



# CT findings of post-polypectomy coagulation syndrome and colonic perforation in patients who underwent colonoscopic polypectomy



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## ARTICLE INFORMATION

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**AIM:** To investigate the clinical characteristics and computed tomography (CT) findings of post-polypectomy coagulation syndrome (PPCS) and colonic perforation in patients who have undergone colonoscopic polypectomy.

**MATERIALS AND METHODS:** Through a hospital database search, 5542 adult patients (age >40 years) who had undergone colonoscopic polypectomy from January 2011 to November 2014 were identified. After identification of patients with PPCS and colonic perforation, two abdominal radiologists reviewed the CT images of the patients in consensus.

**RESULTS:** Eight patients (0.14%) with PPCS and six patients (0.11%) with perforation were identified. Five patients were excluded for absence of CT examination, leaving four patients with PPCS and five patients with perforation included in the study. Three of the patients with perforation eventually underwent surgery, while all the patients with PPCS completely recovered with conservative management. On CT images, the involved colonic wall was longer and thicker in the PPCS group than in the perforation group. All four patients with PPCS showed a mural defect filled with fluid and stratified enhancement with surrounding infiltration. Two patients, who did not undergo surgery for perforation, did not show surrounding infiltration and fluid collection.

**CONCLUSION:** On CT images, PPCS shows severe mural thickening with a stratified enhancement pattern, a mural defect filled with fluid and surrounding infiltration in addition to absence of extraluminal air. In patients with perforation, absence of CT findings suggestive of surrounding inflammation or peritonitis would help in choosing non-surgical management.

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## Introduction

Colonoscopic polypectomy, which is been known to reduce the incidence and mortality of colorectal cancer, is a

commonly performed procedure after screening colonoscopy.<sup>1,2</sup> Although serious complications are uncommon in colonoscopy performed for an average risk screening patient (2.8 per 1000 screening procedures), polypectomy can increase the incidence of adverse events, such as bleeding and colonic perforation.<sup>3,4</sup>

Post-polypectomy coagulation syndrome (PPCS) is an uncommon complication related to colonoscopic polypectomy with incidences ranging from 0.5% to 1.2%.<sup>3,5–9</sup> This syndrome is characterised by a series of symptoms

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and signs such as abdominal pain, fever, leucocytosis, and peritoneal irritation, which are also seen in patients with colonic perforation and usually develop as early as 12 hours and up to 5 days after colonoscopic polypectomy.<sup>3,8,9</sup> In contrast to colonic perforation, which often requires surgical management, PPCS should be managed conservatively with intravenous hydration, parenteral antibiotics, and fasting.<sup>3,8,9</sup> Therefore, it is important to recognise PPCS and differentiate it from colonic perforation to avoid unnecessary surgery in patients with abdominal symptoms after polypectomy.

PPCS is a known disease entity among gastroenterologists and abdominal radiologists, and there are some reports of complications related to colonoscopic polypectomy including PPCS<sup>3,5,6,8–11</sup> and a review article about imaging findings of its complications<sup>12</sup>; however, to the authors' knowledge, no study has reported the computed tomography (CT) findings of PPCS and colonic perforation in patients who have undergone colonoscopic polypectomy. Thus, the aim of the present study was to investigate the clinical characteristics and CT findings of PPCS and colonic perforation in patients who have undergone colonoscopic polypectomy.

## Materials and methods

### Patient inclusion

The institutional review board approved the study protocol, and informed consent was waived. Through a search of the hospital electronic medical record system for the time period of January 2011 to November 2014 with the search terms "adult patients (age >40 years)" and "colonoscopy and polypectomy", 5542 adult patients who had undergone colonoscopic polypectomy were retrospectively identified.

To identify those patients who developed PPCS and colonic perforation after colonoscopic polypectomy from this set of 5542 patients, their medical records were reviewed with the following inclusion criteria: (a) abdominal pain, fever, and abdominal tenderness within 5 days after colonoscopic polypectomy; (b) colonic perforation detected during the colonoscopic polypectomy procedure; (c) no evidence of other possible diseases with similar presentation, such as appendicitis, diverticulitis, and cholecystitis on clinical and imaging findings; and (d) contrast-enhanced abdominopelvic CT performed within 5 days after colonoscopic polypectomy.

### Diagnosis of PPCS and colonic perforation

The diagnosis of PPCS was made when the patients presented with abdominal pain and fever and showed peritoneal irritation, leucocytosis, and elevated C-reactive protein (CRP) level in the absence of free gas on chest and/or abdomen plain radiography, or abdominopelvic CT examination after colonoscopic polypectomy.<sup>8</sup> The diagnosis of colonic perforation was made when a colonic perforation was noted during the procedure or when either

pneumoperitoneum or pneumoretroperitoneum was noted on chest and/or abdomen plain radiography or CT examination after colonic polypectomy.<sup>8</sup>

### Protocol of abdominopelvic CT examination

Contrast-enhanced CT examinations were performed using 64- ( $n=2$ ), or 256- ( $n=7$ ) detector-row CT machines (Brilliance 64 or iCT256; Philips Medical Systems, Cleveland, OH, USA). Intravenous non-ionic contrast material (2 ml/kg; iomeprol, 350 mg iodine/ml; Iomeron 350; Bracco, Milano, Italy) was administered via the antecubital vein using a power injector (Stellant D, Medrad, Indianola, PA, USA) at a rate of 3 ml/s. Helical scan data were acquired during the portal venous phase using  $64 \times 0.625$  or  $128 \times 0.625$  mm collimation; a rotation speed of 0.5 seconds; and a pitch of 0.644 or 0.993, and 120 kVp. The effective tube current ranged from 125 to 285 mAs using an automatic tube current modulation technique (Dose-Right; Philips Medical Systems). Transverse and coronal section datasets were reconstructed with 4-mm-thick sections at 3-mm increments.

### Data analysis

One investigator (Y.J.S, second-grade radiology resident) reviewed patients' medical records and gathered demographic data and clinical information about patients' past-medical history, symptoms, signs, colonoscopic polypectomy, laparoscopic findings, and follow-up results.

Two abdominal radiologists (Y.H.K. and Y.J.L., with 15 and 4 years of experience, respectively) reviewed the abdominal CT images in a consensual manner at a picture archiving and communication system (PACS) workstation (Infinit, Seoul, Korea). The reviewers assessed the following CT findings: (a) presence and location of extraluminal air; (b) location of the involved colonic segment; (c) pattern, length, and thickness of the involved colonic segment; (d) pattern of enhancement of the involved segment; (e) presence of a mural defect; and (f) presence of surrounding infiltration, fluid collection, and adjacent peritoneal or retroperitoneal fascial thickening.

Colonic wall thickening was defined as a thickness >3 mm. The enhancement patterns of an involved segment were classified as transmural homogeneous enhancement and stratified enhancement. The stratified appearance of a thickened colonic wall was defined as high-attenuating inner and outer layers surrounded by a lower attenuating middle layer of the colon wall (target sign).<sup>13,14</sup>

Because of the small sample size, the two groups were not compared statistically.

## Results

### Patients' demographics and clinical characteristics

Table 1 presents the clinical characteristics of the included patients. Among the 5542 adult patients who underwent colonoscopic polypectomy, eight patients

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