Research Square

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Diagnostic Pitfalls and Management Patterns of Pediatric Right-Sided Colonic Diverticulitis: A Single-Center Retrospective Study

Hao Shi
Shanghai Children's Hospital
Jing Xiong
Shanghai Children's Hospital
Qiongqiong Ji
Shanghai Children's Hospital
Xiang Ren
Shanghai Children's Hospital
Jiangbin Liu
Shanghai Children's Hospital
Zhibao Lv
Shanghai Children's Hospital
Haifa Hong
Shanghai Children's Hospital
Ting Xu
xtingxu@163.com

Shanghai Children's Hospital

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Abstract

Objective

To characterize the clinical features, imaging findings, and management patterns of pediatric right-sided colonic diverticulitis (rsCD), identify common diagnostic pitfalls, and summarize institutional experience that may improve diagnostic accuracy and clinical decision-making.

Methods

This retrospective study reviewed pediatric patients diagnosed with rsCD at a tertiary pediatric medical center between January 2018 and December 2025. To explore factors that may contribute to operative decision-making under diagnostic uncertainty, we developed an exploratory four-item composite framework, with each factor assigned 1 point. A group consisting of patients with uncomplicated appendicitis (UA) and complicated appendicitis (CA) was included for comparative analysis.

Results

A total of 26 pediatric patients with rsCD were included in the main analytic cohort. Most patients had no symptoms other than abdominal pain. Diarrhea was observed in only three patients (11.5%). Preoperative diagnostic accuracy was low, with rsCD suspected in only three patients (11.5%). Modified Hinchey classification showed localized inflammation (type Ia/Ib) in 21 patients (80.8%). Analysis of contributors to management deviation showed that most patients (84.6%) had a cumulative score of 2 or higher. Laparoscopic diverticulectomy was performed in 13 patients (50.0%), laparoscopic conversion to open ileocecal resection in 4 (15.4%), and laparoscopic peritoneal lavage in 5 (19.2%). Appendectomy was performed in 17 patients (65.4%). All patients recovered without major postoperative complications. In exploratory comparative analysis, rsCD patients were similar to UA patients in inflammatory markers, pediatric appendicitis score (PAS) ($P = 0.219$), and fecalith prevalence ($P = 0.279$). Compared with CA patients, rsCD patients had lower inflammatory markers ($P < 0.05$), a lower PAS category ($P = 0.032$), fewer associated symptoms ($P < 0.001$), and a shorter length of stay (9.6 ± 2.6 vs. 12.3 ± 2.1 days, $P < 0.001$).

Conclusions

Pediatric rsCD is a rare condition with nonspecific clinical manifestations that frequently overlap with common causes of pediatric acute abdomen. Improved awareness and a short period of active observation in selected stable patients may help reduce diagnostic pitfalls and optimize clinical decision-making.

1. Introduction

Colonic diverticulitis (CD) is traditionally considered a common condition among older adults in Western industrialized countries and has long been attributed to Western lifestyle patterns[1]. However, over the past two decades, the epidemiology of CD has shifted. Clinical data indicate that the global prevalence of CD has increased, particularly in Eastern countries, accompanied by a notable trend toward younger age at onset[2]. This change is thought to be associated largely with the westernization of diet and lifestyle.

In the pediatric population, CD has historically been regarded as rare, as children and adolescents were believed to be at minimal risk[3]. Nevertheless, an increasing number of sporadic cases have recently been reported in this age group. The pathogenesis of CD remains incompletely understood but is thought to involve fecal stasis, alterations in the intestinal microbiota, chronic inflammation, and neuromuscular changes[4]. CD has also been associated with several risk factors, including obesity, increasing age, male sex, alcohol consumption, physical inactivity, a low-fiber diet, and smoking[5].

CD is typically located on the left side of the colon, and right-sided CD (rsCD) accounts for only 1.5-5% of all cases in Western populations. In Asian populations, however, more than 70% of CD cases are reported to involve the right colon, based on data from South Korea and Japan[6, 7]. rsCD may affect any region of the right colon, extending from the appendix to the ascending colon, and most frequently involves the cecum[8]. Most patients remain asymptomatic. However, when diverticula become inflamed, patients may present with right or left lower quadrant abdominal pain, fever, and peritonitis[9]. These manifestations, especially right lower quadrant abdominal pain, overlap with other pediatric acute abdominal conditions, such as appendicitis, mesenteric lymphadenitis, and Meckel's diverticulitis.

Owing to its nonspecific clinical presentation and limited awareness among pediatric surgeons, rsCD is frequently misdiagnosed, which may subsequently influence clinical management. No standardized guidelines tailored to pediatric rsCD are currently available, and data on rsCD in children and adolescents remain scarce. Therefore, this study reviewed our institutional experience with pediatric rsCD at a tertiary children's hospital in China, focusing on demographic and clinical characteristics, imaging findings, therapeutic strategies, outcomes, and diagnostic challenges encountered in clinical practice.

2. Methods

2.1 Study Design and Study Population

This retrospective study was conducted in the Department of General Surgery at Shanghai Children's Hospital, a tertiary pediatric medical center. Patients diagnosed with rsCD between January 2018 and December 2025 were included. This study was approved by the Ethics Committee of Shanghai Children's Hospital.

For exploratory comparison, a control group was selected from patients diagnosed with uncomplicated appendicitis (UA) or complicated appendicitis (CA) between November 2025 and December 2025, with 20 cases included in each subgroup. UA was defined as inflammation confined to the appendix without perforation, gangrene, abscess, phlegmon, or diffuse purulent peritonitis. CA was defined as the presence of one or more of the following: visible fecalith, perforation, gangrenous changes, abscess or phlegmon, or diffuse purulent peritonitis[10]. The Pediatric Appendicitis Score (PAS) was calculated and categorized as low (0-3), intermediate (4-6), or high (7-10) probability of appendicitis[11, 12].

2.2 Data Collection

Clinical data were retrospectively collected from the electronic medical record system, including demographic characteristics, clinical presentation, laboratory findings, imaging modalities and radiological conclusions, preoperative clinical diagnosis, surgical procedures, postoperative complications, and length of stay. Associated symptoms, including fever, vomiting, and diarrhea, were recorded as a cumulative count for each patient.

In the rsCD group, the final diagnosis was confirmed based on imaging findings and/or intraoperative evidence. To quantify clinical resemblance to appendicitis, an analogous PAS based on recorded clinical information was calculated for each rsCD patient and referred to as a pseudo-PAS. This score was used only as a descriptive measure. A modified Hinchey classification was also used to categorize disease severity[13]:

Stage 0: mild clinical diverticulitis.

Stage Ia: confined pericolic inflammation.

Stage Ib: confined pericolic abscess.

Stage II: pelvic or distant intra-abdominal abscess.

Stage III: generalized purulent peritonitis.

Stage IV: fecal peritonitis at presentation.

In addition, we developed an exploratory composite framework to evaluate potential contributors to operative decision-making under diagnostic uncertainty. Each item was assigned a value of 0 or 1 point, resulting in a total score ranging from 0 to 4 for each patient. The four contributing factors were defined as follows:

1. Unreliable clinical history: migratory pain recorded after leading questions.

2. Nonspecific presentation: pseudo-PAS≥4.

3. Suggestive radiology reports: preoperative imaging reports that explicitly suggested appendicitis or another disease (e.g., Meckel's diverticulum), or described an appendicolith-like finding.

4. Risk-averse decision-making in emergency settings: presentation during off-hours, defined as 17:00-08:00 on weekdays or any time on weekends/holidays.

2.3 Statistical Analysis

All statistical analyses were performed using SPSS version 29.0. Continuous variables are presented as mean ± SD or median with interquartile range (IQR), as appropriate. Categorical variables are presented as n (%). Group differences were assessed using Student's t test, the Mann-Whitney U test, the chi-square test, or Fisher's exact test, as appropriate. A two-sided P value <0.05 was considered statistically significant.

3. Results

3.1 Patient Characteristics and Clinical Presentation

A total of 30 patients with rsCD were identified during the study period. Four patients treated with intravenous antibiotics alone were excluded from the cohort, leaving 26 patients for analysis. There were 13 males (50.0%), with a mean age of 10.1 ± 3.0 years and a mean BMI of 17.5 ± 3.1 kg/m² (Table 1). The initial presentation was abdominal pain in all patients. However, associated symptoms were uncommon. Only 8 patients (30.8%) presented with one or more associated symptoms, such as fever or vomiting. Notably, diarrhea, a manifestation commonly associated with diverticular disease in adults, was observed in only 3 patients (11.5%).

3.2 Diagnostic Evaluation

Laboratory analysis showed mildly elevated inflammatory markers, with a mean WBC count of 12.7 ± 3.4 × 10^9/L and a mean C-reactive protein (CRP) level of 28.2 ± 22.0 mg/L. Procalcitonin (PCT) levels remained relatively low, with a median of 0.055 ng/mL (IQR, 0.040-0.085). Based on pseudo-PAS, 12 patients (46.2%) were categorized as high probability of appendicitis (score≥7), whereas the remaining 14 patients (53.8%) had low-to-intermediate scores (score 0-6).

Regarding radiological assessment, all patients underwent preoperative imaging with ultrasound and/or CT, and 22 patients (84.6%) underwent both modalities. A prominent radiological feature was the presence of fecalith-like findings, which were identified in 17 patients (65.4%). Modified Hinchey classification was determined by retrospective review of preoperative CT images after the final diagnosis had been established. Most patients had localized inflammatory changes: 11 (42.3%) were classified as type Ia (Fig. 1a-b), and 10 (38.5%) as type Ib (Fig. 1c-d). More advanced disease was uncommon, with type II identified in 3 patients (11.5%) and type III in 2 patients (7.7%) (Fig. 1e-h). No fecal peritonitis was observed. Despite the high rate of imaging, preoperative recognition remained challenging. rsCD was suspected preoperatively in only 3 patients (11.5%). Most patients (73.1%) were initially diagnosed with

appendicitis. Other presumptive diagnoses included Meckel's diverticulum in 2 patients (7.7%), epiploic appendagitis in 1 (3.8%), and colonic duplication in 1 (3.8%).

3.3 Management and Decision-Making Analysis

Thirteen patients (50.0%) were managed with laparoscopic diverticulectomy alone. Reflecting the complexity of some cases, 4 patients (15.4%) underwent conversion to open diverticulectomy, and another 4 (15.4%) underwent conversion to open ileocecal resection. Less invasive strategies were also used in 5 patients: 3 patients (11.5%) underwent laparoscopic peritoneal lavage with mass biopsy, and 2 (7.7%) underwent laparoscopic peritoneal lavage alone. Concomitant appendectomy was performed in 17 patients (65.4%). Abdominal drainage was placed in 13 patients (50.0%). The overall length of stay was 9.6 ± 2.6 days. All patients recovered without major postoperative complications.

To explore factors associated with intervention decisions under diagnostic uncertainty, we calculated the exploratory contributor score for each patient. Most patients (84.6%) had a cumulative score 2 or higher. Specifically, 17 patients (65.4%) scored 2 points, and 5 (19.2%) scored 3 points. Only 4 patients (15.4%) had one contributing factor.

3.4 Comparative Analysis

There were no statistically significant differences in sex, age, BMI, or off-hours presentation among the three groups (Table 2). Compared with the UA group, rsCD patients had similar inflammatory profiles. There were no significant differences in WBC count (P = 0.063), CRP level (P = 0.062), or PCT level (P = 0.661). Similarly, no significant differences were observed in PAS category (P = 0.219) or fecalith prevalence on imaging (P = 0.279). However, clinical presentation differed. A significantly higher proportion of rsCD patients had no associated symptoms compared with UA patients (P = 0.016). Despite the milder presentation, the mean length of hospital stay for rsCD patients was significantly longer than that for UA patients (9.6 vs. 5.6 days, P < 0.001), reflecting a more complex surgical recovery or management course.

Compared with the CA group, rsCD appeared to be a less severe inflammatory condition. The rsCD group had significantly lower WBC count (P < 0.001), CRP level (P = 0.002), and PCT level (P = 0.023). Clinically, rsCD patients were less likely to have a high-probability PAS category (P = 0.032) and had fewer associated symptoms (P < 0.001). Correspondingly, the length of stay was significantly shorter in rsCD patients than in CA patients (9.6 vs 12.3 days, P < 0.001).

4. Discussion

In this study, we retrospectively analyzed pediatric rsCD from the perspective of diagnostic difficulty and management decision-making. Our findings indicate that, because of its nonspecific clinical presentation and substantial overlap with other common acute abdominal conditions, pediatric rsCD is frequently directed toward operative management in real-world clinical practice. Importantly, these findings should

not be interpreted as evidence of individual negligence or uniformly inappropriate management. Rather, they reflect a diagnostic dilemma created by misleading clinical features, imaging ambiguity, and the need for risk control in emergency settings.

From a patient-related perspective, limitations in symptom description among pediatric patients create a diagnostic barrier. Children and adolescents often have difficulty describing the character, precise location, and temporal evolution of abdominal pain. This challenge is further complicated during history taking. Responses may be influenced by leading questions, resulting in false affirmative answers that obscure the clinical picture. Therefore, migratory pain, a key feature of appendicitis, may be difficult to elicit reliably in routine pediatric practice, making differentiation between rsCD and appendicitis challenging.

From an imaging perspective, the low incidence of pediatric rsCD may limit the experience of pediatric radiologists, and image interpretation may be biased toward evaluating the appendix[14]. A fecalith within an inflamed diverticulum may be interpreted as an appendicolith, thereby reinforcing a presumptive diagnosis of appendicitis and obscuring the possibility that the finding originates from an inflamed colonic diverticulum[15, 16]. In our cohort, 65.4% of patients had fecalith-like findings, and comparative analysis showed no statistically significant difference from either the UA or CA group. The diagnostic challenge is further increased when secondary inflammatory changes, including bowel wall thickening, exudation, abscess, and fat stranding, obscure local anatomy and make the exact origin of pathology difficult to identify. Because CT is not the first-line imaging examination for all children with right lower quadrant abdominal pain, the need to balance diagnostic yield against radiation exposure may also limit early recognition in selected patients[17–19].

From a surgeon-related perspective, clinical decision-making is frequently influenced by the interplay of time pressure and limited resources. Across the three groups, many patients presented during off-hours, when resource limitations may converge with defensive medicine[20, 21]. In this context, concern regarding severe adverse outcomes, including sepsis and gastrointestinal perforation, may lower the threshold for operative exploration. Objective clinical parameters may also support this inclination, because our analysis showed that rsCD closely resembled UA in inflammatory markers and PAS category. In addition, anchoring bias toward appendicitis may develop in routine clinical practice, particularly when radiology reports are suggestive of appendicitis. Even when rsCD is considered, pediatric patients often lack symptoms commonly seen in adults, such as diarrhea or changes in bowel habits; when present, these symptoms may be attributed to gastroenteritis or dietary factors[22]. The clustering of higher exploratory contributor scores suggests that the management pathway was usually not driven by a single factor but by the combined effect of multiple sources of diagnostic uncertainty.

Several surgical options have been described for rsCD, including simple lavage, appendectomy, diverticulectomy, and more extensive ileocecal resection. These procedures can be performed laparoscopically in selected patients. In adults, extensive resection is usually reserved for cases in which malignancy cannot be excluded or infection is widespread[4, 13, 23]. However, these situations are rare in

children, and adult management experience should not be applied directly to pediatric patients. When rsCD is encountered intraoperatively while mimicking appendicitis, systematic intraoperative exploration is often more important than the extent of resection itself. Based on our current experience, laparoscopic diverticulectomy with appendectomy is our preferred strategy when procedure is technically feasible. This approach preserves the ileocecal valve and avoids the potential risk of malabsorption associated with ileocecal resection[3].

Although our retrospective data showed variation in appendectomy practice, concomitant appendectomy may be considered for the following reasons. First, localized inflammation associated with diverticulitis may extend to the adjacent appendix and cause secondary appendiceal inflammation. Second, removal of the appendix may simplify future diagnostic evaluation if right lower quadrant pain recurs[24].

To address these challenges, raising awareness among pediatric surgeons and radiologists is a fundamental first step. rsCD should be included in the differential diagnosis of right lower quadrant abdominal pain, particularly in adolescents and Asian populations. In selected stable patients without generalized peritonitis, a short, goal-directed period of observation with active monitoring may be considered. Dynamic reassessment of physical signs, combined with targeted imaging re-evaluation when necessary, may help avoid premature escalation while maintaining patient safety.

This study has several limitations. First, the sample size was relatively small, which is largely attributable to the low incidence of rsCD in the pediatric population. Second, the retrospective design is inherently susceptible to selection bias and incomplete documentation. Third, the appendicitis control group was selected from a shorter time window than the rsCD cohort, which may introduce selection bias. Finally, as a single-center study, our findings reflect local practice patterns and may have limited generalizability.

5. Conclusions

rsCD is a rare but clinically relevant cause of acute abdomen in the pediatric population. Its presentation frequently overlaps with acute appendicitis, particularly UA. Unreliable clinical history, nonspecific clinical presentation, suggestive radiology reports, and off-hours presentation may predispose clinicians toward early operative management in routine practice. Improved awareness among pediatric surgeons and radiologists may help reduce diagnostic pitfalls and optimize clinical decision-making.

Abbreviations

CD, colonic diverticulitis; rsCD, right-sided colonic diverticulitis; UA, uncomplicated appendicitis; CA, complicated appendicitis; PAS, Pediatric Appendicitis Score; BMI, body mass index; WBC, white blood cell; CRP, C-reactive protein; PCT, procalcitonin; IQR, interquartile range; CT, computed tomography.

Declarations

Ethics Approval

This study was approved by the Ethics Committee of Shanghai Children's Hospital. Institutional Review Board approval was obtained with a waiver of informed consent for this retrospective review.

Declaration of Generative AI and AI-Assisted Technologies in the Manuscript Preparation Process

During the preparation of this work, the authors used Gemini 3.0 Pro (Google) to assist with language editing and organization. The authors reviewed and edited all content and take full responsibility for the final manuscript.

Author Contribution

H.S. and J.X. conceptualized the study. QQ.J. and X.R. performed the formal analysis and prepared the visualizations. H.S. and T.X. wrote the main manuscript text. T.X. and JB.L. reviewed and edited the manuscript. HF.H. and ZB.L. supervised the study. All authors reviewed and approved the final manuscript.

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Tables

Table 1 Clinical characteristics of patients with rsCD

Characteristic	rsCD group (N=26)
Sex, n (%)	
Male	13 (50.0%)
Female	13 (50.0%)
Age (year)	10.1±3.0
BMI (kg/m²)	17.5±3.1
Initial symptoms, n (%)	
Abdominal pain	26 (100.0%)
Off-hours visit, n (%)	16 (61.5%)
Associated symptoms, n (%)	
0	18 (69.2%)
≥1	8 (30.8%)
WBC ($\times 10^9$/L)	12.7±3.4
CRP (mg/L)	28.2±22.0
PCT[a] (ng/mL)	0.055 (0.04, 0.09)
Pseudo-PAS, n (%)	
0-6	14 (53.8%)
≥7	12 (46.2%)
US and CT, n (%)	22 (84.6%)
Fecalith on imaging, n (%)	17 (65.4%)
Modified Hinchey classification, n (%)	
Ia	11 (42.3%)
Ib	10 (38.5%)
II	3 (11.5%)
III	2 (7.7%)
IV	0 (0.0%)
Initial diagnosis, n (%)	
Appendicitis	19 (73.1%)
Diverticulitis	3 (11.5%)

Meckel's diverticulum	2 (7.7%)
Epiploic appendagitis	1 (3.8%)
Colonic duplication	1 (3.8%)
Surgical approach, n (%)	
Laparoscopic diverticulectomy	13 (50.0%)
Laparoscopic converted to open diverticulectomy	4 (15.4%)
Laparoscopic peritoneal lavage + mass biopsy	3 (11.5%)
Laparoscopic peritoneal lavage	2 (7.7%)
Laparoscopic converted to open ileocecal resection	4 (15.4%)
Appendectomy, n (%)	17 (65.4%)
Drainage, n (%)	13 (50.0%)
Length of stay (days)	9.6±2.6
Exploratory contributor score, n (%)	
1	4 (15.4%)
2	17 (65.4%)
3	5 (19.2%)
4	0 (0.0%)

rsCD, right-sided colonic diverticulitis; BMI, body mass index; WBC, white blood cell; CRP, C-reactive protein; PCT, procalcitonin; PAS, Pediatric Appendicitis Score; US, ultrasound; CT, computed tomography.

[a] PCT analysis was based on available data (rsCD, N = 20).

Table 2 Comparison of clinical characteristics with UA and CA

Characteristic	rsCD (N=26)	UA (N=20)	P_1	CA (N=20)	P_2
Gender, n (%)			0.77		0.77
Male	13 (50.0%)	9 (45.0%)		9 (45.0%)	
Female	13 (50.0%)	11 (55.0%)		11 (55.0%)	
Age (years)	10.1±3.0	9.2±2.6	0.286	9.0±2.4	0.197
BMI (kg/m²)	17.5±3.1	16.4±2.2	0.167	16.4±2.4	0.196
Off hours visit, n (%)	16 (61.5%)	14 (70.0%)	0.776	13 (65.0%)	0.947
Associated symptoms, n (%)			0.016*		<0.001*
0	18 (69.2%)	6 (30.0%)		2 (10.0%)	
≥1	8 (30.8%)	14 (70.0%)		18 (90.0%)	
WBC ($\times 10^9$/L)	12.7±3.4	14.9±4.5	0.063	18.0±4.6	< 0.001*
CRP (mg/L)	28.2±22.0	18.0±12.4	0.062	52.4±31.1	0.002*
PCT[a] (ng/mL)	0.055 (0.04, 0.09)	0.05 (0.03, 0.18)	0.661	0.12 (0.06, 0.26)	0.023*
PAS, n (%)			0.219		0.032*
0-6	14 (53.8%)	15(75.0%)		4 (20.0%)	
≥7	12 (46.2%)	5 (25.0%)		16 (80.0%)	
Fecalith on imaging, n (%)	17 (65.4%)	9 (45.0%)	0.279	9 (45.0%)	0.279
Length of stay (days)	9.6±2.6	5.6±1.7	< 0.001*	12.3±2.1	< 0.001*

rsCD, right-sided colonic diverticulitis; UA, uncomplicated appendicitis; CA, complicated appendicitis; BMI, body mass index; WBC, white blood cell; CRP, C-reactive protein; PCT, procalcitonin; PAS, Pediatric Appendicitis Score. P1, rsCD vs. UA; P2, rsCD vs. CA.

[a] PCT analysis was based on available data (UA, N = 18; CA, N = 20).

Figures

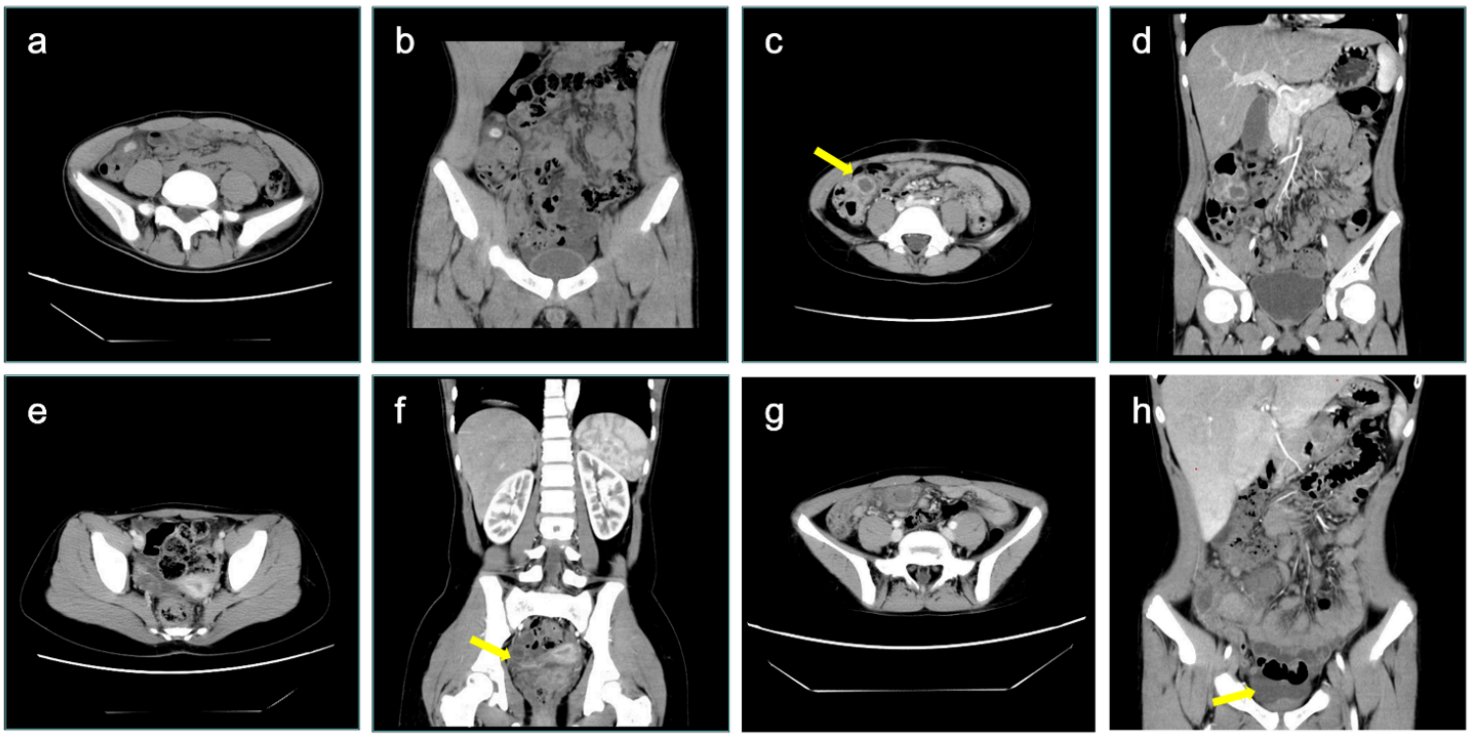


Figure 1

Representative CT images of pediatric rsCD classified according to modified Hinchey classification.a-b: Type Ia, localized pericolic inflammation without abscess formation; c-d: Type Ib, confined pericolic abscess adjacent to the inflamed diverticulum (yellow arrow); e-f: Type II, distant pelvic abscess (yellow arrow); g-h: Type III, generalized purulent peritonitis characterized by free fluid (yellow arrow).