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REVIEW

Current Status of Diagnosis and Treatment of Cap Polyposis: Insights From Chinese Studies and Comparative Analysis with Japanese Cases

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Background: Cap polyposis (CP) is a rare, non-neoplastic colorectal disorder characterized by inflammatory polyps with distinctive endoscopic and histopathological features. Although increasingly reported, particularly in East Asian populations, its etiology remains unclear, and diagnostic and treatment strategies are not well standardized. Previous studies have been limited by small sample sizes and regional focus. This review aims to systematically analyze the clinical characteristics, management, and outcomes of CP in Chinese patients, with comparative insights from Japanese cases, to improve understanding and guide clinical practice.

Methods: A systematic literature search was conducted in PubMed, EMBASE, Cochrane Library, CNKI, and Wanfang databases for studies published before October 2023. Keywords included "cap polyposis" and "cap-shaped polyp". Articles were screened against predefined inclusion criteria: studies from Mainland China, pathologically confirmed CP cases, and availability of clinical and therapeutic data. Data extraction and quality assessment were performed independently by two reviewers using the Newcastle–Ottawa Scale.

Results: Fourteen studies involving 57 patients were included. The most common symptoms were hematochezia (59.6%) and diarrhea (28.1%). Polyps were predominantly located in the rectum (68.4%), and 66.7% of patients had three or more polyps. Helicobacter pylori testing was positive in 57.1% of tested patients (12/21). Comparative analysis with Japanese cases revealed similar rectal predominance but suggested potential variations in gender distribution and treatment preferences. Treatments included endoscopic mucosal resection, endoscopic submucosal dissection, H. pylori eradication, and surgery. During a median follow-up of 14 months, 10 patients experienced recurrence.

Conclusion: CP is a benign but easily misdiagnosed condition with a high recurrence rate. Diagnosis relies on combined endoscopic and histopathological findings. Treatment remains empirical, with H. pylori eradication beneficial in infected patients, and endoscopic resection effective for localized disease. Further multicenter studies are needed to establish standardized management protocols.

Keywords: cap polyposis, cap-shaped polyp, China, *Helicobacter pylori*, endoscopic mucosal resection, endoscopic submucosal dissection

Introduction

Cap polyposis (CP) was first described by William et al[1] in 1985 and derives its name from the characteristic "cap" of granulation tissue covered by fibrous purulent exudate. It represents an intestinal inflammatory polyposis with unique histological and colonoscopic characteristic.[2,3] CP is a rare form of polyposis that has remained largely overlooked due to its infrequency and the limited awareness among medical professionals. Only 11 cases had been reported until 2004,[4] and fewer than 100 cases were documented by 2017.[5] With the advancement of endoscopic diagnostics and increased awareness among clinicians, the number of CP reports has risen. Nevertheless, CP continues to be classified as a rare disease in countries such as France,[6] Denmark,[7] and even Japan, where the majority of reports have originated.[8]

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The exact incidence of CP has not been reported. Beijing Friendship Hospital in China indicated that cap polyps accounted for 1.5‰ of the patients who underwent endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD) for colorectal polyps at their hospital.[9] The incidence of CP in the general population may be relatively low. Cap polyps can occur in individuals aged 12 to 76 years;[4] however, they are most commonly observed in women in their 50s. This condition has also been documented in infants and children. In 2007,Liu et al[10] from Jiangsu Province reported the first case of colonic cap polyps in China. Currently, the awareness of this disease among medical professionals is limited. To enhance understanding of this condition, improve the diagnostic rate, and reduce the likelihood of misdiagnosis, we systematically analyzed the clinicopathological characteristics of CP through a comprehensive literature review.[11,12]

Systematic Review of the Current Status of Diagnosis and Treatment of CP in China

Literature Search Strategy

PubMed, EMBASE, Cochrane Library, China National Knowledge Infrastructure (CNKI), and Wanfang Database were searched for studies regarding the diagnosis and treatment of CP published prior to October 2023. The keywords utilized included "cap-shaped polyp" and "cap polyposis". We sought to trace the references of the included articles and manually searched relevant conference proceedings to identify additional information that may not have been retrieved through database searches. The language was restricted to English and Chinese.

Inclusion and Exclusion Criteria

Studies were included in this review if they met the following criteria: conducted in a region of China; patients were from Mainland China; patients were diagnosed with cap-shaped polyps through pathological assessment and fulfilled the pathological diagnostic criteria; no other intestinal lesions were present, such as tumors; the study was a case report or case series, rather than a review or systematic review of literature; and the language was limited to English and Chinese. The exclusion criteria included: animal studies; reviews, summaries, systematic reviews, and letters to the editor.

Literature Screening

Two reviewers independently analyzed, determined, and scored all selected literature based on predetermined principles. Consultation with a third reviewer was conducted in cases of discrepancies in decisions.

Data Extraction

Data extracted from the literature by two authors (Zhang and Xu) independently included the following: title, first author names, year of publication, province, age, gender, disease process, lesion site, detection of *Helicobacter pylori* (*H. pylori*), presentation under colonoscopy, pathology prior to treatment, treatment, postoperative pathology, and follow-up.

Quality Assessment

The methodological quality of each included observational study was evaluated using the Newcastle–Ottawa Quality Assessment Scale (NOS). NOS includes three aspects of cohort studies: selection, comparability, and exposure or outcome. The highest score is 9, with high-quality studies achieving a score of 6 or above.

Results

Outcome of Literature Search

Two researchers independently extracted data utilizing previously designed standardized data extraction tables. To address potential discrepancies during the data extraction process, we adhered to a structured approach to ensure consistency and minimize bias. The researchers reached a consensus when their initial assignments showed no agreement; alternatively, a third senior researcher with expertise in systematic review methodology was consulted to make the final determination. A total of 295 studies were identified through a systematic literature search, and 191 articles remained after the exclusion of duplicates. Following a review of the titles and abstracts, 124 articles were excluded

as they pertained to reviews, editorials, or non-human studies. An additional 57 articles were omitted after full-text identification due to incomplete data or the inability to extract key results. Ultimately, 14 studies were selected for this systematic assessment (Figure 1).

Study Characteristics

A total of 14 studies published from 2007 to 2023, including 57 patients with CP, were included in this review. The literature selection process is illustrated in Figure 1. All studies diagnosed CP based on morphological and pathological criteria. Eleven articles were published in Chinese[10,13–22] and three articles in English.[3,23,24] The geographical distribution of the patients was as follows: 48 in Beijing, 2 in Guizhou, 2 in Jiangsu, 2 in Shandong, 1 in Shanghai, 1 in Gansu, and 1 in Fujian. The sample size ranged from 1 to 14 centimeters. The correlation between clinicopathological characteristics was investigated, and the basic features of the studies are presented in Table 1. However, it is essential to recognize that studies with small sample sizes limit the statistical power to detect subtle effects and increase susceptibility to outliers or selection bias; thus, caution is necessary when extrapolating research findings to broader populations.

Situation of Chinses People Suffering From CP

Clinical Characteristics

Thirteen studies involving 57 patients were included. The male-to-female ratio was 40:17. The median age was 42 years (range, 17–70 years). Among the 57 patients, 34 (59.6%) experienced hematochezia or blood in the stools, with a maximum frequency of more than 20 times per day; 16 (28.1%) had diarrhea; 12 (22.2%) presented with rectal mucosal prolapse; and 11 (20.4%) exhibited mucus stools. Five patients reported no symptoms. Detailed information is provided in Table S1. The majority of the patients were previously healthy; however, four (7.4%) had a documented medical history. One had a history of rectal cancer treated surgically, one had proctitis, two had undergone therapy for colon polyps, one suffered from hypothyroidism, and two had hypertension.

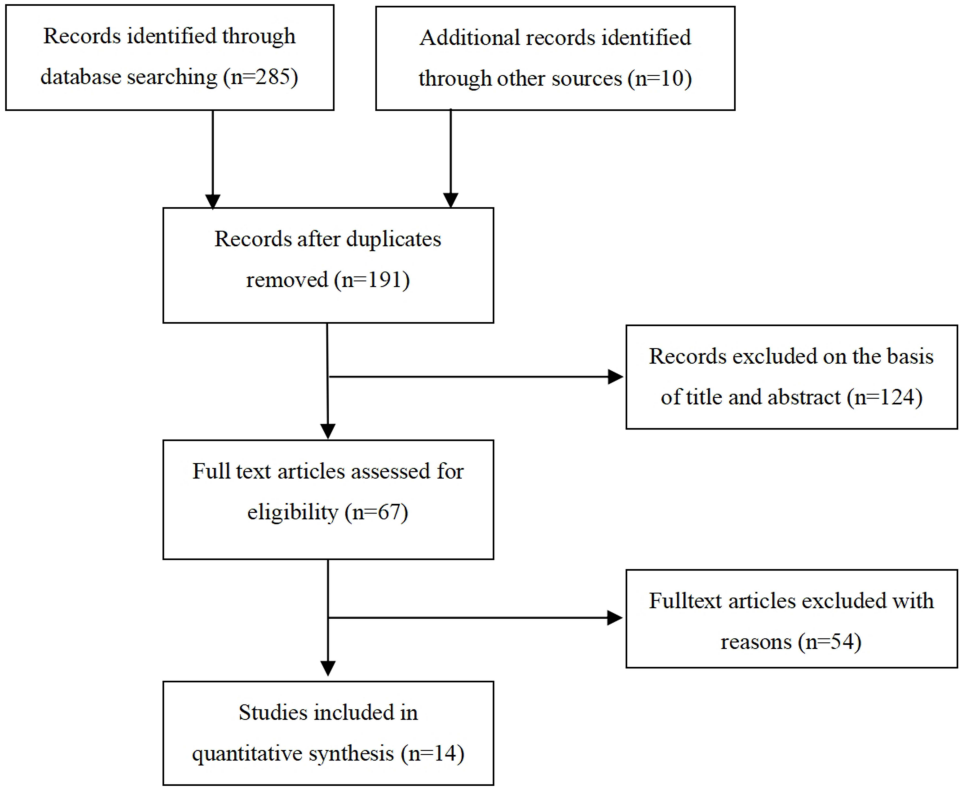

Figure 1 Flow chart of the selection process of studies for inclusion in this review.

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Table 1 List of Diagnosis and Treatment of CP in Chinese Mainland Included in the Literature

First Author	Year	NO.	Province	Age	Gender	Disease Process	Lesion Site	Detection of HP	Presentation under colonoscopy	Pathology Before Treatment	Treatment	Postoperative Pathology	Follow-up
Wang X[23]	2023	1	Fujian	18	Male	6M	Rectum	Negative	Rough and uneven protrusions 8 centimeters above the upper edge of the anal canal, with erythema and yellow white coating on the surface	A slender and proliferative gland with a characteristic cap like structure formed by an inflammatory exudate composed of mucus, fibrin, and white blood cells	EMR	NA	After 6 months, the patient's symptoms significantly improved and residual polyps were removed under endoscopy.
Zhou Y[3]	2023	1	Bei jing	37	Male	NA	Rectum	Positive	Rectal polyps, three or more	The surface of the lesion is covered with white purulent fibrous exudate; Cellulose exudate, inflammatory cells, and granulation tissue form a "cap like" structure, and the lower crypt is significantly elongated, dilated, or tortuous.	Eradicate HP, topical use of mesalazine	NA	HP turned negative, followed up for 15 months, with mild diarrhea and rectal bleeding.
		2		63	Male	NA	Ttransverse colon to the rectum	Negative	Polypoid protrusion seen from transverse colon to rectum, with ≥ 3 lesions		Oral and topical use of mesalazine, metronidazole, prednisone, 3 times EMR	NA	Follow up for 12 months, still experiencing abdominal pain and diarrhea, with no improvement observed during follow-up colonoscopy.
		3		66	Male	NA	Rectum	Positive	Polypoid protrusion seen in the rectum, with one lesion		Eradicate HP and EMR	NA	HP turned negative, followed up for 6 months, with no abnormalities observed during follow-up colonoscopy, and symptoms disappeared.
		4		67	Female	NA	Rectum	Positive	Polypoid protrusion seen in the rectum, with one lesion		Eradicate HP and EMR	NA	HP turned negative, followed up for 13 months, symptoms disappeared.
		5		34	Male	NA	Rectum	Positive	Polypoid protrusion seen in the rectum, with ≥ 3 lesions		Eradicate HP and EMR	NA	HP turned negative, followed up for 79 months, with no abnormalities observed during follow-up colonoscopy, and symptoms disappeared
		6		23	Male	NA	Rectum	Negative	Polypoid protrusion seen in the rectum, with ≥ 3 lesions		Topical use of mesalazine, EMR	NA	Follow up for 40 months, colonoscopy shows small polyps with a diameter of <0.6cm
		7		27	Male	NA	Rectum	Negative	Polypoid protrusion seen in the rectum, with ≥ 3 lesions		Topical use of mesalazine, EMR, metronidazole	NA	Follow up for 64 months, colonoscopy showed small polyps with a diameter of<0.6cm.
		8		31	Female	NA	Sigmoid colon	Not tested	There is a polypoid protrusion in the sigmoid colon, with one lesion present		EMR	NA	Follow up for 20 months, symptoms disappear
		9		63	Female	NA	Rectum	Not tested	Polyp seen in the rectum, with 2 lesions		EMR	NA	Follow up for 54 months, symptoms disappear

		10		67	Male	NA	Rectum, sigmoid colon	Not tested	Polyps are seen in the rectum and sigmoid colon, with two lesions		EMR	NA	Follow up for 80 months, colonoscopy showed no abnormalities, and symptoms disappeared
		11		69	Male	NA	Rectum, sigmoid colon	Not tested	Polyps visible in the rectum and sigmoid colon, with ≥ 3 lesions		Oral and topical mesalazine, EMR	NA	Follow up for 6 months, colonoscopy showed small polyps with a diameter of<0.6cm.
		12		53	Male	NA	Rectum	Negative	Polypoid protrusion seen in the rectum, with ≥ 3 lesions		EMR	NA	Follow up for 33 months, the patient's symptoms disappeared.
		13		63	Male	NA	Rectum	Not tested	There is a polypoid protrusion at the rectal anastomosis, and one lesion is present		Surgery	NA	Follow up for 39 months, colonoscopy showed no abnormalities, and symptoms disappeared.
		14		20	Male	NA	Rectum	Not tested	Polypoid protrusion seen in the rectum, with ≥ 3 lesions		Surgery	NA	Follow up for 15 months, colonoscopy showed multiple polyps in the rectum and recurrent diarrhea
Wu CN[20]	2023	1	Jiangshu	34	Male	3Y	Rectum, sigmoid colon	Positive	The diameter of sigmoid colon and rectum was 1.0 ~ 3.5 cm, the surface of sigmoid colon and rectum was red, slightly depressed, the boundary was clear, and the opening of glandular duct was enlarged	Surface covered with fibrous exudate, mucosal hyperplasia and crypt elongation	Eradicate HP	NA	After 1 month, the examination showed negative HP. After 4 months, the polyps disappeared and the mucosa was scattered with congestion. After 12 months, the colon mucosa was normal. After 30 months, the lesion did not recur
Zhou RN[19]	2023	1	Bei jing	35	Male	1Y	Ileocecal valve	Not tested	The ileocecal valve was an atypical protuberant lesion, about 13.1×8.7 mm in size, mainly located in the mucosal layer of the intestinal wall (by EUS)	Heterotypic cells can be seen in fibrous connective tissue, with reparative changes in tissue cell response accompanied by granulation tissue	ESD	Ulcer formation of the ileocecal valve, with fibrous tissue proliferation and inflammatory granulation tissue formation visible from the mucosa to the submucosal layer, spindle cell tumor like proliferation, accompanied by more infiltration of inflammatory cells and formation of lymphoid follicles, indicating that the mucosal protrusion is polypoid like, the granulation tissue at the top of the polyp forms a "cap like" structure.	No more bloody stools, no discomfort.

(*Continued*)

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Table 1 (Continued).

First Author	Year	NO.	Province	Age	Gender	Disease Process	Lesion Site	Detection of HP	Presentation under colonoscopy	Pathology Before Treatment	Treatment	Postoperative Pathology	Follow-up
Su XL[22]	2023	1	Gan su	59	Male	2Y	Rectum, sigmoid colon	Negative	The rectum and sigmoid colon mucosa are congested, edematous, and thick, with nodular polypoid lesions visible. A large amount of yellow white purulent secretions are attached to the surface, and the vascular texture is blurred and disappears. The sigmoid colon is narrow, and microscopic examination cannot pass.	NA	Left hemicolectomy	Polyps are composed of elongated, twisted, proliferative, and dilated crypts, with some glandular cavities expanding in a serrated shape, accompanied by goblet cell proliferation and mucin leakage.The surface of polyps is covered with granulation tissue and inflammatory cellulose exudate, forming a cap like structure. The inflammatory exudate is composed of a mixture of cellulose like necrotic tissue, mucus secretions, and inflammatory cells.	Follow up in September, symptoms disappeared, and hypoalbuminemia recovered.
Dong SL[15]	2022	1	Shan dong	30	Female	6M	Rectum, sigmoid colon	Positive	Polypectomy of the rectum and sigmoid colon with diffuse protruding ulceration, covered with white moss	Chronic inflammatory response of intestinal mucosa with lymphoid tissue proliferation and local proliferative polyp formation	Eradicate HP	NA	In February, the follow-up examination showed negative Hp, and in April, both symptoms and lesions disappeared
Qi SL[16]	2022	1	Bei jing	59	Female	NA	Rectum	Not tested	Chronic inflammation of the rectum, multiple polyps in the rectum, with a diameter of 0.5–0.7cm	Mucus cap formation, crypulitis, glandular distortion	Polypectomy, ceftazidime anti infection	NA	Follow up for 19 months, no recurrence
		2		32	Male	NA	Rectum	Not tested	Attic polyp with a diameter of 0.6–1.5cm	Mucus cap formation, crypulitis, glandular distortion and expansion, and infiltration of numerous plasma cells and eosinophils; Fibrous tissue proliferation and degeneration in the mucosal interstitium, muscle fiber disorder, accompanied by the formation of hemosiderin	Rectal mucosal prolapse suspension surgery, polypectomy	NA	Follow up for 19 months, with two relapses and bloody stools.
		3		20	Male	NA	Rectum	Positive	Multiple polypoid protrusions with a diameter of 0.6–1.5cm	Formation of mucus cap; Crypt inflammation, glandular expansion, distortion, and subsidence, with extensive infiltration of plasma cells and eosinophils; Fibrous tissue proliferation and degeneration in the mucosal interstitium, muscle fiber disorder.	Dlorme surgery for rectal prolapse, polypectomy, eradication of HP	NA	Follow up for 17 months, recurrence of polyps 0.2–0.3cm after 4 months of treatment

		4		37	Male	NA	Rectum	Not tested	Chronic inflammation of the rectum, multiple polyps in the rectum, with a maximum diameter of 1–3cm	Formation of mucus cap; Hemorrhoid like dilation of submucosal blood vessels.	Transanal resection of rectal polyps and transanal prolapse surgery	NA	Follow up for 17 months, recurrent diarrhea
		5		37	Female	NA	Colon	Not tested	Multiple polyps of the colon, with a maximum diameter of 0.5–0.7cm	Formation of mucus cap; Gland distortion, increased eosinophils, focal purulent inflammation, lymphoid tissue proliferation.	Polypectomy	NA	Follow up for 15 months, no recurrence
		6		27	Male	NA	Rectum	Not tested	Multiple polypoid protrusions in the rectum, with a maximum diameter of 0.4–1.6cm	Formation of mucus cap; Cystic expansion and subsidence of glands, disorder of muscle fibers, distortion of glands, eosinophilic transformation of some glands, and formation of crypt abscess.	Endoscopic resection of rectal masses for anti-inflammatory treatment	NA	Follow up for 15 months, no recurrence
		7		76	Male	NA	Colon	Not tested	Multiple polyps of the colon, with a maximum diameter of 0.7~1.0cm	Formation of mucus cap; Gland distortion, glandular eosinophilic transformation	polypectomy	NA	Follow up for 14 months, no recurrence
		8		31	Male	NA	Rectum	Not tested	Rectal mucosal erosion, multiple polyps, maximum diameter 0.5–0.7cm	Mucus cap formation, inflammation with erosion, focal suppuration, and thickening of blood vessel walls; Serrated changes in glands, chronic inflammation of some mucous membranes.	Polypectomy and anti-inflammatory treatment	NA	Follow up for 14 months, recurrence of serrated polyps after 7 months
		9		17	Male	NA	Rectum	Not tested	Multiple polyps with a maximum diameter of 0.6–1.5cm	Mucus cap formation, mucosal erosion, mucus pool formation, smooth muscle disorder, formation of hemosiderin, glandular dilation, hemorrhoid like dilation of blood vessels.	EMR, transanal rectal prolapse surgery	NA	Follow up for 14 months, recurrent polyp 0.3cm
		10		51	Female	NA	Rectum	Not tested	Rectal ulcer, multiple polyps, maximum diameter 0.5–0.7cm	Mucus cap formation, glandular reduction, goblet cell reduction, interstitial focal suppuration.	Rectal polypectomy, anti-inflammatory treatment	NA	Follow up for 13 months, no recurrence
		11		55	Female	NA	Rectum	Not tested	Mixed hemorrhoids, multiple rectal polyps, maximum diameter 0.7–1.0cm	Reduced villous and goblet cells	Rectal polypectomy and anal constriction surgery	NA	Follow up for 11 months, no recurrence
		12		46	Female	NA	Rectum	Not tested	Three polyps in the rectum, with a maximum diameter of 0.3cm	Mucus cap formation, glandular distortion, low-grade tubular adenoma	Endoscopic resection of polyps	NA	Follow up for 11 months, no recurrence

(*Continued*)

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Table 1 (Continued).

First Author	Year	NO.	Province	Age	Gender	Disease Process	Lesion Site	Detection of HP	Presentation under colonoscopy	Pathology Before Treatment	Treatment	Postoperative Pathology	Follow-up
		13		68	Female	NA	Ascending colon, descending colon, sigmoid colon	Not tested	Ascending colon, descending colon, and sigmoid polyps, totaling 3 polyps	Mucus cap formation, glandular distortion	Endoscopic resection	NA	Follow up for 11 months, no recurrence
		14		19	Male	NA	Rectum	Not tested	Multiple polyps with a maximum diameter of 1.2–3.0cm	Formation of mucus cap and formation of hemosiderin; Gland dilation, distortion, eosinophilic changes, submucosal hemorrhoid like dilation of blood vessels	Circumcision of rectal polyps	NA	Follow up for 11 months, polyp recurrence with a diameter of 1.5cm
		15		32	Male	NA	Rectum	Not tested	Multiple protrusions in the rectum, with a maximum diameter of 0.8–1.0cm	Mucus cap formation, mucus pool formation, glandular expansion	Endoscopic polypectomy	NA	Follow up for 3 months, no recurrence
Lu C[17]	2022	1	Shan dong	28	Male	>10Y	Rectum	Negative	Directly below 15cm from the anus, the mucosa is scattered with punctate congestion and erosion, and below 8cm, the rectum is scattered with nodular protrusions, surface congestion and erosion, and ulcer formation.	The surface of the polyp is covered with inflammatory exudate, and below it is inflammatory granulation tissue. No crypt glands are found	EMR, Rectal Prolapse Surgery	Polyp like protrusion, surface erosion, cellulose exudate, inflammatory cells, and granulation tissue form a "cap like" structure. The lower crypt is significantly elongated or cystic, with excessive secretion of mucus in the crypt. The granulation tissue rich in capillaries causes fibrous muscular occlusion of the lamina propria.	Follow up for 8 months, the patient's general condition is good
Chen SJ[18]	2022	14	Bei jing	14~74	Male (eight), Female (six)	NA	Rectum, sigmoid colon, transverse colon	1 Positive,1 Negative, 12 Not tested	There were 42 polyps in rectum, 13 in sigmoid colon and 1 in transverse colon, 44 in Yamada Type I, 3 in type II, 5 in type III and 4 in type IV The length of the polyps ranged from 0.4 cm to 2.8 cm. In 15 polyps ≥1.0.41 polyps < 1.0.41 polyps had obvious white cap-like covering on the surface. In 23 polyps, there were obvious hyperemia and redness. In 8 polyps, both of them were found.	NA	ESD (2 cases), EMR (12 cases)	NA	7 cases had gastrointestinal symptoms before surgery, and clinical symptoms improved after surgery; 2 ESD patients and 2 EMR patients underwent colonoscopy one year later without recurrence; 7 EMR patients underwent colonoscopy one year later and no recurrence was observed; 3 cases were lost to follow-up.
Liu C[24]	2021	1	Shanghai	63	Female	3M	Colon	Not tested	Numerous erythematous inflammatory colonic polyps covered by fibrous purulent mucus	NA	Polypectomy	Irregular expansion of glands, reduction of goblet cells, visible crypt abscess, and infiltration of numerous lymphocytes, plasma cells, eosinophils, and neutrophils in the stroma. Localized erosion and blue bacterial clusters visible on the surface of the exudate	Symptom relief after polypectomy

Jia Y[14]	2021	1	Bei jing	34	Female	5M	Rectum, sigmoid colon	Positive	The rectum and sigmoid colon are scattered with patchy and slightly elevated lesions of varying sizes, covered with mucous substances on the surface. NBI shows no significant abnormalities. The intestinal wall thickens, and the mucosal layer thickens significantly (by EUS).	Glands twisted and dilated, with inflammatory cell infiltration, visible new capillaries and fibroblasts, and mild dysplasia of epithelial cells	Eradicate HP	NA	The diarrhea disappeared, and the patient was followed up for 6 years without any discomfort. Retesting showed negative Hp, and olonoscopy showed no recurrence.
Yang KQ[13]	2021	1	Gui zhou	21	Male	1Y	Rectum	Not tested	Multiple polyps can be seen along the dentate line, with a diameter of 0.3–0.8cm, the surface mucosa is congested and edematous, accompanied by white inflammatory exudate attachment	NA	Endoscopic resection	The cap area formed by inflammatory granulation tissue is surrounded by proliferative crypt epithelium, with inflammation and old bleeding. In some areas, glandular ducts rupture and mucus lakes form.	3 months later, endoscopic examination revealed no recurrence of the lesion
		2		19	Male	1Y	Rectum	Not tested	Multiple polyps with a diameter of 0.5~1.2cm can be seen at the edge of the dentate line. The surface mucosa is congested and edematous, accompanied by inflammatory exudate attachment, the mucosa between the polyps is normal	NA	Endoscopic resection	The cap area formed by inflammatory granulation tissue, below which is the proliferative crypt epithelium, with inflammation and old bleeding, some areas of glandular duct rupture and mucus lake formation.	3 months later, endoscopic examination revealed no recurrence of the lesion
Liu ZL[10]	2007	1	Jiang shu	70	Male	>10Y	Transverse colon to the rectum	Positive	Multiple omphalocele and flat protuberances were found in transverse colon. Mucus was found on the surface of the mucosa.the mucosa was red and punctate erosive. Multiple leukoplakia was found in the mucosa between the lesions.	Chronic mucosal inflammation with erosion and polypoid hyperplasia, with infiltration of lymphocytes and neutrophils in the affected mucosal tissue	Total parenteral nutrition for 5 weeks, eradicating HP	NA	After eradicating HP, the symptoms immediately improved, after 8 months, the lesion completely disappeared

Abbreviations: CP, cap polyposis; HP, Helicobacter pylori; ESD, Endoscopic submucosal dissection; EMR, endoscopic mucosal resection; NBI, narrow band imaging; EUS, endoscopic ultrasonography.

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Misdiagnosis and Mistreatment

Not all studies provided information regarding misdiagnoses. Among those with available data, eight patients were initially misdiagnosed based on endoscopic appearance alone. The final correct diagnosis of cap polyposis was confirmed in all cases by characteristic histopathological examination. Specifically, four patients (7.4%) were misdiagnosed with ulcerative colitis (UC), two were misdiagnosed as hemorrhoids, and one was misdiagnosed as rectal tubular adenoma. Additionally, one patient with multiple rectal polyps was misdiagnosed with rectal cancer at another hospital; however, no pathological evidence of malignancy was found. Of the misdiagnosed patients, five received five doses of amino salicylic acid or mesalazine, yet their symptoms were not significantly alleviated.

Physical Examination

Most studies indicated that no evident positive signs were present in the patient's physical examinations. Results from digital rectal examinations were provided for three cases, with detailed descriptions for two. Upon examination, the rectum displayed multiple masses, approximately the size of soybeans and peanuts, characterized by a soft texture and absence of notable tenderness. A small amount of fresh blood was noted on the fingertips.

H. pylori Infection Situation

H. pylori was tested in 21 out of 57 patients (36.8%) using a 13C/14C-urea breath test (UBT). The positivity rate of the UBT was 57.1% (12/21), and all patients underwent eradication treatment.

Abdominal CT

The lesion was confined to the ileocecal valve in the patients. Abdominal enhanced CT revealed thickening and abnormal enhancement of the intestinal wall in the ileocecal region, as well as multiple enlarged lymph nodes nearby and possible tumor-like lesions. The local intestinal wall in the pelvic small intestine exhibited slight thickening and enhancement, suggesting potential inflammatory changes. In one case, a lesion located in the rectum demonstrated circular thickening, irregular narrowing of the lumen, and several polypoid masses protruding into the intestinal cavity.

Endoscopic Features and Histology

Endoscopic manifestations included polyps covered by a thick layer of white fibrinopurulent exudates. The polyps were predominantly located in the rectum only (39/57, 68.4%), in both the sigmoid colon and rectum (9/57, 15.8%), in the sigmoid colon only (1/57, 1.8%), at the ileocecal valve only (1/57, 1.8%), extending from the transverse colon to the rectum (3/57, 5.3%), and throughout the entire colon (4/57, 7.0%). The number of polyps ranged from one to several dozens. Fifteen patients (26.3%) had only one polyp, two patients (3.5%) had two polyps, and thirty-eight patients (66.7%) had three or more polyps identified during colonoscopy. Most colonoscopies revealed various erythematous inflammatory colonic polyps covered by fibrous purulent mucus. The polyps were sessile, erosive, and dark red in color, accompanied by fibrous, purulent, and mucous-like secretions. Only one patient underwent narrow band imaging (NBI) examination, and no evident abnormalities were detected. Two patients underwent endoscopic ultrasound examination; however, the lesions in both were confined to the mucosal layer and did not invade deeper layers. Pathological examination revealed polypoid tissue exhibiting irregular expansion of colonic crypts, covered in superficial regions by a "cap" of ulcerated and inflamed granulation tissue, fibrin, and inflammatory exudate.

Management

Patients received treatment via EMR or ESD, surgical intervention, Hp eradication, and mesalazine, either alone or in combination. Thirty-eight patients received EMR alone (35) or in conjunction with *H.pylori* eradication (3), nine patients underwent surgical intervention, six patients were treated with Hp eradication alone, and five patients underwent ESD. All 12 Hp-positive patients successfully achieved eradication.

Follow-up Results

Fifty-four patients were followed up, with three patients lost to follow-up. The median follow-up duration was 14 months (range, 2–80 months). EMR proved effective for most patients: 24 were asymptomatic post-EMR. The six Hp-positive

patients did not experience relapse after oral eradication treatment without additional interventions. Ten patients exhibited recurrent polyps following therapy.

Situation of Japan People Suffering From CP

Twenty-one Japanese studies involving 27 patients were included.[8,25–44] The correlation between clinicopathological characteristics was investigated, with basic features of the studies presented in Table 2.

Discussion

Etiology and Pathogenesis

The precise etiology and pathogenesis of cap polyps remain unclear. CP constitute a rare intestinal inflammatory disease characterized by inflammatory polyps featuring "cap" granulation tissue.[45] Based on existing research, potential causes of CP include the following:

Abnormal Colorectal Motility

Histological features resembling CP have been described in other disorders where mucosal prolapse serves as the underlying mechanism, such as solitary rectal ulcer syndrome or prolapsed colostomies. Therefore, abnormal colonic motility may represent a common etiological factor in these conditions.[46] However, in another case study, the patient exhibited no evidence of abnormal colonic motility, and orcein stain for elastin fibers yielded negative results.[47]

Rectal Mucosal Prolapse Syndrome

The clinical features of CP exhibit similarities to those of rectal prolapse.[37,48] A nine-year observational study indicated that CP may arise from mucosal prolapse syndrome (MPS), which is a significant factor in the pathogenesis of CP.[30] Some experts propose that CP may be secondary to transient ischemia caused by prolapsed anorectal mucosa and submucosal tissue. From an objective perspective, CP and rectal mucosal prolapse share comparable clinical, endoscopic, and histological characteristics, including the presence of elastin in the mucosa of cap polyps and rectal mucosal prolapse.[30] Both conditions can present with inflammatory cell infiltration, interstitial elongation, and lamina propria fibromuscular occlusion.[37] However, notable differences exist between the two. Rectal mucosal prolapse is typically restricted to the rectum, whereas cap polyps may extend beyond the rectum and into other regions of the intestinal lumen. Endoscopic ultrasonography reveals significant thickening of the mucosal layer in cap polyps. In contrast, rectal mucosal prolapse is characterized by smooth, diffuse thickening of the submucosa and slight thickening of the lamina propria.[49]

Isolated Rectal Ulcer

Emami et al[50] reported a case of a child who developed CP from an isolated rectal ulcer over time. Therefore, when a patient presents with rectal bleeding, fecal mucous secretion, or other gastrointestinal symptoms that overlap with inflammatory bowel disease, familial adenomatous polyposis, or malignant tumors, the potential for CP should be considered.

Infection

In 2010, a case of CP positive for *Campylobacter*-like organism (CLO) test was documented; however, the patient exhibited gastric involvement without colonic lesions.[51] The association between *H. pylori* and CP has attracted significant scholarly attention both domestically and internationally. Although not all patients with CP test positive for *H. pylori*, and the bacterium is not detected in the diseased mucosa of some patients, *H. pylori* eradication therapy has proven effective in a majority of individuals with CP and Hp infection. Japanese guidelines for managing *H. pylori* infection in 2019 recognize CP as a related condition.[52] *H. pylori* infection may influence the immune system; its cellular components can disseminate through the intestine, affect both the small and large intestines, and contribute to colorectal hypertrophy.[53] The possibility of a bacterial infection was suggested by Gehenot et al,[48] who reported a patient with cap polyps that lacked evidence of colonic dysmotility and was successfully treated with metronidazole.

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Table 2 List of Diagnosis and Treatment of CP in Japan Included in the Literature

First Author	Year	NO.	Age	Gender	Disease Process	Lesion Site	Detection of HP	Presentation Under Colonoscopy	Pathology Before Treatment	Treatment	Postoperative Pathology	Follow-up
Sho Masaki[35]	2024	1	78	Female	6M	Sigmoid colon	Negative	The distal and middle portions of the sigmoid colon were stenotic because of the presence of numerous colonic polyps, most of which were sessile and covered by mucus exudate	Inflammatory polyps were covered by a so-called "cap" consisting of fibromucus materials on the surface, inflamed colonic mucosa with distorted glands was characterized by infiltration of immune cells and formation of granulation tissues	A broad range of antibiotics (ampicillin 1500 mg, clarithromycin 400 mg, and metronidazole 500 mg, Qd×7 days)	NA	Follow up for 5 months, the regression of polyposis in the sigmoid colon, the release of stenosis and disappearance of mucosal edema
Tomohiro Minagawa[8]	2021	1	48	Male	4M	From the descending colon to the rectum	Negative	Reddened mucosa and multiple raised lesions from the middle of the transverse colon to the rectum, these lesions were covered with white moss	Inflammatory cell infiltration in the interstitium, and granulation tissue in the superficial layer	Laparoscopicassisted total proctocolectomy and J-type ileal pouch anal anastomosis (IPAA) with ileostomy	Multiple elevated lesions from the descending colon to the rectum. The apex of each lesion was capped with granulation tissue with inflammatory exudate, and the crypt epithelium was hyperplastic, consistent with CP	Follow up for 1 year, no recurrence
Kazuki Okamoto[44]	2018	1	45	Male	6M	Descending colon	Negative	Multiple sessile polyps in the descending colon, which showed a reddish surface covered by white mucus, multiple fundic gland polyps	Mucuscontaining distorted glands and significant inflammatory cell infiltration with fibrosis in the lamina propria and their surface was covered by inflammatory granulation tissue and fibrinopurulent exudate	Ampicillin 1500 mg and metronidazole 500 mg, Qd×7 days	NA	Follow up for 6 month, regression of CP was observed. Decrease in Blautia, Dorea, and Sutterella; increase in Fusobacterium
Koichi Tamura[34]	2018	1	70	Female	6M	From the rectum to the sigmoid colon	Negative	Erythematous polypoid lesions	Hyperplastic polyps or tubular adenomas with low-grade atypia; slight atrophic gastritis with erythematous edema	Laparoscopic low anterior resection of the rectum and the sigmoid colon with diverting ileostomy	Polyps consisting of elongated and mild adenomatous glands with a thick layer of subserosal tissue, and covered with a layer of inflammatory granulation tissues and fibrinopurulent exudate	Follow up for 6 month, no complaints or recurrence of CP
Masaki Murata[33]	2017	1	20	Male	1Y	From the sigmoid colon to the rectum	No evidence	Erythematous variform inflammatory polyps with white caps of fibri nopurulent; thickening of the mucosa without evidenceof invasion into the submucosa	Elongated, tortuous,branched crypts lined with hyperplastic epithelium with inflammatory cell infiltration; a mild degree of fibromusculosis in the lamina propria; the surface of the polyps was covered by thick inflammatory granulation tissue with exudate; mucosa between lesions was histologically normal	HP eradication therapy (Vonoprazan 20 mg, amoxicillin 750 mg and clarithromycin 200 mg, Bid×7 days); ESD	NA	Follow up for 6 months, no recurrence
Yoshiaki Arimura[32]	2014	1	43	Male	NA	Colon	NA	Approximately 500 polyps	Barrier integrity of the polyps was impaired even in the intact, covered epithelia, in which pore-forming claudin-2 was upregulated and redistributed; pore-sealing claudin-7 were downregulated	Polypectomy procedures (7 times)	NA	No signs of polyp recurrence were present 1 year after the first visit (6 months aft er the last polypectomy).

Hideo Suzuki[31]	2014	I	58	Female	6M	From the rectum to the sigmoid colon	Positive	Multiple mucus-capped reddish polypoid lesions	Inflammatory cell permeation in the lamina propria, and the tuber comprised hyperplastic glands; The tumefactive surface was covered with fibrous purulent exudate and inflammatory granulation tissue, and decreased goblet cell mucus secretion was observed in the crypt.	HP eradication therapy (ransoprazole 60 mg, amoxicillin 1500 mg, clarithromycin 800 mg, Qd×7 days); levofloxacin; 3 mg betamethasone enema	NA	Follow up for more than 6 months, had no relapse
Yu Sasaki[30]	2013	I	58	Female	1Y	Rectum, colon	Positive	Shallow ulcers on the anterior wall of the rectum→multiple reddish sessile polyps covered with a layer of fibrinopurulent exudate extending from the rectum to the distal sigmoid colon	Ulcer showed severe infiltration of inflammatory cells with elongated stroma on the surface of the mucosa and fibromuscular obliteration of the lamina propria	NA	NA	Follow up for 9 years, bloody diarrhea stopped completely without medication; no signs of any polypoid lesions
Fuminao Takeshima[29]	2012	I	37	Female	5M	Rectum; sigmoid colon	Positive	Multiple reddened and eroded sessile polyps covered with white purulent exudate	Mucosal surface covered by 'caps' of inflammatory granulation tissue, as well as elongated and branched crypts	HP eradication therapy (rabeprazole 20 mg, amoxicillin 1500 mg, clarithromycin 800 mg, Qd×7 days)	NA	Follow up for 1 month, multiple sessile polyps had disappeared
Takatoshi Chinen[27]	2005	I	52	Female	3W	Sigmoid colon	NA	3 pedunculated polyps with short stalks; the surface of each polyp was covered with white exudate; multiple edematous elevated lesions on the apices of the transverse mucosal folds; 10 to 15 sessile ulcerated polyps with normal-appearing intervening mucosa	Hyperplastic glands with elongated and tortuous crypts; a proliferation of smooth muscle fibers in the center of the polyps, and inflammatory granulation tissue in the lamina propria mucosa and at the surface of the polyps; slightly hyperplastic crypts, with a mixed inflammatory cell infiltrate in the lamina propria, covered bya cap of inflammatory granulation tissue	Colonoscopic polypectomy	NA	Follow up for 2 years, returned with a recurrence blood mucoid diarrhea
Tsuyoshi Konishi[28]	2005	I	76	Female	NA	Total colon	NA	Approximately 30 reddened and eroded sessile polyps with caps of white fibrinopurulent exudate throughout the total colon	Elongated, tortuous, branched, and dilated crypts with mild epithelial hyperplasia, and a cap of fibrinopurulent exudate	Laparoscopic sigmoid colectomy for resection of the adenoma	NA	Follow up for 3 months, almost complete remission of the cap polyposis
Taiji Akamatsu[26]	2004	I	33	Female	2Y	Rectum	Negative	Multiple sessile polyps on the apices of the mucosal folds; The surface of these lesions was reddish and adhered by mucus; Multiple white specks; intervening mucosa was normal	Inflamed mucosa with elongated tortuous crypts attenuated towards the mucosal surface, and a granulation tissue 'cap' on the surface of the mucosa	Metronidazole 750 mg Qd, or prednisolone 40 mg Qd and salazosulfapyridine 3.0 g Qd→betamethasone 0.5–1.0 mg Qd →EMR and endoscopic cauterization using argon plasma coagulation→HP eradication therapy (rabeprazole 40mg, amoxicillin 1500mg, clarithromycin 800mg, Qd ×7 days)	NA	Follow up for 3 months, colonoscopy revealed that the multiple sessile polyps had disappeared

(*Continued*)

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Table 2 (Continued).

First Author	Year	NO.	Age	Gender	Disease Process	Lesion Site	Detection of HP	Presentation Under Colonoscopy	Pathology Before Treatment	Treatment	Postoperative Pathology	Follow-up
		2	50	Female	10M	Rectum; sigmoid colon	Positive	Multiple sessile polyps on the apices of the mucosal folds; the surface was reddish with adherent mucus, and multiple white specks in the area surrounding them; the intervening mucosa was normal, and no diverticular disease	Inflamed mucosa with elongated tortuous crypts attenuated towards the mucosal surface	Metronidazole 750 mg/day, 2 weeks; avoidance of straining at defecation; total parenteral nutrition and enemas of 40 mg/day prednisolone→Surgical resection of the sigmoid colon→HP eradication therapy (lansoprazole 60 mg, amoxicillin 1500 mg, clarithromycin 800 mg, Qd ×7 days).	Granulation tissue is recognized on the surface of inflamed mucosa with elongated crypts	Follow up for 26 months, remained free of disease
		3	53	Female	NA	Rectum; sigmoid colon	Positive	Variform protruding lesions that were separated by normal mucosa	Inflamed mucosa with elongated tortuous crypts	Salazosulfapyridine 3.0g Qd or metronidazole 750 mg Qd →prednisolone 30 mg Qd→steroid hormone enemas (corresponding to 20 mg prednisolone daily)→HP eradication therapy (lansoprazole 60 mg, amoxicillin 1500 mg and clarithromycin 800 mg, Qd×7 days)	NA	Follow up for 15 months, no recurrence
Tatsuya Ohkawara[25]	2003	1	67	Female	8M	Distal rectum to sigmoid colon	NA	Multiple (>20) reddish sessile polypoid lesions covered with thick mucus in the segment	Inflamed mucosa with elongated tortuous crypts that were attenuated toward the mucosal surface. The nodule was covered by a cap ofinf| ammatory granulation tissue and fibrinoid exudate; fibromuscular obliteration was found in the lamina propria	A high-fiber diet, EMR	NA	Follow up for over a 1-year follow-up, no recurrence
Kayoko Shimizu[43]	2002	1	12	Female	2Y	Rectum through the sigmoid colon	NA	Variform protruding lesions covered by mucopurulent exudates; a reddened depressed area was at the top of each protrusion; These lesions occurred on the apexes of the transverse mucosal fold and were separated by normal mucosa; crypts in the depressed areas and long, branching crypts in the surrounding areas	Inflamed mucosa with elongated tortuous glands attenuated toward the mucosal surface; covered with a "cap" of inflammatory granulation tissue; the intervening mucosa was histologically normal	Levofloxacin→ metronidazole (MNZ) 750 mg Qd	NA	Follow up for 12 months, no recurrence
Hideto Oiya[42]	2002	1	63	Male	4M	Rectum to the sigmoid colon; from the angle to the antrum of the stomach	Positive	Varioliform elevated lesions, flattened polypoid lesions and some erosions covered with caps, the mucosa between the lesions was normal	Elongated glands containing mucus, with inflammatory cellular infiltration in the lamina propria; their surface was covered with caps of inflammatory granulation tissue; hyperplasia of glands, infiltration of neutrophils, and intestinal metaplasia	HP eradication therapy (rabeprazole 20mg, clarithromycin 800mg, and of amoxycillin 1500mg, Qd×14 days)	NA	Follow up for 8 months varioliform elevated lesions and caps had completely disappeared from the rectum to the ascending colon, the erosive polypoid lesions in the stomach had completely disappeared.

Tatsuo Oriuchi[37]	2000	1	20	Female	NA	Rectum and the sigmoid-descending colonic junction	NA	30 sessile polyps covered with white fibrinopurulent, on the apices of transverse mucosal folds and were surrounded by normal mucosa	Elongated, hyperplastic-looking glands with a mixed inflammatory infiltrate in the lamina propria, covered by a "cap" of inflammatory granulation tissue; Lesions also showed staining ofintramucosal elastin with an orcein stain.	Sulfasalazine and metronidazole treatment; educated the patient	NA	Follow up for 4 years, the size of the polyps and amount of surrounding mucosal edema were significantly reduced
		2	52	Female	NA	Mainly in the rectosigmoid with the rest occupying the lower descending colon	NA	About 40 sessile and pedunculated polyps covered with white fibrinopurulent exudate	Hyperplastic-looking glands with a mixed inflammatory infiltrate in the lamina propria and an overlying "cap" ofinflammatory granulation tissue	Double-barreled transverse colostomy	NA	Follow up for 4 months, rectosigmoid polyps were seen to be significantly reduced
Hajime Isomoto[41]	2001	1	51	Female	10M	Rectum, sigmoid colon	NA	Red sessile polyps covered with mucous exudate were found at 5 to 30 cm from the anal margin→proximal extension of the lesions, which were present to 40 cm from the anal margin→polyps were still present to 45 cm from the anal margin	Elongated tortuous crypts attenuated toward the luminal surface and a mixed inflammatory cell infiltrate. They were covered by inflammatory granulation tissue	Abdomino-perineal resection with sigmoid colostomy	NA	Follow up for 1 year, complete remission
Yojiro Sadamoto[39]	2001	1	73	Male	NA	From the sigmoid colon to the cecum	NA	Multiple reddened and eroded sessile polyps from the sigmoid colon to the cecum, and mainly on the apices of transverse mucosal folds and were separated by normal appearing mucosa	Elongated tortuous crypts with the so-called "cap" of fibrinopurulent exudate and capillary-rich inflammatory granulation tissue between the epithelial glands at the surface, mild fibromuscular obliteration was evident in the lamina propria	No treatment	NA	Follow up for 4 months, disappearance of the polyps in the cecum and a decrease in number from the sigmoid to the ascending colon
M. Esaki[40]	2001	1	21	Male	3Y	Rectosigmoid colon	NA	Polyps were large and reddish protrusions in various configurations; The surface of the polyps was nodular and the top was eroded or covered by mucous exudate; small polypoid lesions with a reddish central depression; the protrusions decreased in number and became smaller in size at the proximal part of the sigmoid colon	NA	Metronidazole (500mg/d)	NA	6 months

(*Continued*)

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Table 2 (Continued).

First Author	Year	NO.	Age	Gender	Disease Process	Lesion Site	Detection of HP	Presentation Under Colonoscopy	Pathology Before Treatment	Treatment	Postoperative Pathology	Follow-up
		2	67	Female	4Y	Rectosigmoid colon	NA	The surface of the polyps was nodular and the top was eroded or covered by mucous exudate; reddish protruding lesions with a nodular surface, covered by mucous exudate; the protrusions decreased in number and became smaller in size at the proximal part of the sigmoid colon	Identical to those of the endoscopically removed polyps	Proctosigmoidectomy	Granulation tissue on the surface; foamy cells were in the superficial portion of the mucosa, while the submucosa and proper muscular layer were intact	18 months
		3	21	Male	6Y	Rectosigmoid colon	NA	Semipedunculated type; polyps were large and reddish protrusions in various configurations; the surface of the polyps was nodular and the top waseroded or covered by mucous exudate, diminutive white specks	NA	Refused any treatments	NA	None; suffering from tenesmus
		4	76	Female	1.5Y	Rectum	NA	Flat-topped protruding type of cap polyposis; flat-topped protrusions with reddish central depression; the protrusions decreased in number and became smaller in size at the proximal part of the sigmoid colon, diminutive white specks	NA	Refused any treatments	NA	Follow up for 22 months, colorectal lesions remained unchanged; symptoms spontaneously disappeared 1 year after the last colonoscopy; no occult blood in feces for 2 years
Hiroko Kajihara[38]	2000	1	38	Female	4Y	From the rectum through the sigmoid colon	NA	Varioliform lesions which had slightly depressed reddish centers surrounded by scattered whitish patches; covered by caps of mucoid and fibrinopurulent exudate; type IIIL crypt pattern (long, thin, and tubular)	Elongated and tortuous glands and fibromuscular proliferation; eroded surface was covered by a cap of fibrinous exudate	Metronidazole 750 mg Qd and betamethasone enemas 7.9 mg (200mL) Qd	NA	Follow up for 2 months the lesions had completely disappeared except for slight scarring
SusumuShiomi[36]	1998	1	54	Female	Several months	From rectum to the distal descending colon	NA	Sessile polyposis with abundant mucus on the mucosal surface	NA	Left hemicolectomy and sigmoid colectomy	Chronic inflammation of the mucosa and submucosa; Elevations in the form of caps of inflammatory granulation tissue	Diarrhea resolved, hypoproteinemia improved

Abbreviations: CP, cap polyposis; Qd, quaque die; Bid, bis in die; HP, Helicobacter pylori; ESD, Endoscopic submucosal dissection.

Dysbiosis of Intestinal Flora

Dysbiosis of gut microbiota may precipitate intestinal inflammation. The implications of alterations in gut microbiota in CP remain unclear. High-throughput sequencing studies have identified significant changes in the composition of gut microbiota in patients with CP following antibiotic treatment. Notably, the abundance of *Blautia, Dorea*, and *Sutterella* was markedly diminished, whereas that of *Fusobacterium* exhibited a significant increase. These findings suggest that CP may stem from microecological dysbiosis, and microbiome-targeted therapy may hold promise for the management of this condition.[44]

Vascular Malformations

Researchers have documented a case of a CP patient exhibiting extensive vascular malformations in the submucosa following left hemicolectomy, indicating that the patient's vascular malformations may be etiologically associated with CP polyps. The possibility of overlooked vascular malformations in the submucosa during the treatment of patients with CP warrants consideration.[44]

Clinical and Endoscopic Features

Cap polyposis is characterized by a lack of specific clinical manifestations, with the majority presenting as mucinous and bloody diarrhea, constipation, lower abdominal pain, rectal bleeding, tenesmus, difficult defecation, and bloody stool.[2,54] Severe diarrhea may lead to hypoproteinemia, edema, and ascites. Certain patients may experience weight loss and stunted growth,[32] whereas others may remain asymptomatic.[39] Most patients do not exhibit extraintestinal manifestations such as fever, joint pain, or oral ulcers. Polypoid lesions are typically localized between the rectum and sigmoid colon, although some patients may have involvement of the splenic region of the colon,[51] transverse colon, and anal canal.[5] Only a limited number of cases have demonstrated lesions extending from the sigmoid colon to the cecum.[39] In addition to the colon, the stomach may also be affected,[55] which can present as involvement of both the stomach and intestines,[42] or solely the stomach.[51]

Under white light endoscopy, polypoid lesions appear as non-continuous, either multiple or single. Their morphology may be flat, hemispherical, or subpedunculated, with elevated erosive or ulcerative lesions often covered by white mucoid secretions. Beneath these lesions, red unstructured areas are observable. The mucosal tissue between the lesions typically appears normal.[40] Utilizing NBI with magnifying gastroscopy, lesions are assessed as potential tumors. Abnormal surface microstructures and microvessels are frequently observed with magnifying NBI staining. The appearance of cap polyps under NBI endoscopy is markedly different from that of tumors, characterized by a lack of structure in the lesion center, abnormal microvessels in the structure-free area, and abnormal microglands and microvessels surrounding the lesion. Based on our experience, endoscopic images may serve as valuable tools for clinical application and educational endeavors.

Pathology

CP is characterized by distinct pathological findings, indicating that the polyp surface is covered by inflamed granulation tissue, referred to as a "cap", accompanied by fibrin exudate.[40] Other notable features of each layer include the following: For the mucosal surface, erosion or ulceration may be observed on the surface of the polypoid mucosal tissue. Regarding the epithelium and glands, elongated, branched, twisted, and dilated crypts are present. The crypt epithelium is arranged in a regular manner, with nuclei located at the base; these nuclei may be slightly enlarged, mild, and without atypia. A limited number of crypts exhibit serrated changes. Mucus secretion is predominantly hypersecreted, with goblet cell hyperplasia and mucin extravasation. In the lamina propria and muscularis mucosa, various types of acute and chronic inflammatory cell infiltration are evident on the surfaces of the polyps and within the lamina propria. Smooth muscle fibers, oriented perpendicular to the mucosal muscle, proliferate between the crypts, accompanied by fibromuscular occlusion. The role of immunohistochemistry and special staining in the pathological diagnosis of CP is limited.[55] In the submucosa, abnormal hyperplasia of arteries and veins may be observed, forming a vascular network of different sizes.[21]

Differential Diagnosis

CP may initially resemble other gastrointestinal disorders and is frequently misdiagnosed as a tumor or other diseases. It is essential to differentiate it from inflammatory bowel disease, pseudomembranous colitis, irritable bowel syndrome, and tumors.[56] Currently, there are no reports of malignant transformation associated with cap-shaped polyps.

Ulcerative Colitis (UC)

CP is often misdiagnosed as UC. In our study, among 57 patients, four were misdiagnosed as UC and received treatment with steroids, 5-aminosalicylic acid, and other medications, y*et* all exhibited poor responses. The clinical manifestations, locations, and endoscopic characteristics of UC and CP are similar. However, a distinguishing feature is that the intestinal mucosa in CP appears smooth and normal, whereas the mucosa between the polypoid lesions in UC is rough and exhibits chronic inflammatory.[57] Inflammatory pseudopolyps associated with UC may display erosion on the surface, crypt abscesses, and cryptitis, but lack crypt stretching and cystic dilatation. In contrast, crypt abscesses are rare in CP, where the characteristic "cap-like" structure of inflammatory exudation and necrosis is common and indicative.[57]

Prolapsing Mucosal Polyps

The classification of CP as a unique form of inflammatory disease or as part of MPS remains a subject of debate. The pathological morphology of CP bears partial similarity to that of MPS, complicating their differentiation. CP is categorized as a type of prolapsing mucosal polyp, which also includes inflammatory myoglandular polyps, colitis cystica profunda, and inflammatory cloacogenic polyps. This review suggests that CP exhibits specific endoscopic characteristics. Although the histomorphology of CP is not distinctive, a diagnosis can be made based on its endoscopic features and anatomical location, provided that other types of polyps are excluded. Prolapsing mucosal polyps are predominantly located in the rectum, whereas CP can be found from the rectum to the stomach. Therefore, accurate diagnosis is essential.

Pseudomembranous Colitis

An atypical case of pseudomembranous colitis exhibiting characteristics similar to CP has been documented, including the involvement of the rectum and sigmoid colon and the presence of severe protein-losing enteropathy. Resection of the affected segment of the colon led to the complete resolution of protein loss and histological confirmation of pseudomembranous enteritis with features of CP.[58] Pseudomembranous enteritis may present with a cap-like polypoid appearance but lacks the structural changes associated with CP, such as gland crispness or fibromuscular occlusion of the interstitium. Therefore, a comprehensive medical history and meticulous endoscopic examination are beneficial for distinguishing these conditions.

Colon Cancer

One patient in this study exhibited multiple polypoid protrusions in the rectum during endoscopic evaluation, which had been misdiagnosed as rectal cancer but was ultimately identified as CP upon pathological assessment.

Juvenile Polyps

The clinical manifestations of juvenile polyps include bloody stool and diarrhea; however, their histological characteristics consist of surface erosion, ulceration with granulation tissue, a markedly dilated lumen rich in mucus or crypt abscesses, and cysts lined by flat epithelium, notably lacking the typical "cap" structure.

Familial Multiple Adenomas

The pathological changes associated with familial multiple adenomas are primarily neoplastic lesions, whereas CP represents benign inflammatory polyps.[55]

Treatment

The precise etiology of CP remains unclear, and no standardized treatment protocol has been established, leading to a lack of consensus among experts. Several therapeutic approaches have been documented, including anti-inflammatory medications, antibiotics, immunomodulatory agents, and endoscopic interventions. These treatments aim to enhance

bowel function to mitigate excessive muscle tension and mucosal strain. Although symptoms may improve temporarily, relapse is common.[59] Additional strategies such as a high-fiber diet, the use of laxatives, and the avoidance of manual defecation may also yield beneficial effects.[37]

Anti-Infective Drugs

Some patients can be cured by treatment with metronidazole. However, Suzuki et al[31] reported that the efficacy rate of metronidazole was only 28.6% (6/21), indicating that metronidazole as a monotherapy is ineffective. They also reported that the eradication rate of *H. pylori* in the treatment of CP was 100% (14/14).[31] However, the mechanism underlying the efficacy of the anti-*H. pylori* treatment remains unclear. Some researchers have speculated that this effect may be attributed to the response of other intestinal bacteria to *H. pylori* eradication therapy or to the modulation of the immune response due to persistent *H. pylori* infection.[31] This type of infection has been documented in numerous CP cases in Japan, and its eradication correlates with complete symptom relief.[59,60] In patients with CP and gastric *H. pylori* infection, immunohistochemical analysis of colonic mucosa utilizing polyclonal anti-*H. pylori* antibodies did not reveal the presence of *H. pylori*. The patients' symptoms were alleviated, and the polyps resolved following *H. pylori* eradication.[26] However, there is no evidence to support the efficacy of *H. pylori* eradication in *H. pylori*-negative CP cases.[26] A study from China indicated that patients did not experience symptom improvement following *H. pylori* eradication, but their symptoms improved after undergoing polypectomy.[26]

Steroids

For patients with colonic CP who do not respond to *H. pylori* eradication or metronidazole therapy, steroids may represent an acceptable treatment option. Administration via enema is more effective than systemic administration.[31]

Biological Agents

In 2004, Bookman et al[61] reported that a single infusion of infliximab at a dose of 5 mg/kg could significantly enhance symptoms; however, only minor effects were observed endoscopically or histologically. After four infusions of infliximab at 8-week intervals, colonoscopy revealed normal mucosa, and biopsy demonstrated resolved inflammation. Following 38 months of follow-up without further treatment, both endoscopic and histological results remained normal. In contrast, no clinical or endoscopic improvement was observed after two infusions of 5 mg/kg infliximab, and mucosal TNF-α levels did not exhibit significant differences before and after treatment.[46]

Endoscopic Treatment

EMR and ESD are effective interventions for CP. Kim et al[46] reported a case of CP treated with ESD; the patient did not experience relapse even after 6 months of follow-up. They proposed that ESD incurs less trauma and allows for more rapid recovery compared to surgical intervention, provides superior prevention of recurrence compared to EMR, and effectively ameliorates clinical symptoms such as hematochezia and diarrhea. In our study, the clinical symptoms of 38 patients were alleviated following endoscopic treatment of polyposis, suggesting that EMR or ESD is effective for patients with CP.

Given the characteristic morphological features of CP polyps—typically sessile, broad-based, and covered with fibrinous or fibrinous-purulent exudate—advanced endoscopic resection techniques, namely EMR and ESD, are preferred over simple polypectomy. EMR and ESD allow for the safe and complete removal of these flat or sessile lesions. More importantly, they provide large and deep specimens that are crucial for obtaining definitive histopathological confirmation of CP.

Surgery

Large and numerous cap polyps cannot be entirely excised through endoscopy or treated with medication, particularly when accompanied by complications such as hypoproteinemia and other constitutional symptoms. Surgical resection of the affected bowel should be performed expeditiously.[62] Although CP is a nonmalignant condition, surgical intervention may require resection of the affected rectum and sigmoid colon, potentially compromising quality of life. Furthermore, the risk of recurrence persists following surgical treatment. Therefore, the decision regarding surgical intervention should be made with caution.[56,63] The diagnostic pathway and treatment plan are illustrated in Figure 2.

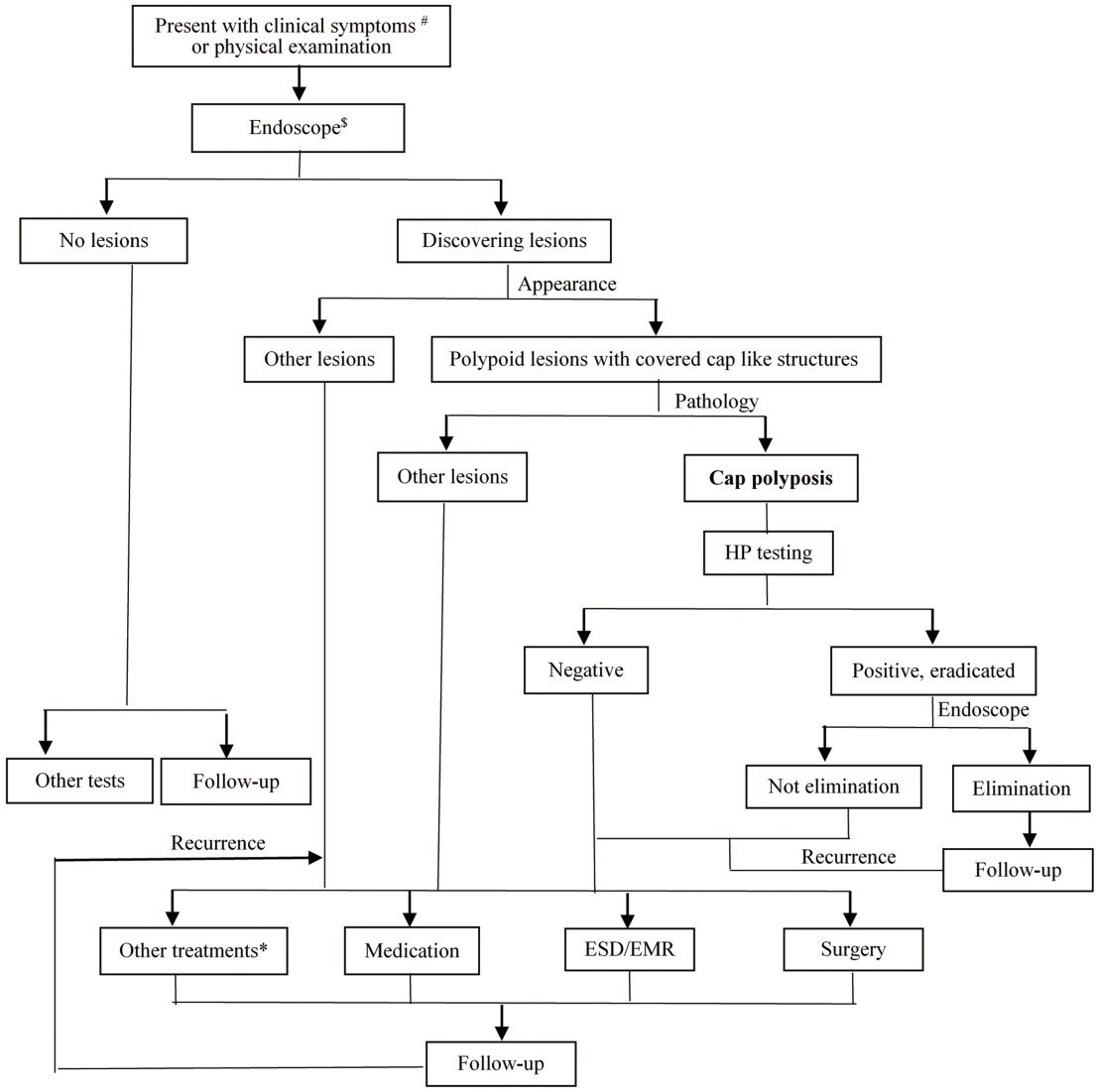

Figure 2 Diagnosis and treatment of cap polyps (Mainly in the rectum).
Notes: #: Clinical symptoms include: abdominal pain, diarrhea, mucous and bloody diarrhea, constipation, rectal bleeding, urgency, dyspareunia, and blood in stool; $: Colonoscopy, esophagogastroscopy and enteroscopy; *:If the lesion is confirmed as malignant tumor, chemotherapy, radiotherapy or Chinese herbal medicine treatment can be selected according to the condition of the disease; Cap polyposis: the diagnosis mainly relies on pathology.

Comparison of Clinical Characteristics of CP Patients Between China and Japan

In recent years, the incidence of CP has demonstrated an upward trend among Asian populations, with particularly concentrated reports from Japan. This phenomenon is hypothesized to be associated with regional dietary practices or genetic predisposition, although the precise etiological factors warrant further investigation. To enhance our understanding of this condition, we conducted a comparative analysis of CP cases reported in Japan and China (Table 3).

Table 3 Comparison of Clinical Characteristics of CP Patients Between China and Japan

Characteristic	Chinese Patients (n=57)	Japanese Patients (n=27)
Year first reported	2007	1998
Age range (years)	14 - 76	12 - 78
Gender ratio (M:F)	2: 1	8: 19

(*Continued*)

Table 3 (Continued).

Characteristic	Chinese Patients (n=57)	Japanese Patients (n=27)
Symptom duration	6 months - 10 years	2 months - 6 years
Most common polyp location	Rectum (68.4%)	Rectum (Most common)
H. pylori status	Positive: 12, Negative: 9, Not tested: 36 (out of 57)	Positive: 7, Negative: 5, Not tested: 15 (out of 27)
Common Oral Medications	Prednisone, Metronidazole, 5-aminosalicylates	Ampicillin, Metronidazole, Levofloxacin, Prednisolone, Sulfasalazine
Common Topical Therapies (Enemas)	Mesalazine, Prednisone, Metronidazole	Betamethasone
Endoscopic Therapies	EMR, ESD, Endoscopic argon plasma coagulation	EMR, ESD, Endoscopic argon plasma coagulation
Surgical Interventions	Transanal rectal prolapse surgery, Anal stricture surgery	Laparoscopic procedures (eg, total proctocolectomy with IPAA, low anterior resection),Open surgeries (eg, hemicolectomy, proctosigmoidectomy)
Follow-up duration	1 - 80 months	1 month - 9 years
Treatment response	Significant improvement in symptoms and endoscopic lesions post-treatment.	Significant effectiveness observed; however, a subset reported persistent severe discomfort and mucous bloody stools.
Relapse rate (n/%)	10 (17.5%)	1 (3.7%)

Table 4 Comparisons of Treatment Outcomes for Different Interventions in Patients

Interventions	No Relapse	Relapse	Total	*P* value
EMR alone or ESD alone	37	4	41	0.064
Surgical operation	12	6	18	
Hp eradication	9	1	10	

CP was first documented in China in 2007, whereas it was reported in Japan in 1998.[36] The age of onset among patients in both countries is comparable, with Chinese patients ranging from 14 to 76 years and Japanese patients from 12 to 78 years (Table 2). Among the reported cases, there is a male predominance in China, with a male-to-female ratio of 2:1. Conversely, the majority of patients in Japan are female, with a female-to-male ratio of 19:8. Sampling bias in small case series may contribute to this gender disparity. The duration of symptoms varies between the two countries; in China, it ranges from 6 months to over 10 years, whereas in Japan, it spans from 2 months to 6 years. The location of the polyps is similar in both countries, with the rectum being the most common site, and the incidence rate increases as the site approaches the rectum.[34,38] This characteristic is consistent in both countries.

Researchers from both countries have recognized the significant connection between HP and CP. Among Chinese patients, there were 12 positive cases, 9 negative cases, and 36 undetected cases of HP. In Japanese patients, 7 were positive for HP, 5 were negative, and 15 were not tested. The primary treatment methods for patients in both countries include health education, with some patients receiving total parenteral nutrition. Japanese patients have explored a wider array of treatment options for CP. Numerous reports from Japan have confirmed the efficacy of eradicating HP in positive patients, which is similarly observed in Chinese patients. Various oral medications have been attempted for the treatment of CP, including ampicillin, metronidazole, levofloxacin, prednisolone, and sulfasalazine.[26,29,33,42,43] In contrast, the

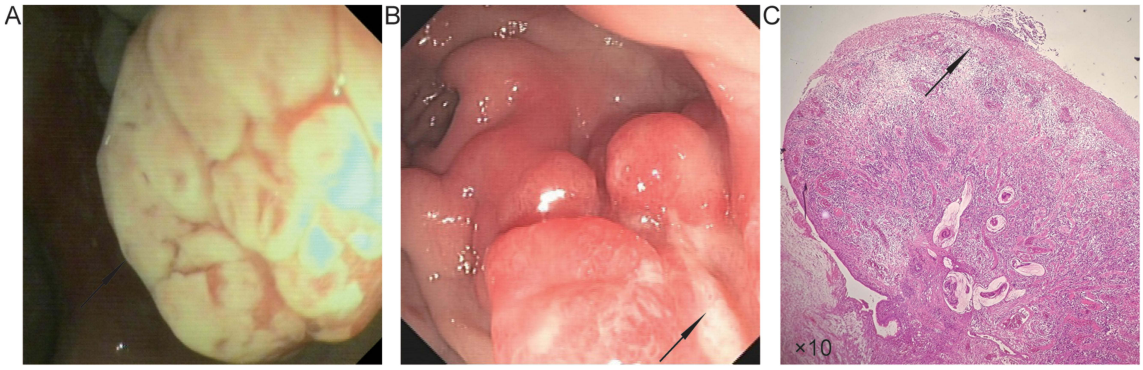

Figure 3 Endoscopic and pathological manifestations of cap polyps. (**A)** Rectal polyps, indicating attachment of thick white moss (black arrow). (**B)** Rectal mucosa is congested and edematous, with multiple erythematous polypoid protrusions of varying sizes visible on the mucosa, with a large amount of purulent secretions attached to the surface (black arrow). (**C)** Under the formation of thick cap like structures in granulation tissue (black arrow), focal glands are significantly dilated, and a large number of acute and chronic inflammatory cells such as lymphocytes and neutrophils infiltrate the mucosal layer.

types of oral medications available for Chinese patients are more limited, primarily consisting of prednisone, metronidazole, and 5-aminosalicylates. Japanese researchers predominantly employ betamethasone enema, whereas mesalazine, prednisone, and metronidazole enemas have also been attempted in Chinese patients.[5,53,59] Furthermore, endoscopic therapy is a critical treatment modality, with EMR, ESD, and endoscopic argon plasma coagulation demonstrating effectiveness. For patients with concomitant stenosis and other complications, laparoscopic surgery and surgical interventions may also be considered. Laparoscopic procedures include laparoscopic-assisted total proctology and J-type ileal pouch-anal anastomosis (IPAA) with ileostomy, as well as laparoscopic low anterior resection of the rectum and sigmoid colon with diverting ileostomy. Surgical procedures include double-barreled transverse colostomy, abdominopancrectomy with sigmoid colostomy, left hemicolectomy, sigmoid colectomy, and proctosigmoidectomy. Conversely, there is a lower prevalence of surgical practitioners in Chinese research, where the surgical interventions primarily consist of transanal rectal prolapse surgery and anal stricture surgery.

In the available follow-up data, Chinese patients were monitored for 1 to 80 months, during which improvements in symptoms of hypoalbuminemia, diarrhea, and rectal bleeding were significant following treatment, and endoscopic lesions resolved upon reexamination. Most HP-positive patients experienced notable symptom improvement after HP eradication. Only a few articles discuss disease recurrence, manifested by the reappearance of polyps during endoscopy, which can be addressed through endoscopic treatment. The Japanese study reported follow-up periods ranging from 1 month to 9 years, with patients also receiving significantly effective treatment; however, a small number of patients continued to experience severe discomfort and mucous bloody stools post-treatment.

We also compared relapse rates among various treatments in Chinese and Japanese patients (Table 4). Our analysis included 69 patients, categorized into three groups: EMR or ESD alone (n=41), surgical operation (n=18), and HP eradication (n=10). Our findings indicate that relapse rates do not significantly differ among the different interventions (P=0.06), which may have been influenced by the follow-up duration.

Conclusion

CP is a benign non-neoplastic condition of the lower gastrointestinal tract characterized by distinctive endoscopic features. Pathological examination reveals a layer of fibrous exudate on the mucosal surface (Figure 3). Our systematic review analyzed 14 studies comprising 57 patients with cap polyposis (CP) from China, with additional comparisons to documented cases from Japan. The main findings indicate that CP most commonly presents with hematochezia, and polyps are predominantly located in the rectum, often occurring as multiple lesions. Over half of the tested patients were positive for *Helicobacter pylori* infection. Endoscopic interventions such as EMR and ESD were frequently employed and proved effective for symptomatic and localized disease, although recurrence was observed in a subset of patients during follow-up.

The comparative analysis between Chinese and Japanese patients revealed similarities in clinical manifestations and predominant rectal involvement, but also suggested potential differences in gender distribution and treatment practices. Based on these findings, we recommend that CP be considered in patients presenting with rectal bleeding and multiple inflammatory polyps, and that both endoscopic evaluation and histological examination are essential for accurate diagnosis. Treatment should be individualized, including testing and eradication of H. pylori where indicated, and endoscopic resection for eligible cases.

Due to the rarity of CP, the available evidence remains limited, and future multi-national studies with larger sample sizes are needed to establish more definitive diagnostic and therapeutic guidelines.

Data Sharing Statement

All relevant data are within the manuscript and its additional files. Data availability is not applicable to this article as no new data were created or analyzed in this study.

Ethics and Consent to Participate Declarations

The study was reviewed and the date has been fully anonymized,the Shiyan Taihe hospital Ethics Committee has waived the informed consent requirement for participants. During the study, we strictly complied with data protection regulations to ensure the security of data and the privacy of participants.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests in this work.

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