

Original Article

Adult Colonic Intussusception

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Key Words

Adult;

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Intussusception;

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Purpose. This study aims to review our hospital experience of adult intussusception of the colon to assess the clinical features, diagnosis, malignant predictive factors, and management.

Methods. From February 2004 to January 2018, 26 patients aged > 18 years were diagnosed with colonic intussusception because of colonic lesions and underwent surgical intervention at Mackay Memorial Hospital. Using SPSS version 22.0 with binary logistic regression analysis, we collected data about medical parameters in this study.

Results. Abdominal computed tomography confirmed intussusception in 96.2% of patients. The leading symptom in all cases was abdominal pain. All colonic leading points of 19 patients who underwent colonoscopy were proved by the procedure. A majority of operation pathology results were malignant, and none of our patients received the preoperative reduction, although 2 patients had a perioperative reduction. Furthermore, patients' sex, anemia, and lesion size exhibited statistical significance about the malignant pathology.

Conclusions. While abdominal computed tomography is the preferred preoperative diagnostic modality, colonoscopy is a reliable procedure to confirm colon lesions preoperatively. Radical operation without preoperative reduction was suggested because of the high incidence of malignant lesions in the adult group. Furthermore, female patients, anemia, and large lesion size favor malignant pathology results statistically, implying that laparoscopic surgery could be performed in selected patients.

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Intussusception is a different entity in adults than it is in children. Typically, adult intussusception represents 1% of all bowel obstructions and 5% of all intussusceptions.¹⁻⁸ In addition, an organic etiology is determined in > 90% of adult patients with intussusception.³ Moreover, adult intussusception of the colon is often secondary to malignant lesions.¹ Usually, the treatment strategy of adult intussusception differs from that in children. Furthermore, adult intussusception presents with nonspecific symptoms in most cases, and it is difficult to diagnose and plan treatment accurately the first time. Perhaps some recent imaging

studies and preoperative malignant predictive factors could facilitate obtaining more information for definitive diagnosis and treatment. Thus, this study aims to review our hospital experience of adult intussusception of the colon to assess the clinical features, diagnosis, malignant predictive factors, and management.

Materials and Methods

From February 2004 to January 2018, 26 patients aged > 18 years were diagnosed with colonic intus-

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susception caused by colonic lesions and underwent surgical intervention at Mackay Memorial Hospital (MMH). We enrolled patients with colocolic- and ileocolic-type intussusception and excluded those with rectal prolapse or stoma intussusceptions. Of note, small-bowel intussusception was not included in the analysis. The medical data comprised age, sex, clinical presentation, preoperative image examination, CEA, Hb, preoperative diagnosis, operation method, histopathology, lesion size and location, length of hospital stay, and postoperative complication. We used SPSS version 22.0 with binary logistic regression analysis to accumulate statistics on these parameters. This study was approved by the Institutional Review Board of MMH.

Results

Between February 2004 and January 2018, 26 patients (average age, 56.2 years; median age, 58 [range,

34-77] years) were diagnosed with colonic intussusception at MMH. Of all, 15 were females with an average age of 52.9 (34-71) and 11 males with an average of 60.6 (39-77) years (female:male ratio, 1.36:1). All patients had single intussusceptions. While 13 (50%) were ileocolic intussusceptions, 13 (50%) were colocolonic intussusceptions. Of colocolonic intussusceptions, 4 (15.4%) were sigmoidorectal intussusception. Notably, we could not evaluate the ratio of antegrade- and retrograde-type intussusception because of the lack of detailed medical records. In addition, 15 patients had pre-operative CEA, 4 of whom had abnormal CEA level (> 5 ng/mL; Table 1). Besides, nearly half of the cases had acecal lesion (46.2%, 12/26). And 5 patients had ascending colon lesions, 4 had transverse colon lesions, 2 had descending colon lesions, 2 had sigmoid colon lesions, and 1 patient had rectum lesion (Table 2).

Of 26 patients, 84.6% (22/26) had abdominal pain, 15.4% (4/26) bloody stool, and 15.4% (4/26) a palpable abdominal mass (Table 3). The duration of symp-

Table 1. Characteristics of 26 patient with intussusceptions caused by colonic lesions

Patients	Age	Sex	Comorbidity	Anemia	Type	Duration (mo)	CEA (ng/ml)
1	36	F	Nil	—	Ileocolic	0	Nil
2	43	F	Nil	+	Ileocolic	0.25	Nil
3	47	F	HBV	—	Colocolic	6	Nil
4	50	F	Nil	+	Colocolic	1	1.52
5	64	F	Sigmoid colon cancer, DM	+	Colocolic	0	2.25
6	65	F	Nil	+	Ileocolic	1	2.07
7	71	F	Hypertension	+	Colocolic	0	228.1
8	58	F	Nil	—	Ileocolic	0.25	Nil
9	58	F	Nil	—	Ileocolic	0	Nil
10	64	F	Nil	+	Colocolic	0.5	0.97
11	54	F	Nil	—	Ileocolic	0.25	Nil
12	50	F	Nil	+	Ileocolic	1	2.65
13	65	F	Nil	+	Ileocolic	0	1.6
14	34	F	Nil	+	Ileocolic	0.5	Nil
15	35	F	Nil	+	Colocolic	0.5	1.54
16	77	M	Nil	+	Colocolic	0.25	Nil
17	39	M	Nil	—	Ileocolic	0	Nil
18	68	M	Hypertension	+	Ileocolic	0	Nil
19	47	M	Nil	—	Colocolic	0	0.62
20	66	M	DM, Hypertension	—	Ileocolic	0.5	5.3
21	44	M	Nil	—	Ileocolic	0	3.8
22	70	M	Nil	—	Colocolic	0.5	1.24
23	61	M	Nil	+	Colocolic	0	Nil
24	67	M	Nil	+	Colocolic	0.5	6.08
25	71	M	HTN, DM, CHF, Hydrocephalus	+	Colocolic	12	7.56
26	57	M	Gastric cancer	+	Colocolic	0.5	0.67

Table 2. Perioperative features and pathologic findings of lesions

Patients	Operation	Lesion diameter (cm)	Pathology	Lesion site	Length of hospital stay (d)
1	Right hemicolectomy	4	Villous adenoma	Cecum	11
2	Right hemicolectomy	6.5	Adenosquamous carcinoma	Cecum	13
3	Right hemicolectomy	5	Lipoma	T-colon	8
4	Right hemicolectomy	7	Mucinous adenocarcinoma	A-colon	19
5	Right hemicolectomy	8.5	Mucinous carcinoma	A-colon	15
6	Right hemicolectomy	6	Adenocarcinoma	Cecum	11
7	Right hemicolectomy	4.5	Adenocarcinoma	A-colon	25
8	Partial colectomy	5.5	Large B-cell lymphoma	Cecum	10
9	Right hemicolectomy	3.7	Adenocarcinoma	Cecum	10
10	Right hemicolectomy	6.5	Adenocarcinoma	A-colon	14
11	Left hemicolectomy	4.5	Lipoma	T-colon	12
12	Partial colectomy	1.2	Gangrenous change	Cecum	6
13	Right hemicolectomy	4.2	Large B-cell lymphoma	Cecum	19
14	Partial colectomy	Nil	Acute suppurative inflammation	Cecum	18
15	Left hemicolectomy	2.5	Tubulovillous adenoma	D-colon	14
16	Right hemicolectomy	8	Lipoma	Cecum	17
17	Partial colectomy	2.4	Chronic ulcer	Cecum	11
18	Partial colectomy	4	Lipoma	D-colon	9
19	Right hemicolectomy	5.5	Adenocarcinoma	Cecum	17
20	Right hemicolectomy**	10.5	Adenocarcinoma	A-colon	17
21	Right hemicolectomy	5.5	Lipoma	T-colon	15
22	Right hemicolectomy	4.2	Adenocarcinoma	Cecum	16
23	Sigmoid colectomy	3.5	Adenocarcinoma	S-colon	25
24	Right hemicolectomy**	6.5	Adenocarcinoma	T-colon	7
25	Radical proctectomy	11	Adenocarcinoma	S-colon	44
26	Radical proctectomy,	7.5	Adenocarcinoma	Rectum	10

** Laparoscopic surgery.

Table 3. Perioperative presentation

Symptoms	No. of cases	Ratio (%)
Abdominal pain	22	84.6
Peritoneal signs	6	23.1
Nausea & vomiting	5	19.2
Diarrhea	5	19.2
Abdomen palpable mass	4	15.4
Bloody stool	4	15.4
Body weight loss	2	7.7
Tenesmus	1	3.8
Dizziness & weakness	1	3.8
Fever	1	3.8
Constipation	1	3.8

toms varied from several hours to 1 year. In addition, 38.5% (10/26) patients had acute symptoms, 15.4% (4/26) subacute symptoms, and 46.2% (12/26) chronic symptoms (acute symptoms were defined as < 4 days, subacute symptoms as 4-14 days, and chronic symptoms > 14 days;⁷ Table 1).

Of 26 patients, 96.2% (25/26) were preoperatively diagnosed with intussusception. The KUB or plain abdominal X-rays could not precisely diagnosis intussusception. In addition, 7 patients had abdominal ultrasonography, 2 of whom were diagnosed with intussusception (28.6% accuracy). While 2 patients received the colon series, 1 patient was diagnosed with intussusception (50.0% accuracy). Moreover, 25 patients had abdominal computed tomography (CT), 24 of whom were diagnosed with intussusception (96.0% accuracy; Table 4). None of the patients underwent an upper gastrointestinal water-soluble contrast study. There were 19 patients underwent colonoscopy, which detected an entity in all of them. Twelve patients received biopsy for pathology. One patient whose benign lesion biopsied was detected with a malignant lesion in the operation pathology later, and the report determined ascending colon adenocarcinoma (Fig. 1).

In this study, 5 patients underwent partial colec-

Table 4. Intussusception was diagnosed by perioperative radiographic study

Examination	% of patient received	Accuracy (%)
KUB or plain abdomen	73.1 (19)	0
Abdominal ultrasound	26.9 (7)	28.6 (2/7)
Abdominal CT	96.2 (25)	96.0 (24/25)
Colon series	7.7 (2)	50.0 (1/2)

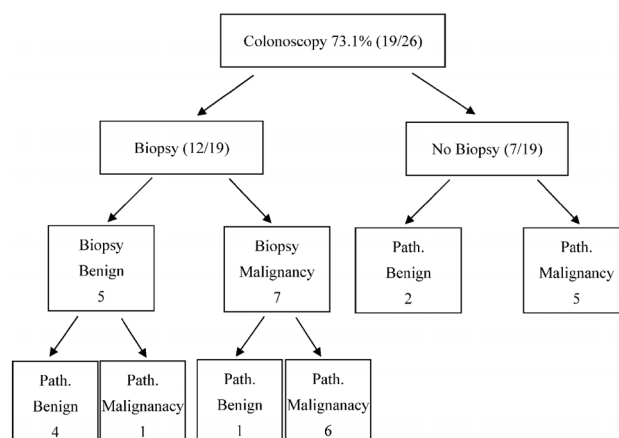
tomy, and 21 patients received radical surgery. Of 21 patients, 16 underwent right hemicolectomy, 2 left hemicolectomy, 2 radical proctectomy, and 1 with sigmoidorectal intussusception underwent radical sigmoidectomy. None of them received the preoperative reduction. Two patients underwent the perioperative reduction (7.7%, 2/26); these 2 patients had ileocolic-type intussusception. While 1 patient with diverticulitis received emergent laparotomy and partial colectomy of the cecum, another patient with cecal cancer underwent emergent right hemicolectomy. Furthermore, 2 patients underwent laparoscopic right hemicolectomy, and they did not report postoperative complications (Table 2).

Furthermore, we noted three postoperative ileus, three wound infections, and one anastomosis leakage in this study. No recurrence of intussusception was recorded during OPD follow-up (Table 5). However, 1 patient died 26 months later after right hemicolectomy because of liver and lung metastasis.

Pathological examinations of 26 intussusceptions revealed that a pathologic leading point occupied 96.2% (25/26), with 64% (16/25) malignant and 36% (9/25) benign, cases. The mean diameter of these lesions was 5.5 (range, 2.5-11) cm. The one non-lesion occupied intussusception was cecum acute suppurative inflammation. In addition, the overall malignant ratio was 61.5% (16/26). Fifteen patients checked the CEA level preoperatively, and most patients had a normal preoperative CEA level (< 5 ng/mL; 73.3%, 11/15).

Discussion

Typically, the uncommon clinical entity and non-specific presentation render the diagnosis of adult colonic intussusceptions difficult. The clinical presenta-

**Fig. 1.** Perioperative colonoscopy survey.**Table 5.** Postoperative complication

Mortality & morbidity	No. of cases	Ratio (%)
Ileus	3	11.5
Wound infection	3	11.5
Anastomosis leakage	1	3.8
Dead	0	0.0

tion in adult colonic intussusceptions is often chronic or subacute, and most patients present with nonspecific symptoms that are suggestive of intestinal obstruction.^{2,7} In this study, the leading symptom was abdominal pain, followed by nausea, vomiting, and diarrhea; other symptoms appeared only in a few patients. These findings corroborate previous studies²⁻⁷ in which the abdominal pain is the most reported symptom.

Several image examinations could facilitate finding colonic lesions and locate the site of obstruction preoperatively. Typically, plain abdominal X-rays are the first-choice imaging tool. However, none of our patients was diagnosed with colonic intussusception by plain abdomen X-rays or KUB preoperatively.

Ultrasonography has usually been used to evaluate suspected intussusceptions in pediatric patients. The classic features include the “target and doughnut sign” on the transverse view and the “pseudokidney sign” in the longitudinal view. The major disadvantage of ultrasonography is masking by gas-filled loops of the bowel, and obesity would also interfere with the image interpretation. In addition, the procedure depends on the operator.⁶⁻¹⁰ Gupta reported that in pa-

tients with a palpable abdominal mass, the diagnostic accuracy of ultrasonography would increase significantly,² whereas our study did not demonstrate this tendency.

Contrast studies reported high diagnostic accuracy. Colon series in this study reported 50% diagnostic accuracy, and abdominal CT presented 96% (Table 4) diagnostic accuracy. Barium studies is contraindicated if there is a possibility of bowel perforation or ischemia.⁷ In our study, abdominal CT proved to be the most useful tool for the diagnosis of colonic intussusceptions. Reportedly, the diagnostic accuracy of CT was 58%-100%, especially in recent series,^{4,5,7} CT could provide more information, such as distant metastasis and lymphadenopathy, if intussusceptions are caused by malignant tumors.

In addition, colonoscopy is a useful tool for evaluating intussusceptions. All our patients who received colonoscopy found the colonic leading lesions of intussusception. We identified the location of the leading point at the same time. However, it might not be advisable to perform endoscopic biopsy or polypectomy in patients with long-term symptoms because of the high risk of perforation.⁵ In this study, all elective operation patients received an endoscopic biopsy, and colonoscopy demonstrated high sensitivity (85.7%, 6/7) and specificity (80%, 4/5; Fig. 1).

Nevertheless, the optimal management of adult intussusception remains controversial. Most debates focus on the issue of primary *en bloc* resection compared with initial reduction followed by a more limited resection. Reportedly, primary *en bloc* resection is the suggestive method because of the high incidence of underlying colonic malignancy.^{1,5-9} Notably, the reduction of intussusception secondary to a malignant lead point is potentially detrimental, as there is a theoretical risk of intraluminal seeding and venous embolization in regions of ulcerated mucosa. Besides, the possibility of large-bowel perforation and anastomotic complications (the bowel wall might be weakened during manipulation) were also potential risks.^{1,7-10} Meanwhile, the radical operation is the better strategy than the partial bowel resection in adult colonic intussusception.

The intussusception occurred in the large bowel

accounting for 60%-80% malignant etiology.^{1,5,9-11} The ability to differentiate malignant from benign etiology provides required information preoperatively. The binary logistic regression analysis confirmed statistically that the sex of patients was an independent predictor of malignancy in adult colonic intussusception. Female patients were more susceptible to malignant lesions; however, other studies did not present this tendency. The bias could be associated with the limited case number. In addition, a low hemoglobin level and anemia (male < 13 g/dL; female < 12 g/dL) were another risk factors for malignancy in the intussusception. Moreover, the large lesion size was a malignancy predictive factor in adult colonic intussusception as well in our study ($p < 0.05$; Table 6). Compared with the study, Goh and Quah reported that the presence of anemia and the site (colon) of intussusception exhibited significant differences between the benign and malignant group.⁵ Different from other studies, our study patients were all colonic intussusception, and the site of intussusception did not reveal statistical significance.

We reported two laparoscopic-assisted operations in this study. Both patients tolerated the operation well and did not exhibit major postoperative complications. Currently, minimally invasive techniques have been applied to the treatment of small or large bowel obstructions. Laparoscopy could be a diagnostic and therapeutic tool for selected cases of adult colonic intussusception. The long-term safety of laparoscopic resection of colorectal cancer is well established, and laparoscopic surgery could be an option for elderly patients, because it is less invasive.¹ In addition, the choice of laparoscopic or open approach depends on the

Table 6. Pre-operative predictive factors of malignant lesions

	<i>p</i> -value
Age	0.516
Gender	0.031
Hb	0.012
Anemia	0.014
Lesion site (cecum/other)	0.756
Lesion size (cm)	0.029
Surgical timing (elective/emergency)	0.769
Duration (mo)	0.435
Palpable mass	0.999

clinical condition of patients, the location and extent of intussusception, the possibility of underlying disease, and the availability of surgeons with adequate laparoscopic expertise.^{7,12}

Although the exact mechanism remains unknown, it is believed that any lesion in the bowel wall or irritant within the lumen that alters the normal peristaltic activity could initiate invagination. In addition, ingested food and the subsequent peristaltic activity of the bowel produce an area of constriction above the stimulus and relaxation below, thereby telescoping the lead point (intussusceptum) through the distal bowel lumen (intussusciens). Furthermore, the most common locations are at the junctions between freely moving segments and retroperitoneally or adhesioneally fixed segments.⁷

Conclusions

Adult colonic intussusception is an uncommon situation, and most adult colonic intussusception cases present with abdominal pain. In addition, adult colonic intussusception is mostly secondary to malignant lesions. Abdominal CT is the most effective and accurate diagnostic technique. Colonoscopy is a reliable procedure to confirm colonic lesions preoperatively. The suggested treatment strategy is radical surgery without the preoperative reduction because of the high incidence of malignancy. Moreover, sex (female patients), anemia (low Hb level), and large lesion size are independent preoperative predictors of malignancy. Laparoscopic-assisted surgery could be performed in selected patients.

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原 著

成人大腸腸套疊

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目的 此研究的目的，藉由分析本院過去關於關於成人大腸腸套疊的案例，以分析臨床特徵、診斷、適當的處置以及惡性病灶的預測因子。

方法 從 2004 年 2 月到 2018 年 1 月，這十四年來在馬偕醫院共有 26 位年齡超過 18 歲的成人大腸腸套疊患者被診斷，我們應用第 22 版的統計分析軟體 SPSS，並使用二元羅吉斯迴歸分析以分析統計我們的臨床醫學數據。

結果 腹部電腦斷層掃描確認了 96.2% 患者的腸套疊診斷，而最常見的臨床症狀是腹痛。在我們的研究中，19 個有接受大腸鏡檢查的病人，其大腸病灶皆可經由大腸鏡檢觀察到；大部分患者的手術病理結果為惡性，我們研究中沒有任何病人接受術前的腸套疊復位，而有兩位病人在手術中有做腸套疊的復位。患者的性別、貧血以及病灶尺寸對於惡性病理的預測，有統計學上的意義。

結論 成人腸套疊大部份的術前診斷是藉由腹部電腦斷層確診，而術前的大腸鏡對於大腸病灶的確認是個可靠的檢查；由於成人族群的高惡性率，根除性手術並且不做術前的套疊復位，為比較建議的治療；根據統計結果，女性、貧血及大尺寸病灶的腸套疊患者，其病理報告較可能為惡性；而我們也可以在適當的案例，選擇以腹腔鏡做根除性手術。

關鍵詞 成年人、大腸的、腸套疊、惡性的。