

The Application Value of Mother-baby Cholangioscope in Minimally Invasive Diagnosis and Treatment of Acute and Chronic Appendicitis

Xia Ningning, Wu Yilong*, Yang Tuo, Lin Qinqi, Lin Weixing, Lin Min

Department of Gastroenterology, The Affiliated Fuding Hospital of Fujian University of Traditional Chinese Medicine, Fuding, Fujian, 355200

***Corresponding author:**

Wu Yilong,

Department of Gastroenterology, The Affiliated Fuding Hospital of Fujian University of Traditional Chinese Medicine, Fuding, Fujian, 355200

Received: 01 Mar 2026

Accepted: 13 Mar 2026

Published: 17 Mar 2026

J Short Name: WJGHE

Copyright:

©2026 Wu Yilong. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and build upon your work non-commercially

Keywords:

Mother-Baby Cholangioscope; Endoscopic Retrograde Appendicitis Therapy (ERAT); Acute Appendicitis; Chronic Appendicitis; Efficacy; Value

Citation:

Wu Yilong, The Application Value of Mother-baby Cholangioscope in Minimally Invasive Diagnosis and Treatment of Acute and Chronic Appendicitis. World J Gastroenterol Hep & Endo. 2026; V31(5): 1-6

1. Abstract

1.1. Objective

To investigate the clinical efficacy and application value of mother-baby cholangioscope-assisted endoscopic retrograde appendicitis therapy (ERAT) in the minimally invasive treatment of acute and chronic appendicitis.

1.2. Method

A retrospective analysis was performed on the clinical data of 27 patients with acute and chronic appendicitis who received mother-baby cholangioscope-assisted ERAT in the Department of Gastroenterology, The Affiliated Fuding Hospital of Fujian University of Traditional Chinese Medicine from April 2024 to December 2025. The colonoscopic and mother-baby cholangioscopic manifestations, surgery-related indicators, and postoperative recovery of the patients were recorded. Postoperative follow-up was conducted on the patients, and the disease recurrence rate and treatment efficacy satisfaction rate were statistically analyzed. Results: Among the 27 patients, 7 had acute appendicitis and 20 had chronic appendicitis, with a 100% success rate of mother-baby cholangioscope intubation, including 18 cases (66.7%) of direct intubation and 9 cases (33.3%) of guide-wire-assisted intubation. The operation time was 19 (14, 28) minutes, and no intraoperative complications such as bleeding or perforation occurred. Under colonoscopy, 16 cases (59.3%) showed hyperemia and swelling of the appendiceal orifice, 5 cases (18.5%) had purulent secretion outflow, 4 cases (14.8%) presented with submucosal eminence changes at the appendiceal orifice, and 1 case (3.7%) had fecalith impaction. Under mother-baby cholangioscopy in the appendiceal lumen, 23 cases (85.2%) had mucosal hyperemia and swelling, 16 cases (59.3%) showed visible fecalith/fecal residue, and 11 cases (40.7%) had visible pus/flocculent substances. At 6 hours after surgery, the

Visual Analogue Scale (VAS) score for pain was <3 points in all patients, with a 100% remission rate of symptoms and signs, and the average length of hospital stay was (5.11±1.83) days; The median postoperative follow-up was 12 months, with a 0-disease recurrence rate and a 100% treatment efficacy satisfaction rate among the patients. The appendiceal stents in 4 patients all fell off spontaneously at 1 month after surgery. Pathological examination of 1 patient who underwent mucosal biopsy indicated hyperplastic polyp. In addition, 3 patients with negative preoperative abdominal CT findings received definitive diagnosis and effective treatment through this technique.

1.3. Conclusion

Mother-baby cholangioscope-assisted ERAT for the treatment of non-perforated and non-gangrenous acute and chronic appendicitis has the characteristics of high intubation success rate, safe operation, and accurate diagnosis and treatment. Meanwhile, it results in mild postoperative pain, rapid recovery, and low long-term recurrence rate in patients. It can achieve effective treatment of the disease on the basis of preserving the physiological function of the appendix, and also has differential diagnostic value, which can detect concomitant lesions in the appendiceal lumen. This technique effectively compensates for the clinical limitations of traditional appendectomy and conventional ERAT, provides a new scheme for the minimally invasive and individualized diagnosis and treatment of appendicitis, and has important clinical application and popularization value.

Appendicitis is one of the acute abdominal diseases with the highest clinical incidence [1]. According to the progression of the disease, it can be divided into two categories: acute appendicitis and chronic appendicitis. Its onset is closely related to factors such as appendiceal lumen obstruction, bacterial invasion, and abnormal hyperplasia of lymphoid tissue, among which fecalith obstruction is the primary cause of acute appendicitis attacks

[2,3]. At present, appendectomy is still the core regimen for the clinical treatment of appendicitis, including two surgical procedures: open surgery and laparoscopic surgery. However, such surgical procedures cannot completely avoid postoperative adverse events such as incision infection, intestinal adhesion, and residual intra-abdominal infection. For patients who are unsuitable for surgery, such as the elderly, those with severe underlying comorbidities, and those with a history of abdominal surgery and severe intra-abdominal adhesion, the application limitations of traditional surgery are more significant, which cannot meet the actual needs of clinical individualized diagnosis and treatment. The clinical application of Endoscopic Retrograde Appendicitis Therapy (ERAT) has broken the traditional “one-size-fits-all” surgical model in the treatment of appendicitis. This technique is operated through the natural orifices of the human body without removing the appendix, and has the advantages of minimal invasiveness, no body surface scar, rapid postoperative recovery, and low incidence of complications [4,5]. However, it has been found in clinical practice that conventional ERAT has the problem of radiation exposure, and it is difficult to clearly display the microscopic lesions in the appendiceal lumen, which is likely to cause fecalith residue, incomplete obstruction relief and other conditions, thereby affecting the therapeutic effect and increasing the risk of disease recurrence. Mother-baby cholangioscope is a new type of ultra-fine endoscopic device modified from peroral digital single-operator cholangioscope. A growing number of studies [6-8] have shown that it can be accurately inserted into the appendiceal lumen through the biopsy channel of colonoscopy, to intuitively display the microscopic morphology of the appendiceal mucosa, the scope of inflammatory infiltration, the size of fecalith and the impaction site. Meanwhile, it can complete precise operations such as appendiceal lumen irrigation, stone extraction, drainage, and biopsy of the diseased mucosa under direct vision, which effectively compensates for the clinical limitations of conventional ERAT. Our hospital, The Affiliated Fuding Hospital of Fujian University of Traditional Chinese Medicine, is the first medical institution in Ningde City to carry out mother-baby cholangioscope-assisted ERAT for the treatment of appendicitis, and has accumulated rich experience in the clinical application of this technique. To further investigate the clinical application value and efficacy of this technique, this paper retrospectively analyzed the relevant clinical practice data and summarized its application effects. The results are reported as follows.

2. Data and Methods

2.1. General Information

A retrospective analysis was performed on the clinical data of patients with acute and chronic appendicitis who received mother-baby cholangioscope-assisted endoscopic retrograde appendicitis therapy (ERAT) in the Department of Gastroenterology, The Affiliated Fuding Hospital of Fujian University of Traditional Chinese Medicine from April 2024 to December 2025. Inclusion criteria [1]. The patients presented with recurrent lower abdominal pain with a disease course of more than 3 days

[2]. Preoperative abdominal ultrasound or CT indicated appendiceal thickening, or accompanied by appendiceal fecalith and effusion [3]. Colonoscopy showed hyperemia and swelling of the appendiceal orifice, submucosal eminence changes, or purulent secretion outflow, etc. Exclusion criteria [1]. Complicated with appendiceal perforation, gangrene, or diffuse peritonitis [2]. Abdominal pain was caused by definite inflammatory bowel disease, urinary system diseases, gynecological diseases, etc. [3], With contraindications to colonoscopy [4], With bleeding tendency [5]. Complicated with psychiatric disorders or other severe systemic diseases. This study was approved by the Ethics Committee of Fuding Hospital (Approval No.: DYLL-KY [2024] No. 020), and all patients signed the informed consent form.

2.2. Preoperative Preparation

All patients completed preoperative examinations including routine blood, urine and stool tests, biochemical tests, coagulation function tests, and abdominal CT. The preoperative fasting time was ≥ 8 hours, and the preoperative water deprivation time was ≥ 4 hours. Standardized bowel preparation was performed with polyethylene glycol electrolyte solution or sodium phosphate powder combined with simethicone, to ensure a clear endoscopic field of view during the operation.

2.3. Instruments and Equipment

Mother-baby cholangioscope (disposable imaging catheter, outer diameter 3 mm, Nanjing Micro-Tech Medical Devices Co., Ltd., China, Model G05008); Cholangioscopy imaging controller (image resolution 1920×1080, Micro-Tech Endoscopy Co., Ltd., China); Electronic colonoscope (CF-HQ290, Olympus, Japan); Stone Retrieval Basket (Dahua Series) (diameter 10 mm/15 mm/20 mm, Micro-Tech Endoscopy Co., Ltd., China); 5Fr plastic stent (length 5 cm, Cook Medical, the United States of America).

2.4. Surgical Procedures:

The patients received general intravenous anesthesia and were placed in the left lateral decubitus position. With the assistance of a transparent cap, the colonoscope (mother scope) was inserted along the intestinal lumen through the anus to the ileocecal region, and further advanced to the terminal ileum for at least 10 cm. The condition of the intestinal mucosa was observed to rule out lesions in the ileocecal region and terminal ileum; The appendiceal orifice and surrounding mucosa were carefully observed for manifestations such as hyperemia, swelling, fecalith impaction, and purulent secretion outflow. The transparent cap was used to push open Gerlach's valve to fully expose the appendiceal orifice, which was then aspirated and fixed in the center of the visual field. The mother-baby cholangioscope was intubated directly along the working channel of the mother scope, or inserted into the appendiceal lumen with guidewire assistance. A small amount of water was injected to fully expose the appendiceal lumen, and the mucosa of the appendiceal inner wall was observed under direct vision for hyperemia, swelling, erosion, stenosis, dilatation, pus, fecalith, foreign bodies and other ab-

normalities. The endoscope was then gradually advanced along the lumen to the appendiceal tip, and the appendiceal lumen was sufficiently irrigated with normal saline or metronidazole solution. If fecalith or fecalith impaction was found, the Stone Retrieval Basket was inserted into the appendiceal lumen through the working channel of the cholangioscope to extract the fecalith under direct vision. The appendiceal lumen was continuously and fully irrigated until the irrigating fluid became clear, and then the endoscope was withdrawn. If there was appendiceal lumen stenosis or severe suppuration, a plastic stent was placed in the appendiceal lumen under guidewire guidance for drainage.

2.5. Postoperative Management:

Fasting and water deprivation were performed for 4 to 24 hours after surgery, and symptomatic treatments such as anti-infection therapy and fluid rehydration were administered according to the patients' conditions; If the patients' abdominal pain was relieved without abnormal conditions such as bleeding or perforation, hospital discharge could be arranged.

2.6. Follow-up

All patients received telephone follow-up after surgery; For patients with indwelling plastic stents during surgery, upright abdominal plain film examination was performed at 1 month after surgery. The stents were removed under colonoscopy if they did not fall off spontaneously.

2.7. Observation Index

2.7.1. Colonoscopic and Mother-baby Cholangioscopic Manifestations Under colonoscopy, the ileocecal region and terminal ileum were observed for lesions (such as lymphoid follicles in the terminal ileum, inflammation, and ileocecal diverticula), the morphology of the appendiceal orifice, as well as manifestations including hyperemia, swelling, purulent secretion outflow, fecalith impaction, stenosis, and submucosal eminence changes; Under mother-baby cholangioscopy, the appendiceal lumen was observed for hyperemia, swelling, erosion, ulcer, fecalith/fecal residue, pus/flocculus, foreign body, stenosis, as well as tortuous course and dilatation of the lumen.

2.7.2. Treatment Conditions Successful intubation was defined as the mother-baby cholangioscope being successfully inserted to the appendiceal tip. Successful treatment was defined as the disappearance of symptoms such as abdominal pain after mother-baby cholangioscope-assisted treatment, with no complications such as bleeding or perforation. The intubation success rate, operation time, and length of hospital stay were statistically analyzed.

2.7.3. Postoperative Status

The postoperative feeding time, Visual Analogue Scale (VAS) score for pain at 6 hours after surgery, incidence of complications, disease recurrence rate, and treatment efficacy satisfaction rate of the patients were statistically analyzed.

2.8. Statistical Methods

SPSS 29.0 statistical software was used to process the data in this study. Enumeration data were expressed as cases (%). Mea-

surement data conforming to normal distribution were expressed as mean \pm standard deviation ($\bar{x} \pm s$), and measurement data with non-normal distribution were expressed as median (M (P25, P75)).

3. Result

3.1. General Information

A total of 27 patients who underwent mother-baby cholangioscope-assisted ERAT were enrolled in this study. Among them, 7 cases (25.9%) were diagnosed with acute appendicitis, 20 cases (74.1%) with chronic appendicitis, 16 cases (59.3%) were male, 11 cases (40.7%) were female, with a mean age of (49.0 \pm 16.6) years. The main clinical manifestations were right lower abdominal pain in 10 cases (37.0%), lower abdominal pain in 15 cases (55.6%), abdominal distension in 7 cases (25.9%), nausea and vomiting in 2 cases (7.4%), and fever in 1 case (3.7%). Physical signs showed tenderness in the right lower abdomen in 11 cases (40.7%) and rebound tenderness in 3 cases (11.1%). For the 7 patients with acute appendicitis, the preoperative white blood cell count was (11.29 \pm 4.16) $\times 10^9/L$, the neutrophil percentage was (74.90% \pm 13.23%), and the C-reactive protein (CRP) level was 73.70 (12.83, 93.10) mg/L. For the 20 patients with chronic appendicitis, the preoperative white blood cell count was (7.63 \pm 1.90) $\times 10^9/L$, the neutrophil percentage was (60.6% \pm 11.75%), and the CRP level was 2.27 (1.61, 4.63) mg/L. Among the 27 patients, 3 cases showed no abnormalities on preoperative abdominal CT examination, and 24 cases had appendiceal abnormalities indicated by abdominal CT, which manifested as varying degrees of luminal dilatation and thickening, appendiceal wall thickening, or fecalith formation.

3.2. Surgery-Related Conditions

3.2.1. Colonoscopic Manifestations (Figure 1) Normal appendiceal orifice was observed in 9 cases (33.3%), hyperemia and swelling of the appendiceal orifice mucosa in 16 cases (59.3%), purulent secretion outflow from the appendiceal orifice in 5 cases (18.5%), submucosal eminence changes of the appendiceal orifice in 4 cases (14.8%), fecalith impaction at the appendiceal orifice in 1 case (3.7%), and stenosis of the appendiceal orifice in 1 case (3.7%); Lymphoid follicular hyperplasia in the terminal ileum was found in 2 cases (7.4%), erosion of the terminal ileum in 1 case (3.7%), and ileocecal diverticulum in 2 cases (7.4%);

2.22 .Mother-baby Cholangioscopic Observations (Figure 2) Hyperemia and swelling of the mucosa in the appendiceal lumen were observed in 23 cases (85.2%), erosion and ulcer of the appendiceal inner wall in 1 case (3.7%), fecalith/fecal residue in the appendiceal lumen in 16 cases (59.3%), pus/flocculus in the appendiceal lumen in 11 cases (40.7%), and tortuous and redundant course of the appendiceal lumen in 1 case (3.7%). No case of appendiceal lumen stenosis was found.

2.23. Endoscopic Treatment (Figure 3) Successful mother-baby cholangioscope intubation was achieved in all 27 patients, with an intubation success rate of 100%, including 18 cases (66.7%) of direct intubation and 9 cases (33.3%) of guidewire-assisted intubation. Appendiceal lumen irrigation with normal saline was

performed in 24 cases, and irrigation with 250 ml of metronidazole and sodium chloride injection in 3 cases. Stone extraction with the Stone Retrieval Basket was applied in 5 cases, plastic stents were indwelled postoperatively in 4 cases, and mucosal biopsy was performed in 1 case due to visible multiple polypoid eminences in the appendiceal lumen. The operation was uneventful in all 27 patients, with no intraoperative complications such as bleeding and perforation. The operation time was 19 (14, 28) minutes.

2.24. Postoperative Conditions The Visual Analogue Scale (VAS) score for pain was <3 points in all 27 patients at 6 hours after surgery, with a 100% significant remission rate of symptoms and signs. All patients received early oral liquid diet after surgery, which was gradually transitioned to semi-liquid diet.

Among them, 3 cases (11.1%) resumed oral diet at 4 hours after surgery, 9 cases (33.3%) at 6 hours after surgery, and 15 cases (55.6%) at 24 hours after surgery. The average length of hospital stay of the patients was (5.11 ± 1.83) days.

2.25. Postoperative Follow-up Conditions The 27 patients were followed up for 12 (10, 13) months after surgery. No complications occurred in any patient, no disease recurrence was observed, with a recurrence rate of 0 and a treatment efficacy satisfaction rate of 100%; For the 4 patients with indwelling appendiceal stents, reexamination of upright abdominal plain film at 1 month after surgery showed that all stents fell off spontaneously, and no secondary endoscopic procedure was required for removal. Pathological examination of 1 patient who underwent appendiceal mucosal biopsy indicated hyperplastic polyp.



Figure 1: Endoscopic Manifestations: Appendiceal Findings Under Colonoscopy A: Normal mucosa of the appendiceal orifice; B: Mucosal eminence, hyperemia and swelling of the appendiceal orifice; C: Submucosal eminence changes of the appendiceal orifice; D: Fecalith impaction observed at the appendiceal orifice.

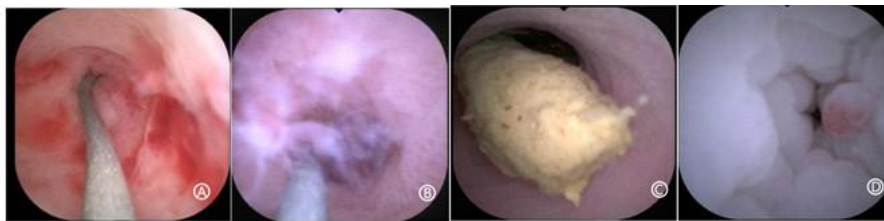


Figure 2: Manifestations of the Appendiceal Lumen Under Mother-baby Cholangioscopy: E: Hyperemia and swelling of the appendiceal inner wall mucosa; F: Purulent secretion/flocculus can be seen in the appendiceal lumen; G: Strip-shaped fecalith can be seen in the appendiceal lumen; H: Mucosal polypoid eminence can be seen in the appendiceal lumen.

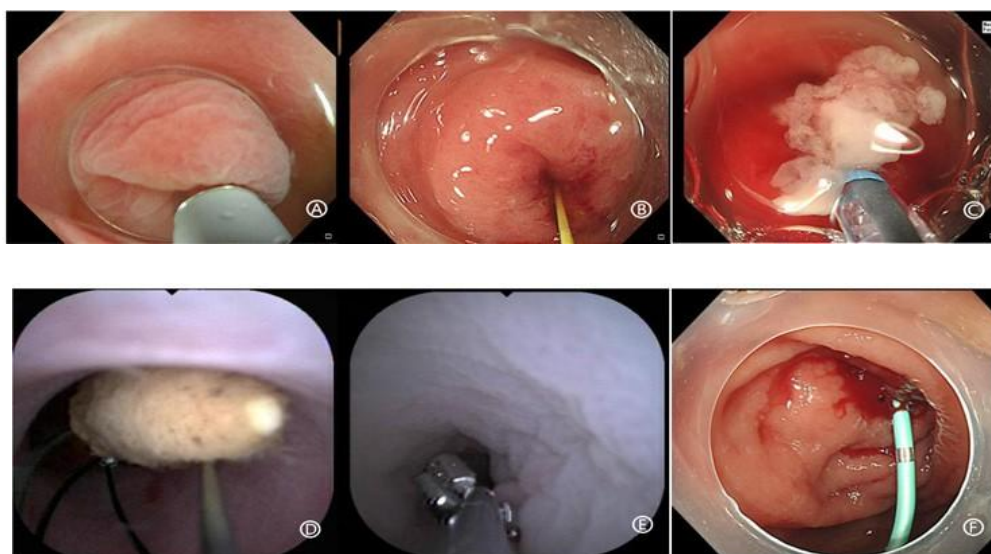


Figure 3: Endoscopic Treatment A: The mother-baby cholangioscope is directly inserted into the appendiceal lumen through the biopsy forceps channel of the colonoscope; B: The mother-baby cholangioscope is inserted into the appendiceal lumen with the assistance of a guidewire; C: A guidewire and sphincterotome are placed along the appendiceal orifice, and massive pus outflow is observed after pressurized flushing with normal saline; D: The fecalith in the appendiceal lumen is retrieved using the Stone Retrieval Basket; E: Mucosal biopsy of the appendiceal lumen is performed; F: A plastic stent is implanted in the appendiceal lumen.

4. Discussion

The appendix is located at the posteroinferior end of the cecum, with its proximal end opening 2-3 cm below the ileocecal valve. The appendix is generally 5-7 cm in length and 0.5-0.6 cm in diameter. Appendicitis is one of the most common abdominal diseases in surgery. Typical acute appendicitis is relatively easy to diagnose due to its clear symptoms, while the clinical manifestations of patients with chronic appendicitis are mostly atypical, with recurrent mild to moderate abdominal pain as the main symptom. The disease course can last for more than 1-2 days, and even persist for months to years; In addition, most patients with chronic appendicitis have no significant abnormalities in blood tests, and the sensitivity and specificity of imaging examinations are limited, resulting in great difficulty in clinical diagnosis. At present, there are no unified diagnosis and treatment guidelines or expert consensus available for reference.

Appendectomy has long been the main treatment for appendicitis. However, with the in-depth clinical research [9], it has been found that the appendix is not a dispensable organ without physiological functions. It has a strong immune function and stores abundant human probiotics, and this physiological effect is particularly important for children and adolescents; Other studies [10,11] have confirmed that the risk of suffering from digestive system diseases such as cholelithiasis and colorectal cancer is increased after appendectomy. Therefore, in the process of diagnosis and treatment of acute and chronic appendicitis, it is necessary to re-examine the physiological value of the appendix and the necessity of appendectomy, and carefully select the strategy of appendiceal preservation or resection.

The clinical application of Endoscopic Retrograde Appendicitis Therapy (ERAT) has provided a new option for the treatment of appendicitis. This technique does not require appendectomy, which not only preserves the physiological function of the appendix, but also has the advantages of minimal invasiveness, no body surface scar, and rapid postoperative recovery. However, conventional ERAT still has certain limitations: First, the operation process relies on X-ray fluoroscopy to assist the localization of the appendiceal lumen, which is likely to cause radiation exposure to both doctors and patients. Long-term operation carries potential health risks, and it is particularly unsuitable for children, pregnant women, and women preparing for pregnancy. Second, conventional endoscopy cannot penetrate deep into the appendiceal lumen, and can only indirectly judge intraluminal lesions through the external manifestations of the appendiceal orifice. It is difficult to clearly display microscopic lesions of the appendiceal mucosa, the specific location of fecalith impaction, the distribution range of pus and other conditions, which easily leads to fecalith residue and incomplete relief of luminal obstruction, thereby increasing the risk of disease recurrence. Relevant studies have shown that the recurrence rate of appendicitis treated with conventional ERAT can reach 6.9%~10% [12-14]. Third, conventional ERAT mostly involves irrigation, stone extraction and drainage under "blind operation", which cannot

implement individualized and precise treatment for specific intraluminal lesions. Subsequently, a study reported in 2020 that the application of single-operator peroral cholangioscopy system (SpyGlass) assisted ERAT in the treatment of acute appendicitis can visualize the appendiceal lumen under direct vision, thereby achieving accurate diagnosis and completing operations including appendiceal lumen irrigation, drainage and stone extraction, which effectively compensates for the technical defects of conventional ERAT [7].

This study retrospectively analyzed the clinical data of 27 patients with non-perforated and non-gangrenous acute and chronic appendicitis who underwent mother-baby cholangioscope-assisted ERAT. The results showed that preoperative abdominal CT showed no obvious appendiceal abnormalities in 3 patients, and no suspected diagnosis of appendicitis was made. However, the patients were definitively diagnosed with appendicitis in combination with colonoscopic manifestations and mother-baby cholangioscopic examination results, and effective treatment was completed. This suggests that abdominal CT has a certain missed diagnosis rate in the diagnosis of appendicitis, which is consistent with the conclusions of previous studies [15], when appendicitis is highly suspected based on the patient's clinical manifestations and laboratory examinations, the possibility of appendicitis should be considered even if the CT imaging findings are insufficient to confirm the diagnosis. Thus, mother-baby cholangioscope-assisted ERAT is not only a treatment modality, but also a diagnostic tool, which has important differential diagnostic value for patients with negative imaging findings but clinically highly suspected appendiceal-origin abdominal pain. In this study, the success rate of mother-baby cholangioscope intubation into the appendiceal lumen reached 100% (27/27) among the 27 patients, among whom 66.7% (18/27) of the patients received direct intubation, and only 33.3% (9/27) required guide-wire-assisted intubation. Clinically, individualized treatment under direct vision can be implemented for patients according to the specific lesions under mother-baby cholangioscopy: For patients with simple inflammation and a small amount of fecal residue in the appendiceal lumen, normal saline irrigation was administered; for patients with obvious suppurative symptoms, anti-infective irrigation with metronidazole and sodium chloride injection was performed; for patients with fecalith impaction, stone extraction was conducted with the Stone Retrieval Basket under direct vision; for patients with obvious luminal suppuration and high intraluminal pressure, a plastic stent was placed for drainage. Meanwhile, multiple polypoid eminences in the appendiceal lumen were found by mother-baby cholangioscopy in 1 patient in this study, and mucosal biopsy and pathological diagnosis were completed. This suggests that this technique can not only treat appendicitis, but also detect concomitant lesions in the appendiceal lumen, realize early diagnosis and early intervention of the disease, and further expand the application value of endoscopic technology in the diagnosis and treatment of appendiceal diseases. No severe complications such as bleeding or perforation occurred during the operation in all patients in

this study. The Visual Analogue Scale (VAS) score for pain was <3 points in all patients at 6 hours after surgery, with a 100% remission rate of clinical symptoms and signs. This indicates that mother-baby cholangioscope-assisted ERAT causes minimal damage to the intra-abdominal tissues of patients, with mild postoperative pain, which can significantly improve postoperative comfort. In terms of postoperative feeding time, 44.4% of the patients in this study could resume oral diet within 6 hours after surgery. In contrast, after traditional appendectomy, the time to resume oral diet needs to be evaluated according to the recovery of intestinal function and anal exhaust of the patients, and the diet is generally resumed gradually 24 to 48 hours after surgery; The average length of hospital stay of the patients in this study was only (5.11±1.83) days, which significantly shortened the hospital stay and reduced the medical cost of the patients. The patients were followed up for 12 (10, 13) months after surgery in this study, with a disease recurrence rate of 0 and a treatment efficacy satisfaction rate of 100%. For the 4 patients with indwelling appendiceal stents, all stents fell off spontaneously at 1 month after surgery, and no secondary endoscopic procedure was required, which reduced the treatment pain and economic burden of the patients; Compared with conventional ERAT, mother-baby cholangioscope can complete precise operations under direct vision, thoroughly remove pathogenic sources such as fecalith and pus in the appendiceal lumen, completely relieve luminal obstruction, and greatly reduce the recurrence rate.

In conclusion, mother-baby cholangioscope-assisted ERAT for the treatment of non-perforated and non-gangrenous acute and chronic appendicitis has the clinical advantages of high intubation success rate, safe operation, clear visual field, accurate diagnosis and treatment, mild postoperative pain, rapid recovery, and low long-term recurrence rate. It can achieve effective treatment of the disease on the basis of preserving the physiological function of the appendix, and effectively compensates for the clinical limitations of traditional appendectomy and conventional ERAT. It provides a new and effective scheme for the minimally invasive and individualized diagnosis and treatment of appendicitis, and has important clinical application and popularization value. As a single-centre retrospective clinical study, this study has the limitation of small sample size. Subsequent multi-centre and large-sample clinical studies are needed to further verify the clinical efficacy and application value of this technique.

References

1. KRZYZAK M, MULROONEY S M. Acute appendicitis review: background, epidemiology, diagnosis, and treatment. *J Cureus*. 2020; 12(6): e8562.
2. Snyder M J, Guthrie M, Cagle S. Acute appendicitis: Efficient Diagnosis and anagement. *J Am Fam Physician*. 2018; 98(1): 25-33.
3. Abdul Jawad K, Qian S, Vasileiou G. Microbial Epidemiology of Acute and Perforated Appendicitis: A Post-Hoc Analysis of an EAST Multicenter Study. *J Surg Res*. 2022; 269: 69-75.
4. Liu B R, Ma X, Feng J. Endoscopic retrograde appendicitis therapy (ERAT): a multicenter retrospective study in China. *J Surgical Endoscopy*. 2015, 29(4): 905-909.
5. Liu Bingrong, Wang Hongguang, Sun Xiangzhao. Multicentre retrospective analysis of endoscopic retrograde treatment for appendicitis [J]. *Chinese Journal of Digestive Endoscopy*. 2016(33); 514-518.
6. Cao Shouli, Xue Dongyun, Li Junshan. Application of a Disposable Pancreaticomother-baby Imaging System-Assisted Endoscopic Retrograde Appendicitis Treatment in Acute Appendicitis. *J Chinese Journal of Digestive Endoscopy*. 2024; 41(11): 895-900.
7. Tao Liying, Wang Hongguang, Guo Xiang. Diagnostic and Therapeutic Value of SpyGlass DS-Assisted Retrograde Appendicitis Treatment Under Endoscopy (with video). *J Chinese Journal of Electronic Coloproctology*. 2020; 9(6): 625-629.
8. Guo Sijie, Wang Hongguang, Tao Liying. Analysis of the Diagnostic and Therapeutic Value of Single-Use Mother-baby Cholangioscopy-Assisted Endoscopic Retrograde Appendicitis Treatment for Acute Uncomplicated Appendicitis. *J Chinese Journal of Endoscopy*. 2025; 31(11): 55-61.
9. Clarke C S. The vermiform appendix: an immunological organ sustaining a microbiome inoculum. *J Clinical Science*. 2019; 133(1).
10. Shiu-Dong C, Chung-Chien H, Heng-Ching L. Increased Risk of Clinically Significant Gallstones following an Appendectomy: A Five-Year Follow-Up Study. *J Plos One*. 2016; 11(10): e0165829.
11. Sun X, Li R, Zhao W. The association between appendectomy and increased invasion of ascending colon cancer: a retrospective study involving 880 patients. *J World Journal of Surgical Oncology*. 2025; 3(1).
12. Shen Z, Sun P, Jiang M. Endoscopic retrograde appendicitis therapy versus laparoscopic appendectomy versus open appendectomy for acute appendicitis: a pilot study. *J BMC Gastroenterology*. 2022; (1): 1-10.
13. Li Jianyi, Cheng Chunli, Fan Yanming. Therapeutic Outcomes of Endoscopic Rinsing for Appendicitis (ERAT) in 865 Cases [J]. *Modern Digestive and Interventional Diagnosis and Treatment*. 2019; 24(8): 4.
14. Podda M. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *J World Journal of Emergency Surgery*. 2020; 15(1).
15. Haringa J B, Bracken R L, Davis J C. Prospective evaluation of MRI compared with CT for the etiology of abdominal pain in emergency department patients with concern for appendicitis. *Journal of Magnetic Resonance Imaging*. 2019; 50(5).