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The impact of refined nursing management on the diagnosis of early gastric cancer under ME-NBI

Yi Fan[1,2*], Ming Ma[1,2], Qing Liu[1,2] and Yu Wu[1,2]

Abstract

Objective To explore the impact of magnifying endoscopy with narrow-band imaging (ME-NBI) combined with refined nursing management on the endoscopic diagnosis of early gastric cancer.

Methods Patients who underwent painless gastroscopy at the Affiliated Hospital of Zunyi Medical University from January 1, 2021 to December 31, 2021 were randomly selected as study subjects. They were randomly divided into an experimental group and a control group. The experimental group received ME-NBI examination and refined nursing interventions included psychological support, environmental management, and structured patient preparation to optimize endoscopic conditions. The control group received routine endoscopic examination and nursing. The gastric cancer detection rates, patient compliance, and mucosal visibility were evaluated. The patient compliance scale used in this study evaluates adherence based on medication intake, positional changes, and examination cooperation.

Results A total of 998 patients were included, with 499 in each group. The gastric cancer detection rate was significantly higher in the experimental group (4.2%) compared to the control group (0.6%) ($\chi^2 = 13.721$, $p < 0.0001$). Patients were randomly assigned to an experimental group ($n = 499$) receiving ME-NBI with refined nursing, and a control group ($n = 499$) receiving routine care. There were no statistically significant differences in general data such as gender, age, family history of gastric cancer, and Helicobacter pylori infection between the two groups (all $p > 0.05$), indicating comparability. In the experimental group, 334 cases (66.93%) had good compliance scores (9–10 points) and 165 cases (33.07%) had general compliance scores (6–8 points), while in the control group, 31 cases (6.21%) had good compliance scores and 468 cases (93.79%) had general compliance scores. Patient compliance was significantly higher in the experimental group compared to the control group ($\chi^2 = 396.569$, $p < 0.0001$), indicating that refined nursing can improve patient compliance. In addition, the comparison of gastric mucosal visibility scores during endoscopic examination showed that in the experimental group, 384 cases (76.95%) scored 1 point, 115 cases (23.05%) scored 2 points, and 0 cases (0.00%) scored 3 points; while in the control group, 27 cases (5.41%) scored 1 point, 228 cases (45.69%) scored 2 points, and 244 cases (48.90%) scored 3 points. The mucosal visibility was significantly higher in the experimental group compared to the control group ($\chi^2 = 591.322$, $p < 0.0001$), indicating that refined nursing can improve gastric mucosal visibility. The gastric cancer detection rate was significantly higher in the experimental group (4.2%) compared to the control group (0.6%) ($\chi^2 = 13.721$, $p < 0.0001$), indicating that refined care can improve the gastric cancer detection rate.

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Conclusion The application of refined nursing management combined with ME-NBI technology for the diagnosis of early gastric cancer can significantly improve patient compliance, gastric mucosal visibility, and gastric cancer detection rate, which is worthy of clinical promotion and application.

Keywords Refined nursing management, ME-NBI, Early gastric cancer, Patient compliance, Gastric mucosal visibility

Gastric cancer is a common malignant tumor of the digestive system and the second leading cause of cancer-related deaths. Its incidence and mortality rates rank second among malignant tumors in China [1], posing a serious threat to patients' health and life. Studies have shown that the prognosis of gastric cancer patients is closely related to the timing of diagnosis and treatment. The 5-year survival rate of patients with advanced gastric cancer is less than 20% after surgery, and their quality of life is poor [2], while the prognosis of patients with early gastric cancer is relatively good, and the 5-year survival rate can exceed 90% after active treatment [3]. Therefore, early diagnosis of gastric cancer can provide a basis for clinical diagnosis and treatment and maximize the survival of patients.

Ordinary white light endoscopy is a common method for clinical diagnosis of gastric cancer. It can observe the surface and boundaries of lesions, but clinical application has found that it has a high misdiagnosis rate for early gastric cancer and is difficult to distinguish from inflammatory lesions [4]. With the rapid development of medical technology, narrow-band imaging combined with magnifying endoscopy (ME-NBI) has been widely used. It can effectively image small lesions in detail and improve the accuracy of gastric cancer diagnosis [4–6]. However, digestive endoscopy, as an invasive operation, can cause obvious discomfort to the patient's body. Most patients will experience negative emotions such as anxiety and fear before the examination, and often exhibit subconscious resistance behaviors, resulting in inability to cooperate well with the physician's operation [7, 8]. Therefore, strengthening nursing interventions for patients undergoing digestive endoscopy is crucial.

Refined nursing is a new nursing concept that has emerged in clinical practice in recent years. It mainly improves nursing quality through quantification and refinement of nursing procedures, thereby improving patient satisfaction, in order to obtain the best examination results [9]. We hypothesized that refined nursing management could improve ME-NBI image quality and diagnostic accuracy through three mechanisms: (1) enhanced patient compliance leading to more stable endoscopic examination; (2) optimized pre-examination preparation resulting in reduced mucus adherence; and (3) standardized position changes enabling complete mucosal visualization. Therefore, this study aims to explore the impact of magnifying endoscopy with narrow-band imaging combined with refined nursing management on the endoscopic diagnosis of early gastric cancer, integrate refined nursing into the diagnosis and treatment of early gastric cancer, improve the ability of early diagnosis and treatment of early gastric cancer under endoscopy, and improve patient compliance.

Materials and methods

General information

Using the random number table method, patients who underwent painless gastroscopy (defined as endoscopic examination under conscious sedation using intravenous propofol [0.5–2.0 mg/kg] and remifentanil [0.5–1.0 μg/kg], with continuous monitoring of vital signs) at the Digestive Endoscopy Center of our hospital from January 2021 to December 2021 were included in the study. The indications for endoscopy included: (1) screening for gastric cancer in patients aged ≥ 40 years; (2) follow-up of known gastric diseases; (3) investigation of upper gastrointestinal symptoms such as dyspepsia, epigastric pain, or early satiety; and (4) positive results from serum pepsinogen testing or H. pylori infection requiring further examination and randomly divided into an experimental group and a control group at a 1:1 ratio (Fig. 1). All medications known to affect gastric mucosal visibility were documented. Patients were instructed to discontinue proton pump inhibitors and H2 receptor antagonists 2 weeks before the examination, and mucosal protective agents 3 days before, unless medically contraindicated. Patients with H. pylori infection (confirmed by rapid urease test and histology) were indicated for endoscopy if they had persistent dyspeptic symptoms, a family history of gastric cancer, or prior history of gastric ulcer. Pepsinogen levels were assessed as a biomarker for atrophic gastritis, and patients with a pepsinogen I level < 70 ng/mL or a pepsinogen I/II ratio < 3.0 were recommended for further evaluation. Pepsinogen I and II levels were measured to assess the possibility of atrophic gastritis, following the standard cutoff values for identifying gastric atrophy.

Inclusion criteria: (1) age ≥ 18 years old; (2) voluntarily participated in this study and signed an informed consent form; (3) stable condition and able to tolerate gastroscopy.

Exclusion criteria: (1) those with severe cardiac, pulmonary, hepatic, renal and other organ dysfunction; Organ

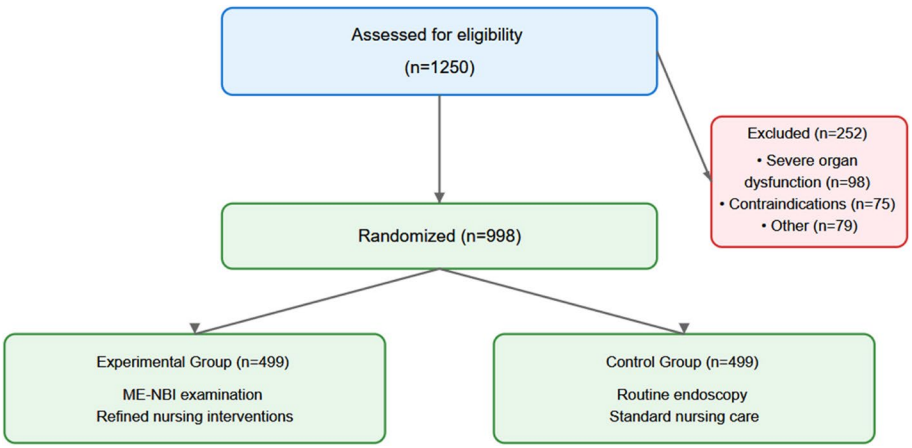

Fig. 1 Flow diagram of patient enrollment and allocation

dysfunction was defined as severe impairment of cardiac (New York Heart Association Class III-IV heart failure), pulmonary (chronic obstructive pulmonary disease with FEV1 < 50%), hepatic (Child–Pugh class C), or renal function (estimated glomerular filtration rate < 30 mL/min/1.73m^2). Patients with severe mental disorders that impair comprehension and compliance, such as schizophrenia and severe bipolar disorder, were excluded, while patients with anxiety and depression were included in the study. (2) those with contraindications to endoscopy such as gastrointestinal bleeding, perforation, or obstruction; (3) pregnant or lactating women; (4) those with mental disorders. This study was approved by the hospital ethics committee.

Nursing methods

Patients in the control group received routine nursing interventions, including:

① When the patient makes an appointment, carefully check the patient's general information, explain precautions, and instruct them to sign the informed consent form related to the examination. When the patient enters the waiting area of the endoscopy center, 20 min before entering the treatment room, orally administer 20,000 units of chymotrypsin + 1 g sodium bicarbonate + 30 ml simethicone + 80 ml warm water. The nurse verbally informs the patient of the position changes and examination methods.

② Before the examination, confirm that the patient is in a fasting state, recheck the patient's information, and prepare the equipment.

③ During the examination, monitor the patient's vital signs. If the patient experiences discomfort, promptly report it to the examining physician.

④ After the examination, escort the patient to the observation room.

Patients in the experimental group received refined nursing interventions [10] on the basis of routine nursing, including:

① Pre-examination preparation and psychological nursing: When making an appointment, provide detailed written materials and video demonstrations about the examination process. Assess the patient's psychological characteristics and condition. 24 h before examination, provide dietary guidance (clear liquid diet for 6 h, complete fasting for 4 h) and review current medications. When the patient enters the waiting area of the endoscopy center, conduct anxiety assessment and play an animated video on examination procedures. 20 min before entering the treatment room, orally administer defoaming agents under the "one-on-one" guidance of the nurse.

② Position management and environmental care: Guide patients through standardized position changes (right lateral, prone, left lateral, supine) with MP3 audio assistance (in both Mandarin and dialect versions). Each position should maintain even breathing for 10 times, with position changes repeated 5 times. Ensure a comfortable examination environment by controlling light, noise, and temperature. The service attitude should be amiable to improve patient compliance.

③ Vital sign monitoring and procedure assistance: Monitor vital signs throughout the entire process. Observe the patient's complexion and expression. During the examination, provide continuous position adjustment assistance and verbal encouragement. Report any abnormalities immediately to the examining physician.

④ Post-examination care: Escort patients to the observation room for a 30-min observation period. Monitor vital signs until the anesthetic sensation disappears.

Provide detailed discharge instructions including dietary restrictions and follow-up appointment arrangements. The nursing staff should promptly handle any post-procedure complications if they occur.

Observation indicators

Record the mucosal visibility scores (according to the scoring criteria reported by Gyu Jin Lee [11]) of the endoscopic examinations in the experimental and control groups. Mucosal visibility was assessed immediately after endoscope insertion and before any water flushing or cleaning procedures. The assessment was performed in five standardized locations: the greater and lesser curvatures of the antrum, the greater and lesser curvatures of the body, and the greater curvature of the fundus. Additionally, the gastric cancer detection rates in both groups were recorded. The final visibility score was determined as the worst score among these five locations. A second assessment was performed after standard water flushing if the initial score was 2 or 3, but only the initial scores were used for group comparison to evaluate the effectiveness of pre-examination preparation. Use the hospital's self-made patient compliance assessment scale to evaluate the patient's compliance at two levels: good compliance (9–10 points) and general compliance (6–8 points). All endoscopic examinations and visibility assessments were performed by three senior endoscopists, each with more than 10 years of experience in gastroscopy and at least 5 years of experience with ME-NBI. To ensure scoring consistency, all three endoscopists underwent standardization training before the study began, and the interobserver agreement was assessed using 50 test cases (kappa = 0.85). To minimize bias, the endoscopists were blinded to the group allocation when performing the examinations and visibility assessments.

① Visibility according to the scoring criteria reported by Gyu Jin Lee:

1 point: No adherent mucus, clear field of view;
2 points: A small amount of mucus, but the field of view is not blurred and does not affect observation;
3 points: A large amount of adherent mucus, blurred field of view, affecting observation, requiring cleaning.

② Patient compliance using the hospital's self-made patient compliance assessment scale:

a No remaining or residual medication dosage (2 points);
b Immediately begin position changes on the examination bed after taking the medication (2 points);
c 5 rounds of position changes (2 points);
d The duration of each position is ten even breaths (2 points);
e Change positions in the same direction (right lateral, prone, left lateral, supine) (2 points).

Statistical analysis

Sample size was calculated using G*Power 3.1.9.2 software. Based on previous studies, we estimated that refined nursing management would improve the good compliance rate from 10 to 25%. With $\alpha = 0.05$ and $\beta = 0.20$ (power = 80%), the required sample size was 452 patients per group. SPSS 22.0 statistical software was used for data analysis. Measurement data are expressed as mean ± standard deviation (± s), and independent sample t-test was used for inter-group comparison. Count data are expressed as the number of cases (percentage) [n(%)]. For comparisons involving two groups, an independent sample t-test or chi-square test was used as appropriate. For comparisons involving more than two groups, one-way analysis of variance (ANOVA) was performed followed by post-hoc Bonferroni correction where necessary. A two-sided p-value of < 0.05 was considered statistically significant.

Results

Comparison of general information between the two groups

There were no statistically significant differences between the two groups in terms of gender, age, body mass index, smoking history, drinking history, and family history of gastric cancer (all $p > 0.05$). Helicobacter pylori status was categorized into four groups: never infected, currently infected (confirmed by both rapid urease test and histology), post-eradication (confirmed by negative urea breath test at least 4 weeks after completion of therapy), and failed eradication. The distribution of H. pylori status was comparable between the two groups ($p = 0.412$). These results indicate good comparability between the experimental and control groups. See Table 1.

Refined nursing can improve patient compliance

Comparison of patient compliance between the two groups found that in the experimental group, 334 cases (66.93%) had good compliance scores (9–10 points) and 165 cases (33.07%) had general compliance scores (6–8 points), while in the control group, 31 cases (6.21%) had good compliance scores (9–10 points) and 468 cases (93.79%) had general compliance scores (6–8 points). Patient compliance was significantly higher in the experimental group compared to the control group ($\chi^2 = 396.569$, $p < 0.0001$), indicating that refined nursing can improve patient compliance. See Table 2.

Table 1 Comparison of general information between the two groups [n(%)]

Item	Experimental Group (*n* = 499)	Control Group (*n* = 499)	*P*-Value
Gender			0.110
Male	294 (58.9%)	269 (53.9%)	
Female	205 (41.1%)	230 (46.1%)	
Age (Years)			0.430
≤ 40	42 (8.4%)	51 (10.2%)	
41 ~ 59	195 (39.1%)	208 (41.7%)	
≥ 60	262 (52.5%)	240 (48.1%)	
Body Mass Index (kg/m^2)			0.347
< 24	301 (60.3%)	287 (57.5%)	
≥ 24	198 (39.7%)	212 (42.5%)	
Smoking History			0.387
Yes	125 (25.1%)	137 (27.5%)	
No	374 (74.9%)	362 (72.5%)	
Drinking History			0.315
Yes	108 (21.6%)	121 (24.2%)	
No	391 (78.4%)	378 (75.8%)	
Family History of Gastric Cancer			0.260
Yes	32 (6.4%)	24 (4.8%)	
No	467 (93.6%)	475 (95.2%)	
Helicobacter Pylori Status			0.412
Never infected	265 (53.1%)	248 (49.7%)	
Currently infected[a]	155 (31.1%)	172 (34.5%)	
Post-eradication[b]	62 (12.4%)	58 (11.6%)	
Failed eradication	17 (3.4%)	21 (4.2%)	
Medication Use in Past Month			
Proton pump inhibitors	156 (31.3%)	148 (29.7%)	0.584
H2 receptor antagonists	89 (17.8%)	93 (18.6%)	0.742
Mucosal protective agents	67 (13.4%)	71 (14.2%)	0.705
Antacids	45 (9.0%)	48 (9.6%)	0.745

[a] Currently infected status was confirmed by both rapid urease test and histology

[b] Post-eradication status was confirmed by negative urea breath test at least 4 weeks after completion of therapy

Table 2 Comparison of patient compliance between the two groups

Compliance Score	Control Group (*n* = 499)	Experimental Group (*n* = 499)	*p*
Good (9–10 points)	31 (6.21%)	334 (66.93%)	< 0.0001
General (6–8 points)	468 (93.79%)	165 (33.07%)	

Refined nursing can improve gastric mucosal visibility

Comparison of gastric mucosal visibility scores during gastroscopic examination between the two groups found that in the experimental group, 384 cases (76.95%) scored 1 point, 115 cases (23.05%) scored 2 points, and 0 cases (0.00%) scored 3 points; while in the control group, 27 cases (5.41%) scored 1 point, 228 cases (45.69%) scored 2 points, and 244 cases (48.90%) scored 3 points. The mucosal visibility was significantly higher in the experimental group compared to the control group ($\chi^2 = 591.322$, $p < 0.0001$), indicating that refined nursing can improve gastric mucosal visibility. See Table 3.

Table 3 Comparison of gastric mucosal visibility scores during gastroscopy between the two groups

Visibility Score	Control Group (*n* = 499)	Experimental Group (*n* = 499)	*p*
1 Point	27 (5.41%)	384 (76.95%)	< 0.0001
2 Points	228 (45.69%)	115 (23.05%)	
3 Points	244 (48.90%)	0 (0.00%)	

Refined nursing can improve the gastric cancer detection rate

The gastric cancer detection rates in the control and experimental groups are shown in Table 4. The gastric cancer detection rate was significantly higher in the experimental group (4.2%) compared to the control group (0.6%) ($\chi^2 = 13.721$, $p < 0.0001$).

Discussion

The endoscopic manifestations of early gastric cancer lack specificity and are easily misdiagnosed as benign lesions such as chronic gastritis and gastric ulcers, resulting in a high rate of missed diagnosis [12]. The experience and skills of endoscopists are important factors affecting diagnostic accuracy. How to objectively improve the imaging quality of the gastric mucosa under endoscopy is crucial for the screening of early gastric cancer. The results of this study show that the application of ME-NBI combined with refined nursing management for early gastric cancer screening can significantly improve patient compliance, gastric mucosal visibility scores, and gastric cancer detection rate.

ME-NBI technology uses the principle of narrow-band filtering to separate the white light of the endoscope into blue light with a wavelength of 415 nm and green light with a wavelength of 540 nm. Blue light can display the capillaries in the superficial layer of the mucosa, while green light can highlight the surface structure of the mucosa. After magnification, the changes in the mucosal microvascular architecture and surface microstructure can be clearly shown [13]. Compared with traditional white light endoscopy, ME-NBI has obvious advantages in distinguishing between benign and malignant lesions,

Table 4 Comparison of gastric cancer detection rates between the two groups

Group	Total (n)	Positive [n (%)]	Negative [n (%)]	χ^2 Value	*P*-Value
Control	499	3 (0.6)	496 (99.4)	13.721	0.000
Experimental	502	21 (4.2)	481 (95.8)		

especially in the detection of superficial, flat, and other hidden lesions [6]. This suggests that this technology can be used as an effective supplement to routine white light endoscopy to improve the endoscopic detection rate of early gastric cancer and is worthy of promotion and application.

However, endoscopy is a traumatic operation, and some patients often have poor compliance due to negative emotions such as fear and anxiety, resulting in poor cooperation, which seriously affects the quality of the examination [14]. Therefore, it is necessary to strengthen patient management, alleviate concerns, and create a good atmosphere for endoscopic examination. This study adopted a refined nursing model to provide personalized and precise high-quality nursing services from the dimensions of psychology, environment, position, vital sign monitoring, diet, health education and more. This study also obtained similar results, with a good compliance rate of 66.93% in the experimental group, much higher than the 6.21% in the control group. This suggests that adopting a refined nursing model can significantly improve the patient experience of gastrointestinal endoscopy and increase compliance.

Gastric mucosal visibility is another key factor affecting the detection of lesions under endoscopy [15]. Foreign studies have shown that a large amount of residual mucus and saliva in the gastric cavity will seriously affect the field of view of the gastric mucosa, leading to early lesions being missed, which is a common cause of missed diagnosis under endoscopy [16]. This study used the gastric mucosal visibility scoring criteria reported by Gyu Jin Lee et al. [11], with 1 point indicating no mucus adhesion in the gastric cavity and a clear field of view; 2 points indicating a small amount of mucus but no blurring of the field of view affecting mucosal observation; and 3 points indicating a large amount of mucus coverage, with a blurred field of view. The results showed that the rate of a gastric mucosal visibility score of 1 point was as high as 76.95% in the experimental group, while it was only 5.41% in the control group, with a significant difference ($p < 0.0001$). The reason for this is that the experimental group adopted a series of optimization measures, such as routine fasting before the examination, preventive use of gastrointestinal decompression when necessary, instructing the patient to take deep breaths during the examination, assisting with turning over, etc., to maximize the removal of gastric residue and ensure a clear field of view. The gastric cancer detection rate was significantly higher in the experimental group (4.2%) compared to the control group (0.6%). This finding suggests that the combination of ME-NBI and refined nursing management may help in the early detection of gastric cancer. The improved mucosal visibility and patient compliance in the experimental group likely contributed to the higher detection rate. ME-NBI technology uses narrow-band imaging to enhance the visualization of superficial mucosal structures and microvascular patterns, which can aid in the identification of early gastric cancer lesions. The refined nursing interventions, including psychological support, environmental control, and procedural assistance, likely improved patient comfort and cooperation, thereby facilitating a more thorough examination.

However, this study still has the following limitations: (1) It is a single-center study with a relatively small sample size, and the extrapolation of the results still needs to be cautious; (2) The study period is short, and it was not possible to further follow up and evaluate the impact of ME-NBI combined with refined nursing on the long-term prognosis of early gastric cancer; (3) The evaluation of gastric mucosal visibility lacks objective quantitative indicators and is rather subjective. (4) Although we found improved mucosal visibility scores in the experimental group, the relatively small number of early gastric cancer cases limits our ability to draw definitive conclusions about the relationship between improved visibility and cancer detection rates. (5) Atrophic gastritis was a potential confounder in our study, as it may influence mucosal visibility and detection rates. The use of pepsinogen as a biomarker helped stratify patients with potential gastric atrophy, which was taken into account during data interpretation. Future large-scale, multicenter studies with early gastric cancer detection as the primary endpoint are needed. In the future, prospective, multicenter, and large-sample long-term follow-up studies are still needed to further explore the application value of ME-NBI combined with nursing intervention measures in the secondary prevention of early gastric cancer, so as to provide evidence-based evidence for the development of individualized and precise prevention and treatment strategies.

Conclusion

In summary, this study shows that the application of refined nursing management combined with ME-NBI technology for the screening and diagnosis of early gastric cancer can significantly improve patient compliance, gastric mucosal visibility, and gastric cancer detection rate. These findings suggest that this approach is worthy of clinical promotion and application. Nursing staff should strengthen training in professional skills for endoscopic nursing, master the operation procedures and image interpretation of ME-NBI, actively innovate nursing models, and work together with medical teams to contribute to the early diagnosis and treatment of gastric cancer.

Abbreviation

ME-NBI Magnifying endoscopy with narrow-band imaging

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Authors' contributions

Conceptualization: Yi Fan,; Methodology:Yi Fan; Formal analysis and investigation: Ming Ma, Qing Liu, Yu Wu; Writing - original draft preparation: Yi Fan, Ming Ma; Writing - review and editing: Yi Fan, Ming Ma, Qing Liu, Yu Wu; Resources:Yi Fan; Supervision:Yi Fan.

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Data availability

The datasets used or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Approval for the study was obtained from the Ethics Committee of the Affiliated Hospital of Zunyi Medical University (Date.2020.8.3;No.KLI-2020–197), and the research was conducted in accordance with the principles outlined in the Declaration of Helsinki regarding ethical principles for medical research involving human subjects. All patients provided informed consent for research authorization and record review, and the study was approved by the institutional review board, ensuring adherence to ethical norms and standards for research involving human participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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