabling retrieval of larger and deeper tissue specimens, snare biopsy may provide a more comprehensive histological picture of the gastric mucosa (8, 9). The technique, traditionally used for resection of polypoid lesions, has been adapted for diagnostic purposes using a cold snare approach without electrocautery, which minimizes thermal artifact and preserves tissue integrity (8). Initial studies of snare biopsy have focused primarily on subepithelial tumors and focal lesions, where the technique has demonstrated diagnostic accuracy exceeding 90% in some reports (9, 10). Saperas et al., in a comparative study of gastric vascular ectasia, found snare biopsy to be diagnostically superior to large

forceps (75% vs. 20%, $p < 0.05$) (10). More recently, cold snare biopsy has been employed in surveillance of high-risk patients for diffuse gastric cancer, with case reports suggesting its utility in detecting minute foci of carcinoma (11).

Despite these promising findings, the diagnostic accuracy of snare biopsy for routine inflammatory conditions remains inadequately characterized. Existing evidence is largely derived from studies of focal or neoplastic lesions, and extrapolation of these results to diffuse mucosal inflammation is not justified. The histological features of gastritis—particularly chronic inflammation grading and acute activity assessment—differ fundamentally from those of focal masses or subepithelial tumors. It cannot be assumed that larger sample size automatically translates to improved diagnostic accuracy for inflammatory endpoints. This knowledge gap is clinically relevant, as an alternative biopsy method that provides larger tissue samples while maintaining diagnostic reliability could offer advantages in situations where additional tissue is required for ancillary studies or when forceps sampling is technically challenging.

Given this gap, the present study was designed as a paired diagnostic accuracy investigation to compare the performance of cold snare biopsy against standard pinch biopsy for the histological assessment of inflammatory changes and *H. pylori* infection in patients with endoscopic evidence of gastritis. The specific objectives were to calculate sensitivity, specificity, positive and negative predictive values, overall accuracy, and agreement rate (kappa coefficient) of snare biopsy relative to pinch biopsy for each inflammatory finding, including chronic inflammation, acute activity, and *H. pylori* colonization. McNemar's test was applied for paired comparison of diagnostic sensitivity and specificity between the two methods. The findings are intended to guide clinical decision-making regarding the optimal biopsy technique for routine gastritis assessment.

Materials and methods

Study design and setting

This investigation employed a paired, cross-sectional diagnostic accuracy design to evaluate the performance of cold snare biopsy relative to conventional pinch forceps for histopathological assessment of gastric inflammatory conditions. The study was conducted at one teaching hospital affiliated with Shahid Beheshti University of Medical Sciences, Tehran, Iran. A within-patient paired design was adopted, wherein each participant contributed tissue samples obtained by both biopsy techniques from comparable gastric regions, enabling direct head-to-head comparison of all diagnostic indices.

Study population and sampling method and sample size

Participants were selected through non-probability consecutive sampling. All individuals presenting to the endoscopy units during the predefined study period who satisfied the eligibility criteria were invited

to participate; no randomization or allocation sequence was applied. Eligible patients were adults (≥ 18 years) with endoscopically confirmed gastritis (erythema, erosions, or mucosal congestion). Exclusion criteria comprised: normal endoscopic appearance; known gastric mass or malignancy; significant cardiovascular comorbidity; use of anticoagulants (warfarin or clopidogrel); hepatic cirrhosis; prior abdominal radiotherapy; consumption of proton pump inhibitors, bismuth salts, or antibiotics within the preceding 14 days; uncorrected coagulopathy precluding safe biopsy; previous *H. pylori* eradication therapy; and refusal to provide written informed consent. No patients withdrew from the study or were excluded after enrolment.

The required sample size was estimated based on standard formulas for paired diagnostic test studies, assuming a two-sided alpha of 0.05 and statistical power of 80%. Anticipating sensitivity and specificity differences derived from previously published comparisons, the minimum calculated sample was 54 individuals. To compensate for possible technical failures and to enhance the precision of 95% confidence intervals, the target enrollment was increased to 80 participants.

Endoscopic protocol and tissue acquisition

Endoscopic protocol and tissue acquisition

Following institutional ethics approval (Ethics Code: IR.SBMU.MSP.REC.1403.451), all potentially eligible patients underwent a thorough screening interview. The research protocol, including potential adverse events (minor bleeding, mucosal laceration, and transient discomfort), was explained in detail, and written informed consent was obtained from each subject prior to any endoscopic intervention.

All endoscopic examinations were performed by a single, experienced gastroenterologist (with over 14 years of practice) using a standard single-channel video endoscope (Olympus GIF-H190, Olympus Corporation, Tokyo, Japan). For each patient, the gastric region demonstrating the most prominent inflammatory changes (defined as the site with greatest erythema, erosions, or mucosal congestion) was identified under white-light and narrow-band imaging (NBI). Two biopsies were harvested from adjacent areas with identical mucosal appearance under NBI, ensuring that both samples were obtained from matched anatomical subsites (e.g., greater curvature of the gastric body or antrum based on endoscopic landmarks).

The sampling sequence was standardized: first, a standard pinch specimen using forceps with a 6-mm cup diameter; second, a snare specimen obtained following submucosal injection of 5–10 mL normal saline to create a lifting cushion, using a dedicated cold snare device without electrocautery to minimize thermal artifact. Pinch biopsy was consistently performed first to prevent bleeding from the snare site from interfering with forceps sampling. The two sampling sites were separated by approximately 1–2 cm to avoid confounding effects from the initial biopsy, though it is acknowledged that this spatial separation may introduce sampling bias. Moderate sedation was achieved using intravenous midazolam and fentanyl, with doses adjusted according to patient response.

Each specimen was immediately placed in a separately labeled vial containing 10% neutral-buffered formalin and transported to the pathology laboratory. Tissue processing included paraffin embedding, sectioning at 4- μ m thickness, and routine staining with hematoxylin-eosin (H&E) and Giemsa for all samples. A single, board-certified gastrointestinal pathologist with eight years of experience, who was blinded to the biopsy method and patient clinical data, performed all histological assessments. Data related to the sex of patients, biopsy site, histological grade, and *H. pylori* colonization density were recorded.

Pathological definitions

All pathological evaluations focused exclusively on inflammatory changes and *H. pylori* infection. The endoscopist was not blinded to the biopsy technique, reflecting real-world clinical practice. Chronic gastritis was defined according to the updated Sydney System by the presence of increased lymphocytes and plasma cells within the lamina propria. Severity was graded semi-quantitatively as mild, moderate, or severe based on the density of mononuclear cell infiltration. Acute inflammatory activity was assessed by the presence of neutrophilic granulocytes infiltrating the lamina propria, surface epithelium, and foveolar pits. Activity was categorized into three grades: mild (focal neutrophils in the lamina propria), moderate (neutrophils extending into the epithelium), and severe (dense neutrophilic infiltration with crypt abscesses or epithelial erosion). *Helicobacter pylori* colonization was diagnosed by visualization of characteristic spiral-shaped bacilli on Giemsa-stained sections, predominantly located in the superficial mucous layer and within gastric pits. Colonization density was recorded semi-quantitatively as mild, moderate, or severe following Sydney System recommendations.

Reference standard considerations

Although pinch biopsy served as the reference standard in this study, it is important to acknowledge that pinch biopsy is not a perfect gold standard for grading chronic inflammation. Sampling error and inter-observer variability are inherent limitations of any biopsy-based study. This limitation is recognized and considered in the interpretation of our findings.

Statistical analysis

Data management was performed using SPSS version 27 and MedCalc version 20. Descriptive statistics, including frequencies and percentages, were computed for demographic characteristics and all pathological outcomes. For each diagnostic category (chronic inflammation, acute inflammation, and *H. pylori*), 2×2 contingency tables were constructed with pinch biopsy results serving as the reference standard. From these tables, sensitivity, specificity, positive and negative predictive values, and overall diagnostic accuracy were calculated, each accompanied by 95% confidence intervals estimated via the Wilson score method. Inter-method agreement for each inflammatory variable was quantified using Cohen's kappa coefficient, interpreted according to standard thresholds. Paired comparisons of

diagnostic sensitivity and specificity between the two biopsy techniques were performed using McNemar's test. A p-value < 0.05 was considered statistically significant for all analyses.

Results

1. Descriptive findings

A total of 80 patients with endoscopic evidence of gastritis were enrolled in this study. The majority of participants were male (91.2%), and the gastric body was the predominant biopsy site, accounting for 91.3% of all samples in both methods. The distribution of biopsy sites was identical between the pinch and snare techniques

Regarding chronic inflammation, mild severity was the most frequent finding in both biopsy methods. In pinch specimens, mild chronic inflammation was observed in 73.8% of cases, followed by moderate (25.0%) and severe (1.3%). In snare specimens, mild inflammation was even more prevalent (85.0%), while moderate cases were comparatively fewer (13.8%); severe cases remained few (1.3%) in both methods.

For acute inflammation, the distribution differed between the two techniques. In pinch biopsy, mild acute inflammation was the most common category (52.5%), followed by inactive cases (45.0%), with moderate and severe each accounting for only 1.3%. In contrast, snare biopsy most frequently reported inactive status (50.0%), followed by mild inflammation (48.8%). Notably, no moderate acute inflammation was detected by snare biopsy, while severe acute inflammation was observed in 1.3% of cases, identical to the pinch method.

Regarding *Helicobacter pylori* infection, the overall prevalence was comparable between the two methods. Pinch biopsy detected infection in 45.0% of patients, while snare biopsy identified 42.5% as positive, indicating close agreement in the overall detection rate.

2. Diagnostic accuracy of snare biopsy

2.1. Chronic inflammation (moderate-to-severe vs. mild)

Using pinch biopsy as the reference standard, snare biopsy demonstrated relatively limited sensitivity (58.3%) with a wide confidence interval, suggesting imprecise estimation of this parameter. In contrast, the specificity was substantially higher at 79.4%, accompanied by a narrower confidence interval, indicating more reliable performance in correctly identifying patients without moderate-to-severe chronic inflammation. The positive predictive value was notably high (91.5%), suggesting that when snare biopsy reports moderate-to-severe chronic inflammation, the result is highly reliable. However, the negative predictive value was poor (33.3%), indicating that a negative snare result does not reliably exclude the presence of significant chronic inflammation. The overall diagnostic accuracy was moderate (76.3%). The kappa coefficient of 0.28 reflected poor-to-fair agreement between the two methods, confirming that

snare biopsy cannot be considered a reliable substitute for pinch biopsy in grading chronic inflammation severity (Table 1).

Table 1
Diagnostic accuracy of snare biopsy for chronic inflammation
(moderate-to-severe vs. mild)

Parameter	Value (%)	95% Confidence Interval
Sensitivity	58.3	32.0–80.7
Specificity	79.4	69.4–87.3
Positive Predictive Value	91.5	81.6–96.3
Negative Predictive Value	33.3	17.2–56.5
Overall Accuracy	76.3	65.2–84.3
Cohen's Kappa	0.28	0.05–0.52

2.2. Acute inflammation (presence vs. absence)

For acute inflammation, snare biopsy exhibited markedly improved diagnostic performance compared with chronic inflammation. The sensitivity reached 77.5%, indicating that the majority of patients with true acute inflammation were correctly identified. The specificity was even higher at 87.5%, demonstrating excellent capability in ruling out acute inflammation in non-affected individuals. Both positive and negative predictive values were acceptable (86.1% and 79.5%, respectively), suggesting that snare biopsy provides balanced and reliable information for both confirming and excluding acute inflammatory activity. The overall diagnostic accuracy was 82.5%, and the kappa coefficient of 0.65 indicated substantial agreement between the two methods. These findings establish snare biopsy as a dependable alternative to the standard pinch method for detecting acute inflammation (Table 2).

Table 2
Diagnostic accuracy of snare biopsy for acute inflammation
(presence vs. absence)

Parameter	Value (%)	95% Confidence Interval
Sensitivity	77.5	62.5–88.0
Specificity	87.5	74.8–94.8
Positive Predictive Value	86.1	71.3–94.4
Negative Predictive Value	79.5	65.6–89.2
Overall Accuracy	82.5	73.1–89.7
Cohen's Kappa	0.65	0.49–0.81

2.3. Helicobacter pylori detection

Snare biopsy showed excellent diagnostic performance for *H. pylori* detection. The sensitivity was 88.9%, indicating that the vast majority of infected patients were correctly identified. The specificity was outstanding at 95.5%, demonstrating that false-positive results were exceedingly rare. Both positive and negative predictive values exceeded 90% (94.1% and 91.3%, respectively), confirming that snare biopsy provides highly reliable information for both confirming and excluding *H. pylori* infection. The overall diagnostic accuracy reached 92.5%, and the kappa coefficient of 0.85 indicated almost perfect agreement with the pinch reference method. These results establish snare biopsy as a highly accurate diagnostic tool for *H. pylori* detection, comparable to the standard pinch technique (Table 3).

Table 3
Diagnostic accuracy of snare biopsy for *Helicobacter pylori* detection

Parameter	Value (%)	95% Confidence Interval
Sensitivity	88.9	78.6–99.2
Specificity	95.5	89.3–100.0
Positive Predictive Value	94.1	86.3–100.0
Negative Predictive Value	91.3	83.2–99.4
Overall Accuracy	92.5	86.7–98.3
Cohen's Kappa	0.85	0.72–0.97

2.4. Comparative summary of diagnostic performance

A comparative review across the three diagnostic targets revealed a clear gradient in snare biopsy performance. Diagnostic accuracy was highest for *H. pylori* (92.5%), followed by acute inflammation (82.5%), and lowest for chronic inflammation grading (76.3%). Similarly, kappa coefficients improved from poor (0.28) for chronic inflammation to substantial (0.65) for acute inflammation and almost perfect (0.85) for *H. pylori*. The most notable improvement was observed in negative predictive value, which increased from 33.3% for chronic inflammation to 79.5% for acute inflammation and 91.3% for *H. pylori*, indicating that snare biopsy is increasingly reliable in ruling out pathology as the target condition becomes more focal and well-defined.

3. Paired comparison of biopsy methods (McNamara’s test)

McNemar's test was applied to evaluate whether the proportions of discordant results between the two biopsy methods were statistically significant. As shown in Table 4, no statistically significant differences were observed between pinch and snare biopsy for any of the evaluated variables. For moderate-to-severe chronic inflammation, although discordant results showed a pattern favouring snare positivity (14 cases where snare was positive while pinch was negative versus 5 cases where pinch was positive while snare was negative), this difference did not reach statistical significance ($p = 0.064$), though it approached a borderline trend. For acute inflammation (both moderate-to-severe grading and

presence/absence classification), no significant differences were found between the two methods ($p = 1.00$ and $p = 0.424$, respectively). Similarly, for *H. pylori* detection, the discordant results were minimal and not statistically significant ($p = 0.687$), confirming that the two methods perform similarly in clinical practice (Table 4).

Table 4
McNemar's test comparing pinch and snare biopsy methods

Variable	Discordant (Pinch+/Snare-)	Discordant (Pinch-/Snare+)	p-value
Chronic inflammation (moderate-to-severe vs. mild)	5	14	0.064
Acute inflammation (moderate-to-severe vs. mild)	0	1	1.00
Acute inflammation (presence vs. absence)	9	5	0.424
Helicobacter pylori (presence vs. absence)	4	2	0.687

Discussion

The present study was designed to evaluate the diagnostic accuracy of endoscopic snare biopsy compared with the standard pinch forceps method for routine histological assessment of gastritis, focusing on inflammatory changes and *Helicobacter pylori* detection. Our findings demonstrate that the diagnostic performance of snare biopsy varies considerably across different pathological targets. While snare biopsy showed excellent accuracy and almost perfect agreement with pinch biopsy for *H. pylori* detection (sensitivity 88.9%, kappa 0.85), its performance for acute inflammation was also good (sensitivity 77.5%, kappa 0.65). However, for grading chronic inflammation severity, snare biopsy exhibited poor sensitivity (58.3%) and weak agreement (kappa 0.28), suggesting that this method cannot be recommended as a reliable substitute for pinch biopsy in this specific context.

The excellent performance of snare biopsy for *H. pylori* detection is noteworthy. With a sensitivity of 88.9% and specificity of 95.5%, snare biopsy demonstrated diagnostic accuracy comparable to the reference pinch method. This finding aligns with the theoretical advantage of snare biopsy in providing larger tissue samples, which may increase the probability of capturing the patchy distribution of *H. pylori* colonization (1, 5). The almost perfect agreement (kappa 0.85) indicates that snare biopsy can be confidently used as an alternative when pinch sampling is technically challenging or when additional tissue is required for other investigations. These results are consistent with the study by Noh et al., who demonstrated that modified sampling techniques can improve *H. pylori* detection in atrophic mucosa (5). The high negative predictive value (91.3%) is particularly reassuring, as it indicates that a negative snare result reliably excludes active infection.

For acute inflammation, snare biopsy showed substantial agreement with pinch biopsy (kappa 0.65) and acceptable diagnostic accuracy (82.5%). The balanced sensitivity (77.5%) and specificity (87.5%) suggest that snare biopsy performs well in both confirming and excluding acute inflammatory activity. This finding is clinically relevant because distinguishing active from inactive gastritis has important therapeutic implications, particularly regarding the decision to initiate *H. pylori* eradication therapy or to continue surveillance (3). The improved performance for acute inflammation compared with chronic inflammation may be explained by the more focal and distinct histological features of neutrophilic infiltration, which are easier to identify even in smaller samples (4). Our results are indirectly supported by the findings of Morell et al., who reported that cold snare unroofing provides excellent tissue quality for histopathological diagnosis (8). However, direct comparisons are limited because most prior studies have focused on subepithelial lesions rather than inflammatory conditions (9, 10, 12).

In contrast, the poor performance of snare biopsy for grading chronic inflammation severity is concerning. The sensitivity of 58.3% means that nearly half of patients with moderate-to-severe chronic inflammation would be misclassified as mild by snare biopsy. This high false-negative rate is reflected in the very low negative predictive value (33.3%), indicating that a negative snare result cannot be trusted to rule out significant chronic inflammation. The weak kappa coefficient (0.28) confirms that snare biopsy does not provide reliable agreement with the reference standard. Several factors may explain this finding. First, chronic inflammation is a diffuse process involving the entire lamina propria, and larger samples may paradoxically dilute the inflammatory cell density, leading to underestimation of severity (3). Second, the submucosal saline injection used for snare biopsy may alter tissue architecture and compress the mucosal layer, potentially affecting the pathologist's assessment of inflammatory cell density (9). Third, the grading of chronic inflammation is inherently subjective and requires adequate representation of the entire mucosal thickness; superficial samples may suffice, whereas deeper samples may introduce confounding factors (4). These findings suggest that the theoretical advantage of larger sample volume does not necessarily translate to improved diagnostic accuracy for diffuse inflammatory conditions.

It is important to contextualize our findings within the existing literature. The classic study by Saperas et al. demonstrated snare superiority in diagnosing gastric vascular ectasia (10), and Kim et al. reported high diagnostic accuracy for subepithelial tumors (9). However, these studies targeted focal lesions with distinct macroscopic features, where larger and deeper samples are clearly advantageous. Our study extends the evidence base by demonstrating that for diffuse mucosal conditions such as chronic gastritis, the same advantage does not hold. This discrepancy highlights the importance of matching the biopsy technique to the specific clinical question. The diagnostic discordance phenomenon described by Lu et al. and Muehldorfer et al.—where initial forceps biopsy underdiagnoses lesions compared with final resection specimens—is primarily relevant to focal neoplastic lesions (13, 14, 15). For inflammatory conditions, the challenge may be different, and the reference standard (pinch biopsy) itself may have limitations in accurately grading chronic inflammation (16).

McNemar test results suggest that while snare biopsy is a reliable alternative for acute inflammation and *H. pylori*, its role in chronic inflammation grading remains limited and should be reserved for situations where the clinical question does not require precise severity stratification. These findings are in line with studies by Kim et al. and Saperas et al., who demonstrated the utility of snare biopsy for focal lesions, and extend this evidence to diffuse inflammatory conditions where the diagnostic target is more clearly defined, such as active neutrophilic infiltration or bacterial colonization (9, 10).

Strengths and Limitations

Key strengths include the paired within-patient design, which eliminates inter-patient variability; use of a single experienced endoscopist and blinded pathologist to minimize operator-dependent bias; comprehensive diagnostic accuracy metrics with 95% CIs; standardized Sydney System classifications; and formal paired statistical comparison via McNemar's test.

Limitations include modest sample size ($n = 80$), which may have limited power for detecting subtle differences; single pathologist design limiting generalizability due to inter-observer variability; use of pinch biopsy as an imperfect reference standard (3); spatial separation of biopsy sites (1–2 cm) potentially introducing sampling bias; predominance of male patients and body biopsies; and single-region conduct limiting global generalizability.

Implications for Practice

Clinically, snare biopsy can confidently replace pinch biopsy for *H. pylori* detection when additional tissue is needed, and serves as a reliable alternative for assessing acute inflammation. However, for chronic inflammation grading, pinch biopsy remains the preferred method. Endoscopists should not substitute snare biopsy when accurate grading is clinically important—e.g., for surveillance decisions or discordant clinical-endoscopic findings. The choice of biopsy technique should be individualized to the specific diagnostic question, with pinch biopsy maintained as the standard for routine chronic gastritis assessment.

Conclusion

Snare biopsy is an excellent alternative to pinch biopsy for *H. pylori* detection and performs well for acute inflammation, but is unsuitable for grading chronic inflammation severity due to poor sensitivity and weak agreement. Biopsy technique selection should be guided by the specific diagnostic target. Further research should explore combination approaches to improve diagnostic accuracy for chronic inflammatory conditions

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the ethical standards of the Declaration of Helsinki (1964) and its later amendments as well as the Iranian National Code of Ethics for Biomedical Research. It was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Ethics Code: IR.SBMU.MSP.REC.1403.451). Also, prior to enrolment, all participants were comprehensively briefed on the objectives of study, the detailed procedures to be undertaken, the anticipated benefits and potential risks, as well as their unequivocal right to withdraw at any stage without facing any adverse repercussions. Written informed consent was obtained from every participant. Furthermore, to safeguard confidentiality and personal privacy, all collected data were anonymised and de-identified prior to any subsequent analysis.

Consent for publication

Not applicable. This manuscript contains no individual person's data in any form (including individual details, images, or videos).

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

MP: Conceptualization, methodology, investigation (histopathological examination and interpretation of all biopsy specimens), supervision, project administration, resources, validation FT: Conceptualization, methodology, investigation, data curation, data analysis and interpretation, writing original draft, review and editing AS: Conceptualization, methodology, investigation (endoscopic procedures and biopsy acquisition), resources, supervision, validation AT: Data curation, formal analysis, software, validation, review and editing. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work.

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Data Availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

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