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The primary aim of *World Journal of Gastrointestinal Surgery* (WJGS, *World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, etc.

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Colo-colonic intussusception as a rare complication of colonoscopy with polypectomy: Two case reports

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Abstract

BACKGROUND

Colonoscopy is the most frequently used diagnostic and therapeutic tool for the treatment of colorectal diseases. Although the complication rate is low, it can be potentially serious. Intussusception is a rare and severe complication often associated with polypectomy. Only a handful of post-colonoscopy intussusception cases have been reported, making this study a valuable addition to the medical literature.

CASE SUMMARY

Case 1: A 61-year-old man underwent colonoscopy with polypectomy for chronic abdominal pain. The patient experienced abdominal pain 11 hours later but was still discharged after pain management. He was readmitted due to recurring pain. Computed tomography (CT) showed colo-colonic intussusception. Initial conservative management and attempts at endoscopic reduction failed; therefore, laparoscopic right hemicolectomy was performed. Histopathological examination revealed tubular adenomas in the polyps and inflammation in the resected specimens. Case 2: A 59-year-old woman underwent colonoscopy with polypectomy for a polyp in the transverse colon. She experienced upper abdominal pain, fever, nausea, and vomiting 9 hours after the procedure. Emergency CT and blood tests revealed a colo-colonic intussusception near the hepatic flexure and an elevated white blood cell count. Initial attempts at endoscopic reduction failed and conservative treatment showed no improvement. She underwent successful laparoscopic reduction and recovered uneventfully. Histopathological examination of the resected polyp revealed hyperplasia.

CONCLUSION

Post-colonoscopy intussusception in adults is rare, and polypectomy may contribute to its occurrence. Early diagnosis is crucial, with prompt CT examination serving as key. After excluding malignancies, conservative management and reduction of intussusception should be considered before surgical bowel

resection.

Key Words: Intussusception; Colonoscopy; Polypectomy; Complication; Case report

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Core Tip: This study discusses two rare cases of colo-colonic intussusception as a complication of colonoscopy with polypectomy in adults. A 61-year-old man and 59-year-old woman developed intussusception after polyp removal during colonoscopy. Both patients underwent unsuccessful conservative and endoscopic reduction interventions, leading to surgical procedures. These findings highlight the importance of early detection using computed tomography and suggest that polypectomy may increase the risk of intussusception. Conservative management should be attempted before surgical resection, assuming that malignancy has been ruled out. This study highlights the importance of awareness and prompt management of this rare complication.

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INTRODUCTION

Colonoscopy is the most frequently used diagnostic and therapeutic tool for colorectal diseases including colorectal tumors, inflammatory bowel disease, and lower gastrointestinal bleeding. The incidence of complications associated with colonoscopy is very low at < 1% [1]. Polypectomy performed during colonoscopy is generally considered safe. However, multiple colonoscopy-related complications may still occur, with the most common being gastrointestinal bleeding, perforation, and cardiopulmonary events, and over 85% of serious complications are reported in patients undergoing colonoscopy with polypectomy [1,2]. Intussusception after colonoscopy in adults is extremely rare and often associated with polypectomy. To the best of our knowledge, only 15 cases of post-colonoscopy intussusception have been reported since the first description by Yamazaki *et al* [3] in 2000.

To raise awareness and provide more information for better management of this unusual condition, we present two cases of intussusception after colonoscopy with polypectomy in adults, followed by a short review of the literature on this condition.

CASE PRESENTATION

Chief complaints

Case 1: A 61-year-old man experienced colicky abdominal pain in the right lower quadrant 11 hours after colonoscopy with polypectomy. Abdominal computed tomography (CT) revealed colo-colonic intussusception.

Case 2: A 59-year-old woman presented with upper abdominal pain and distention 9 hours after colonoscopy with polypectomy. Abdominal CT revealed a colo-colonic intussusception.

History of present illness

Case 1: The patient presented to our hospital with a 10-month history of abdominal pain in the lower right quadrant. Abdominal CT performed 1 month previously showed no positive findings, and colonoscopy performed 7 months previously showed multiple polyps. To further investigate the cause of abdominal pain and remove the polyps, we performed CT enterography (CTE), followed by colonoscopy and polypectomy. The CTE revealed no anomalies.

Colonoscopy was performed under intravenous anesthesia. The quality of bowel preparation was adequate, and no technical difficulties were encountered during colonoscopy. The colonoscopy took 25 minutes, including 11 minutes for intubation and 14 minutes for withdrawal. The terminal ileum was intubated. Three polyps in the sigmoid colon, sized 4-6 mm, were discovered during intubation and removed from the spot by cold snare polypectomy (CSP). Two polyps in the ascending colon near the hepatic flexure, sized 4-5 mm, were discovered during withdrawal and removed by CSP (Figure 1). No other abnormalities were found during colonoscopy. The patient regained consciousness approximately 6 minutes after the procedure and felt well without obvious abdominal discomfort.

Eleven hours later, the patient started to experience colicky abdominal pain in the right lower quadrant with tenderness, but no rebound tenderness. The patient rated the pain as 3 on a scale of 1-10. The pain lasted for 1 hour and was still not relieved; therefore, the doctor on duty administered 10 mg of anisodamine intramuscularly. The patient's pain was relieved. However, only 4 hours later, the pain recurred without tenderness or rebound tenderness. The patient

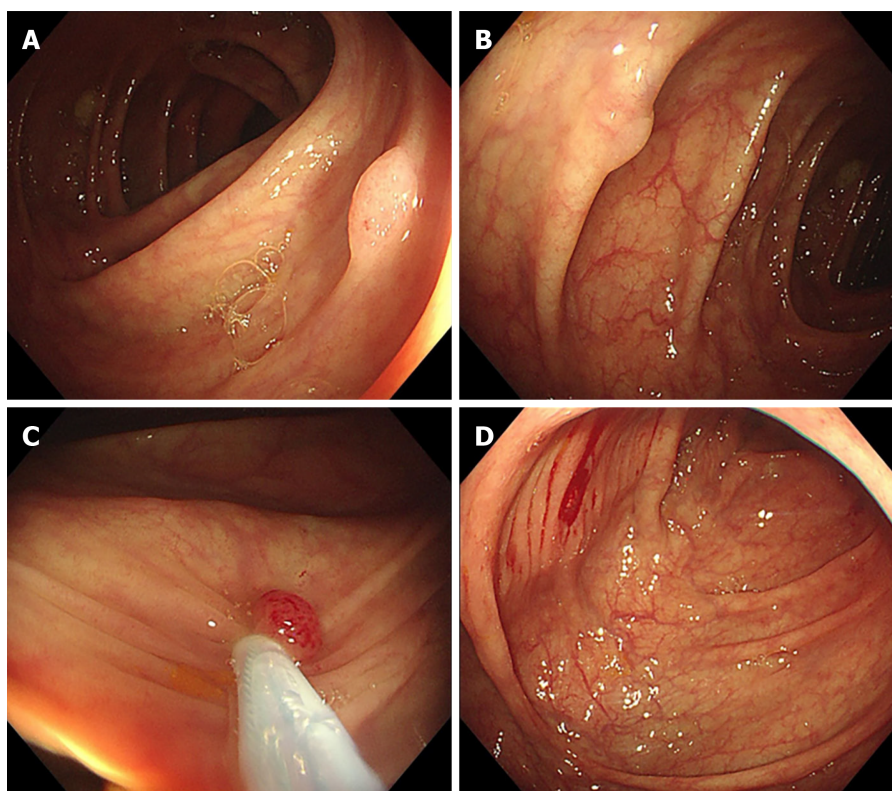


Figure 1 Images of initial colonoscopy of case 1. A and B: Two polyps measuring 4-5 mm in the ascending colon near the hepatic flexure discovered during withdrawal; C: Polyp in Figure 1A removed by cold snare polypectomy (CSP); D: Post-polypectomy wound after CSP of the polyp in Figure 1B.

was administered a second intravenous dose of anisodamine (10 mg). The pain was relieved, and the patient was discharged 2 hours later. However, 8 hours after the patient was sent home, he returned to the emergency room because of recurring colicky abdominal pain in the right lower quadrant.

Case 2: The patient visited our hospital because a polyp was found in the transverse colon during routine colonoscopy three months prior to presentation.

Colonoscopy and endoscopic polypectomy were performed under intravenous anesthesia. The quality of bowel preparation was adequate, and no technical difficulties were encountered during colonoscopy. The terminal ileum was not intubated. Colonoscopy took 36 minutes, including 10 minutes for intubation of the cecum and 26 minutes for withdrawal and polypectomy. A flat polyp measuring 12 mm in the transverse colon near the hepatic flexure was discovered and removed using endoscopic mucosal resection. The mucosal defect was closed using five metal clips (Figure 2). No other abnormalities were found during colonoscopy. Histopathological examination of the resected polyp revealed hyperplasia.

Nine hours after colonoscopy, the patient began to experience pain and distention in the upper abdomen. The pain worsened in the next 2 hours, and the patient rated it 7 on a scale of 1-10. A glycerin enema and antispasmodics (anisodamine and magnesium sulfate) were administered. The pain was briefly alleviated and then intensified again, accompanied by fever, nausea, and vomiting.

History of past illness

Case 1: Past medical history included chronic hepatitis B for 5 years and hepatocellular carcinoma surgery 4 years previously.

Case 2: The patient had a history of cesarean section surgery 30 years previously, and ectopic pregnancy surgery 22 years previously.

Personal and family history

Both patients' personal and family history was unremarkable.

Physical examination

Case 1: Upon returning to the emergency room, an abdominal physical examination revealed moderate tenderness with peritoneal signs in the right lower quadrant. The patient's body temperature was 38 °C, heart rate 93 beats/minute (bpm), respiratory rate 20 breaths/minute, and blood pressure was 101/63 mmHg.

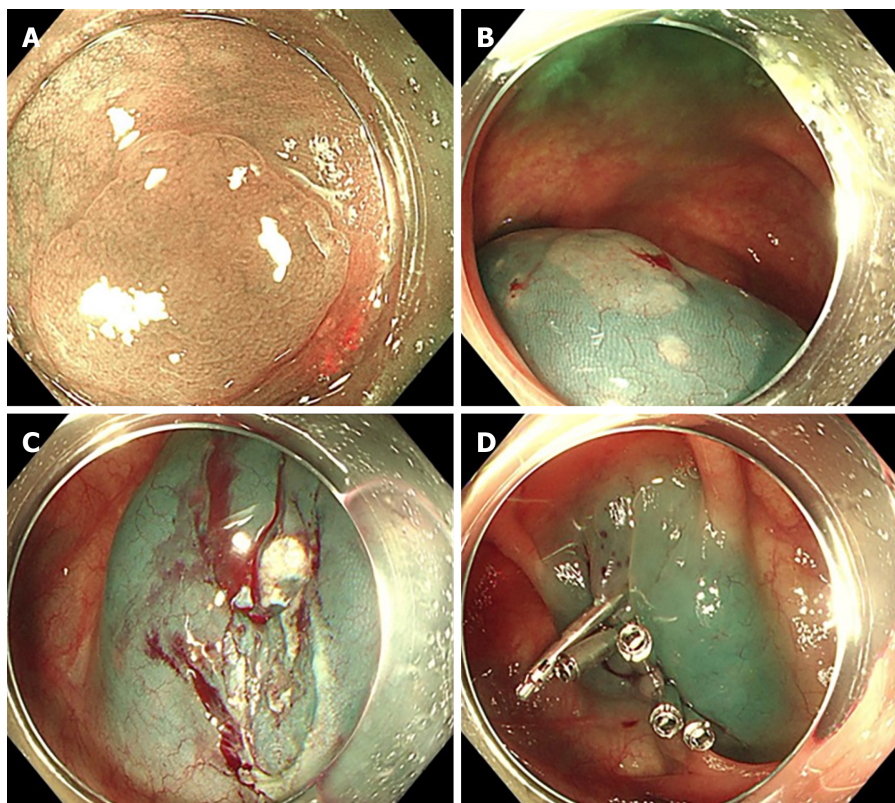


Figure 2 Images of initial colonoscopy of case 2. A-C: A flat polyp measuring 12 mm discovered in the transverse colon near the hepatic flexure, and removed by endoscopic mucosal resection; D: The mucosal defect closed using five metal clips.

Case 2: Initially, the patient exhibited moderate upper abdominal tenderness. After the pain intensified and the patient became febrile, with accompanying nausea and vomiting, the vital signs were recorded as follows: Temperature, 38 °C; heart rate, 106 bpm; respiratory rate, 22 breaths/minute; and blood pressure, 169/91 mmHg. Further examination revealed tenderness and rebound tenderness of the upper abdomen.

Laboratory examinations

Case 1: Laboratory examinations demonstrated an elevated white blood cell count of $14.9 \times 10^9/L$ (normal $4.0-10.0 \times 10^9/L$), with a predominance of neutrophils (90.9%). The C-reactive protein level was normal (5.07 mg/L; normal 0-8 mg/L).

Case 2: Laboratory examinations demonstrated an elevated white blood cell count of $12.5 \times 10^9/L$ (normal $4.0-10.0 \times 10^9/L$), with a predominance of neutrophils (77.9%). The C-reactive protein level was normal (1.21 mg/L; normal 0-8 mg/L) at that point and was found to be significantly elevated to 76.92 mg/L 13 hours later, while the complete blood cell count remained similar.

Imaging examinations

Case 1: Urgent abdominal CT revealed a colo-colonic intussusception near the hepatic flexure: The bowel near the hepatic flexure was dilated and the proximal colon was invaginated into it, which appeared as a target-like lesion (Figure 3A). There were no signs of bowel obstruction, perforation, or masses.

Case 2: Emergency abdominal CT revealed metal clips near the hepatic flexure and a target-like lesion with thickened intestinal walls in the distal colon near the clips, indicative of colo-colonic intussusception (Figure 3B).

FINAL DIAGNOSIS

Both patients were diagnosed with colo-colonic intussusception.

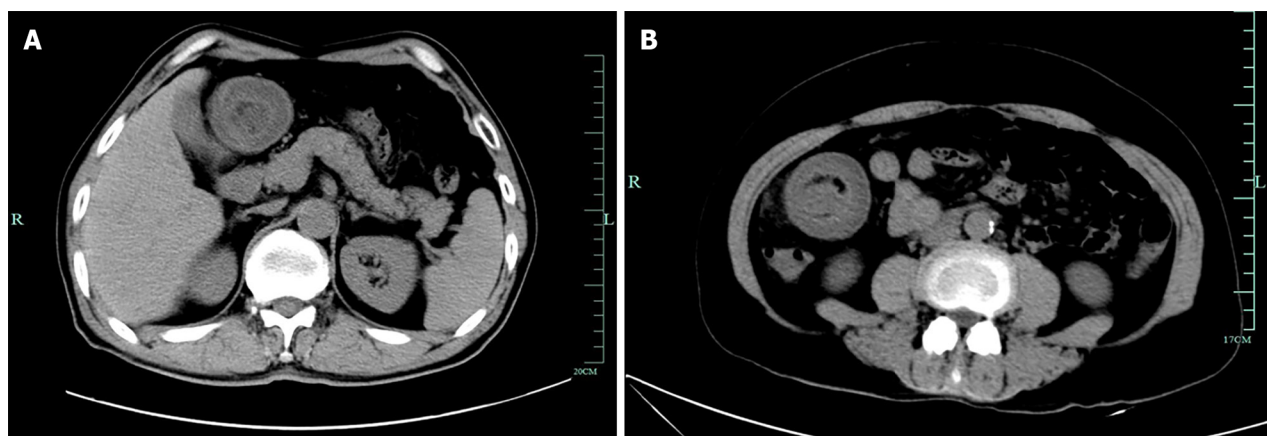


Figure 3 Urgent abdominal computed tomography. A: Urgent abdominal computed tomography (CT) revealing a colo-colonic intussusception near the hepatic flexure; B: Emergency abdominal CT revealing a target-like lesion with thickened intestinal walls.

TREATMENT

Case 1

The patient was readmitted and initially managed conservatively with fasting and the maintenance of intravenous fluids, analgesics (pethidine), antispasmodics (anisodamine), antibiotics (meropenem), antipyretics (indomethacin), and parenteral nutrition. However, the abdominal pain persisted, and the patient passed approximately 20 mL of dark red bloody stool 4 hours after readmittance.

Emergency colonoscopy was performed to attempt endoscopic reduction. Colonoscopy revealed a congested, swollen, purple-red-colored mucosa in the ascending colon near the hepatic flexure invaginating the distal bowel (Figure 4). Repeated attempts to reduce the colo-colonic intussusception by pumping water and air failed.

The patient was then transferred to the operating room for laparoscopic surgery. Intraoperative findings included colo-colonic intussusception in the ascending colon near the hepatic flexure, with significant inflammation and exudation. Due to concerns about possible intestinal necrosis, a laparoscopic right hemicolectomy with intracorporeal anastomosis was performed.

Case 2

Emergency colonoscopy was performed to reduce endoscopic intussusception. Colonoscopy revealed a congested, swollen, and purple-red-colored mucosa in the transverse colon that invaginated the distal bowel. The post-polypectomy wound with metal clips was located approximately 5 cm above the inflamed mucosa and was unaffected by intussusception (Figure 5). Repeated attempts to reduce colo-colonic intussusception by changing the position and pumping water and air failed.

Owing to the patient's unwillingness to undergo surgery, conservative treatment was administered. However, the patient's condition did not improve, and a repeat abdominal CT showed no signs of improvement. Twelve hours after the emergency colonoscopy, the patient was transferred to the operating room for laparoscopic surgery. The intraoperative findings included colo-colonic intussusception in the transverse colon near the hepatic flexure with edema and inflammation. The intussusception was laparoscopically reduced.

OUTCOME AND FOLLOW-UP

Case 1

The patient's postoperative recovery was uneventful, and was discharged 11 days later. No complications occurred.

Histopathological examination of the polyps resected during the initial endoscopy revealed tubular adenomas, whereas the specimen resected laparoscopically showed inflammatory changes with no evidence of malignancy or mass.

Case 2

Postoperative recovery was uneventful, and the patient was discharged 8 days later. No complications occurred.

Both patients shared their perspective that complications are best avoided, and if unavoidable, successful conservative treatment is preferred over surgery; if surgery is necessary, reduction is preferred over resection.

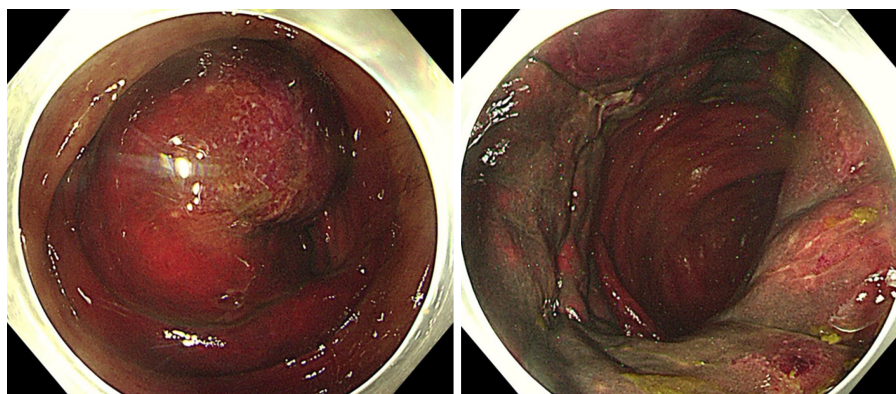


Figure 4 Images of emergency colonoscopy of case 1. Colonoscopy revealing congested, swollen, purple-red-colored mucosa in the ascending colon near hepatic flexure, invaginating into the distal bowel.

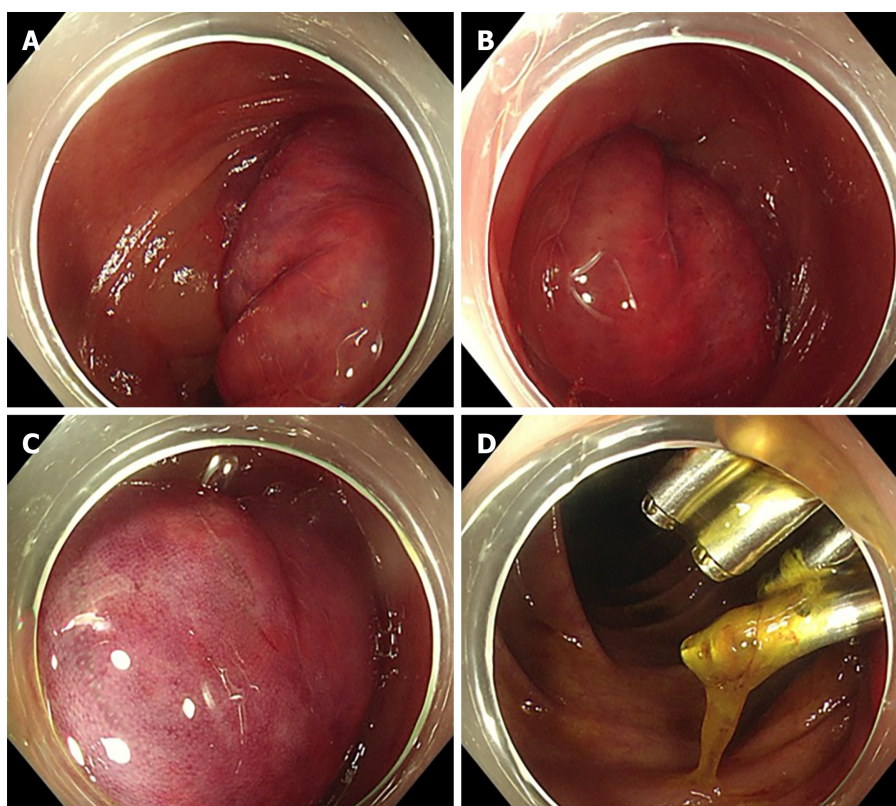


Figure 5 Images of emergency colonoscopy of case 2. A-C: Colonoscopy revealing congested, swollen, and purple-red-colored mucosa in the transverse colon, invaginating into the distal bowel; D: Post-polypectomy wound with metal clips located approximately 5 cm above the inflamed mucosa and not affected by the intussusception.

DISCUSSION

Intussusception after a colonoscopy is exceedingly rare in adults. To date, only 17 cases, including our two cases, have been reported (Table 1)[3-17]. In these cases, the age of patients ranged from 19 to 73 years (average 47.6 years), and the sex ratio was roughly equal (8 males to 9 females). All patients experienced abdominal pain that occurred several hours after colonoscopy as the main clinical symptom, with tenderness as the main abdominal sign. Other less documented symptoms include fever, bloody stools, nausea, and vomiting. Laboratory examination results were documented in 12 cases, all showing elevated white blood cell counts ranging from 10.8 to $22 \times 10^9/L$ (average $14.1 \times 10^9/L$). All diagnoses of intussusception were made by using abdominal CT. The majority (13 cases, 76.5%) were colo-colic intussusceptions, and only four cases (23.5%) were ileocolic. Almost all lesions occurred in the right colon, except in one case where it was located in the splenic flexure. Endoscopic interventions (biopsies or polypectomies) were performed during the initial colonoscopy in 14 (82.4%) of the 17 cases. Of the remaining three cases, one had a large polyp in the terminal ileum[7], which may serve as a potential cause, whereas the other two seemed normal. Regarding the treatments, four cases were successfully treated conservatively, four underwent laparoscopic reduction, one underwent successful endoscopic

Table 1 Summary of the reported cases of intussusception after colonoscopy

Ref.	Age (years)/sex	Endoscopic intervention	Type of intussusception	Treatment
Yamazaki <i>et al</i> [3], 2000	48/male	Biopsy	Cecal colo-colonic	Open resection
Theodoropoulou <i>et al</i> [4], 2009	19/male	No	Ileocecal	Open resection
Ho <i>et al</i> [5], 2010	32/male	Polypectomy	Cecal colo-colonic	Laparoscopic reduction
Nachnani <i>et al</i> [6], 2012	73/female	Biopsy	Ascending colo-colonic	Laparoscopic reduction
Lasithiotakis <i>et al</i> [7], 2012	58/male	No	Ileocecal	Open resection
Lee <i>et al</i> [8], 2013	47/male	Polypectomy	Cecal colo-colonic	Laparoscopic resection
Min <i>et al</i> [9], 2017	31/female	Biopsy	Cecal colo-colonic	Laparoscopic resection
Araki <i>et al</i> [10], 2018	28/male	Polypectomy	Cecal colo-colonic	Endoscopic reduction
Hassan <i>et al</i> [11], 2018	43/female	Biopsy	Ascending colo-colonic	Conservative management
He <i>et al</i> [12], 2020	54/female	Polypectomy and biopsy	Transverse colo-colonic	Conservative management
Ahmed <i>et al</i> [13], 2020	42/female	Polypectomy and biopsy	Transverse colo-colonic	Conservative management
Moon <i>et al</i> [14], 2022	58/female	Polypectomy	Hepatic flexure colo-colonic	Conservative management
Lee <i>et al</i> [15], 2022	69/male	Polypectomy	Ileocecal	Laparoscopic resection
Vadakkenchery <i>et al</i> [16], 2022	36/female	No	Splenic flexure colo-colonic	Laparoscopic reduction
Jastaniah <i>et al</i> [17], 2023	51/female	Polypectomy	Ileocecal	Laparoscopic resection
Current case 1	61/male	Polypectomy	Ascending colo-colonic	Laparoscopic resection
Current case 2	59/female	Polypectomy	Transverse colo-colonic	Laparoscopic reduction

reduction, five underwent laparoscopic segmental bowel resection, and three underwent open segmental bowel resection. No malignant histopathological findings were observed.

Intestinal intussusception mostly occurs in the small intestine, with only 20% of cases involving solely the large bowel [18]. Less than 5% of intussusceptions occur in adults[19]. Intussusception in adults is usually related to definable causes, with only 10%-20% of all cases being idiopathic[20]. Common causes of adult colonic intussusception include adherence, inflammatory lesions, polyps, and benign or malignant tumors[19]. The most prevalent cause is a pathological lead point in the bowel, which is malignant in half of the cases[17]. However, these causes are not usually present in post-colonoscopy intussusception.

The etiology of intussusception after colonoscopy remains unclear. Several hypotheses have been proposed to explain the phenomenon. Some scholars have suggested that edema or hematoma caused by endoscopic interventions, including biopsy and polypectomy, may serve as a lead point[14,15,17]. The metal clips used after polypectomy may also act as a lead point. This may explain the occurrence of intussusception in our first case, as the location of intussusception observed during emergent colonoscopy was consistent with the site of the prior polypectomy. As mentioned previously, biopsies or polypectomies were performed during the initial colonoscopy in 14 (82.4%) of the 17 cases. However, in our second case, the post-polypectomy wound with metal clips was located approximately 5 cm above the inflamed mucosa and was not affected by intussusception, which implies that the post-polypectomy wound and metal clips were not the lead points. Additionally, no endoscopic interventions were applied in two of the previously reported cases. This finding implies the involvement of other mechanisms. Yamazaki *et al*[3] speculated that the intussusception was induced by hyperperistalsis, which vents gas and empties the insufflated colon after colonoscopy[3]. Hassan *et al*[11] proposed that gas aspiration during colonoscope withdrawal creates a vacuum effect, leading to the collapse and invagination of the proximal colon into the distal colon, which is primarily observed in the right colon because of the mobility and freedom of movement of the cecum within the abdomen[11]. In addition, a history of abdominal surgery may predispose patients to intussusception[9]. Both of our patients underwent abdominal surgery. Another hypothesis suggests that complex bowel loops may form during colonoscopy, potentially leading to transient intussusception[6].

Because its etiology is unclear, it is challenging to determine effective preventive measures. We speculate that measures such as avoiding excessive insufflation during colonoscopy, gentle suction maneuvers, and administration of antispasmodic drugs, such as antisodamine, when hyperperistalsis is observed may potentially reduce the incidence of post-colonoscopy intussusception.

Compared to prevention, early diagnosis may be more practical. Early diagnosis of intussusception improves the prognosis. Prompt CT examination is the key to early diagnosis. In our two cases, the severity of the situation was not initially recognized, resulting in delays in performing abdominal CT scans and instead administering pain management, which led to a delayed diagnosis of intussusception. In our first case, laparoscopic resection was performed instead of reduction because of the potential ischemic necrosis, which could have been avoided if the intussusception had been identified earlier. This served as an important cautionary measure. If abdominal pain accompanied by tenderness occurs within hours to days after colonoscopy, particularly after a polypectomy, abdominal CT should be performed promptly.

Additional manifestations, including elevated white blood cell count, fever, and bloody stools, further indicate the need for urgent CT evaluation.

Traditionally, laparoscopic or open bowel resection has been the standard approach for treating bowel intussusception in adults to allow the examination of specimens for any potential malignancy[18,19]. However, in cases of post-colonoscopy intussusception in which the colon has already been examined and malignancy has been ruled out, we believe that conservative management should be considered prior to surgery. If surgical treatment is necessary, after the exclusion of bowel ischemic necrosis or perforation, reduction should be prioritized over resection. Multiple reports have suggested that intussusceptions with a short-affected segment and no lead-point mass can be managed using a 'wait and see' strategy with regular clinical and imaging evaluations to monitor spontaneous resolution[19]. Endoscopic reduction is seldom performed to treat adult intussusception[19,20]. Only 1 of the 17 patients underwent successful endoscopic reduction, whereas this failed in our two cases. We look forward to the future development of endoscopic reduction techniques with high efficacy, which would be the ideal treatment approach for post-colonoscopy intussusception.

This study has several limitations. First, there have been multiple reports on this condition prior to our report. Second, images obtained during surgery were not preserved. Third, we were unable to identify the exact etiology in the two cases. Finally, we failed to provide preventive measures with definite efficacy. Nevertheless, our report of the two cases provides more detailed information, including details of the initial colonoscopies, abundant original images, and the entire process of disease development, diagnosis, and treatment. This study adds to our knowledge of this rare condition and emphasizes the importance of early recognition. Patient perspectives were also reported in our study. Additionally, we conducted a short review of previous reports on this entity.

CONCLUSION

Intussusception after colonoscopy is rare in adults. The etiology of this condition remains unclear. An edema or hematoma caused by a biopsy or polypectomy may serve as the lead point. No preventive measures have been established. Early diagnosis plays a crucial role in the management of this condition, and prompt CT examination is crucial for early diagnosis. If malignancy is ruled out by the initial colonoscopy, conservative management should be considered before surgery. If surgery is necessary, reduction should be prioritized over resection after excluding bowel ischemic necrosis or perforation.

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FOOTNOTES

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