A Case of Colon Cancer Associated with Ulcerative Colitis: Evaluation Using CT Colonography

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(Received May 29, 2015; Accepted June 23, 2015)

A 29-year-old female with ulcerative colitis was found to have advanced sigmoid colon cancer on colonoscopy. Computed tomography (CT) was performed after colonoscopy for the evaluation of metastasis. CT colonography (CTC) could be understood adding carbon dioxide because of soon after colonoscopic examination. Images of CTC were evaluated by two- and three-dimensional images including virtual endoscopic, virtual colon dissection and air images, and then compared with conventional endoscopic images. Virtual endoscopic images of flat elevated cancer with shallow ulcer were similar to those findings by conventional endoscopy. This lesion could be depicted by computer-aided detection.

Key words: Ulcerative colitis, cancer, CT colonography

INTRODUCTION

Patients with inflammatory bowel disease (IBD), particularly those with extensive and long-standing colitis, are at an increased risk of developing colorectal cancer [1–3]. Focal wall thickening, shoulder formation, or large polypoid lesions are suspicious findings for the development of colorectal cancer in patients with ulcerative colitis (UC) [4]. Computed tomography (CT) scans be thoroughly examined patients with long-standing UC for detecting asymmetric mural thickening, focal loss of mural stratification, and mural thickening greater than 1.5 cm, all of which suggest malignancy [5]. Differentiation between inflammatory stenosis in UC and cancer is the domain of endoscopy with biopsy but CT colonography (CTC) may be used as an adjunct in patients in whom the colon cannot be endoscopically accessed [4]. However, there have been few reports on the evaluation of colorectal cancer associated with UC by CTC [4]. On our case, CTC could be performed soon after conventional endoscopy so that images from both tests can be evaluated.

CASE REPORT

A 29-year-old female with a 12-year history of UC was administered for sigmoid colon cancer. She had initially been treated with prednisolone. However, she underwent granulocytopheresis because of steroid-resistant UC of the entire colon. Salazosulfapyrine was administered thereafter. Periodic sigmoidoscopy revealed disease progression and adenocarcinoma was detected around an ulcer lesion on the sigmoid colon wall on biopsy. Total colonoscopy and whole body CT scan for rule out metastasis were performed. CTC could be understood adding carbon dioxide using automatic insufflator soon after endoscopic examination. Contrast material was not used because of a history of asthma. A 128-detector CT scanner (Definition FLASH, Shimens) was used at a tube voltage of 120 kVp, an automatic tube current modulation program for dose reduction, and 0.5-s rotation time. Scanning from the chest to the anal canal was performed during a single breath hold on supine position. We constructed the whole body source images into 1-mm thickness for CTC. Three-dimensional (3D) air images, virtual endoscopic images, fusion images of multiplanar reformatted (MPR) and virtual endoscopic images were reconstructed using a workstation (ZIO Station System, Amin). Additionally, the lesion was evaluated on the basis of virtual colon dissection images using shape analysis filter, which was computer-aided detection (CAD) technique (Hitachi Medical. Co.). Lucent 3D air images showed overall deformity of the colon, whereas solid 3D air images revealed sigmoid colon deformity with ulceration consistent with advanced cancer (Fig. 1a, b). Fusion images of MPR and virtual endoscopic images showed asymmetric thickening of 1 cm on the colon wall and ulcer (Fig. 1c). Virtual endoscopic images as well as conventional endoscopic images showed a flat elevated lesion with ulcer (Fig. 1d, Fig. 2). On virtual colon dissection image with stretch of colon wall at the same width, visualization of the cancer in the stenotic colon was poor due to distension (Fig. 1e). The lesion was clearly seen on virtual colon dissection with the original shape and width of the colon, and the cancer lesion could be depicted using a shape anal-

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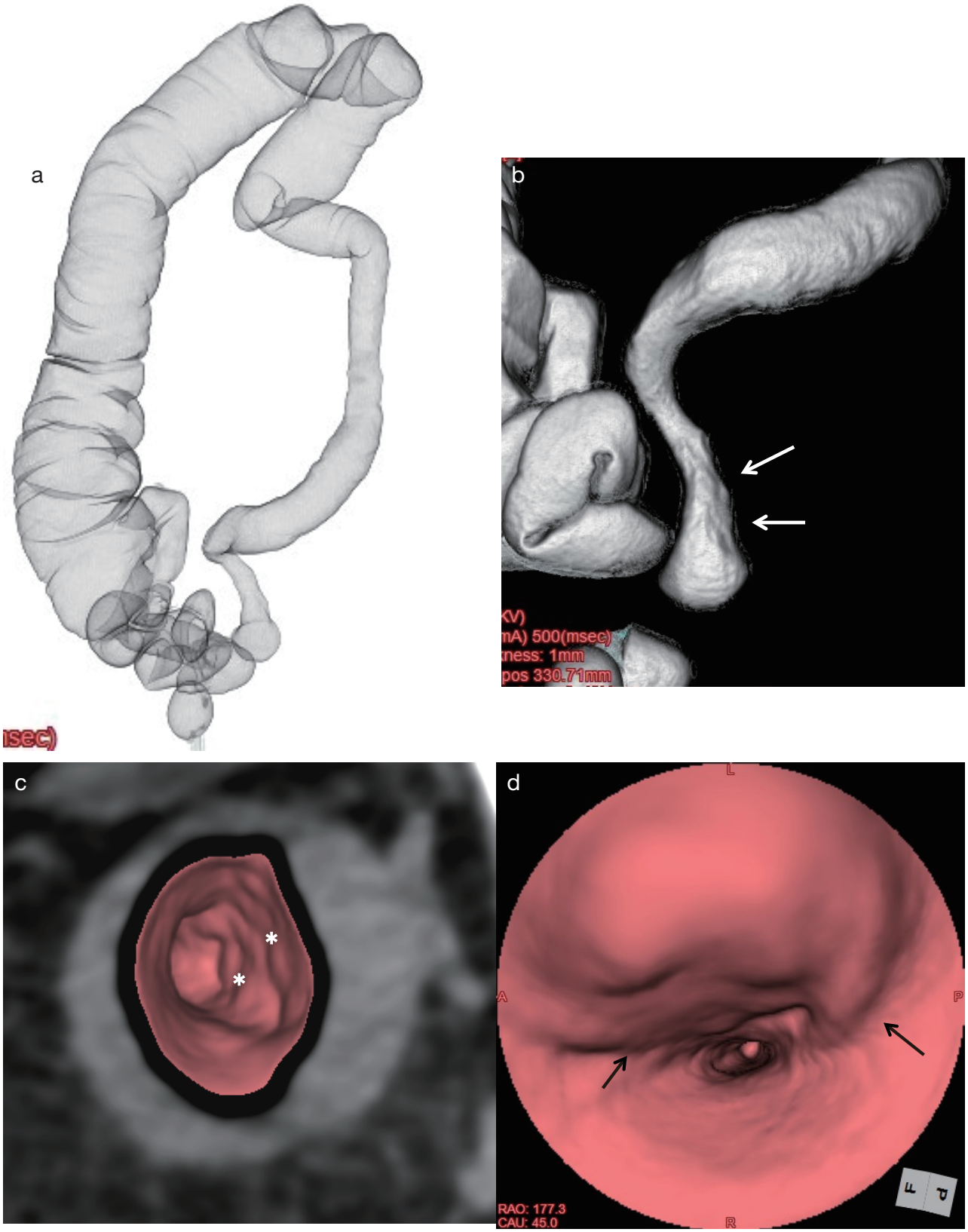

Fig. 1 CT colonographic images
a: Lucent three-dimensional air image showed deformity of the left side of the colon, including stenosis of the sigmoid colon and lead pipe appearance of the descending colon. b: Solid three-dimensional air image showed stenotic deformity with ulcer in the sigmoid colon (white arrows). c: Fusion image of virtual endoscopic and two-dimensional image showed asymmetric colon wall thickening and ulceration on the left side wall (asterisks). d: Virtual endoscopic image showed a flat elevated lesion (black arrows).

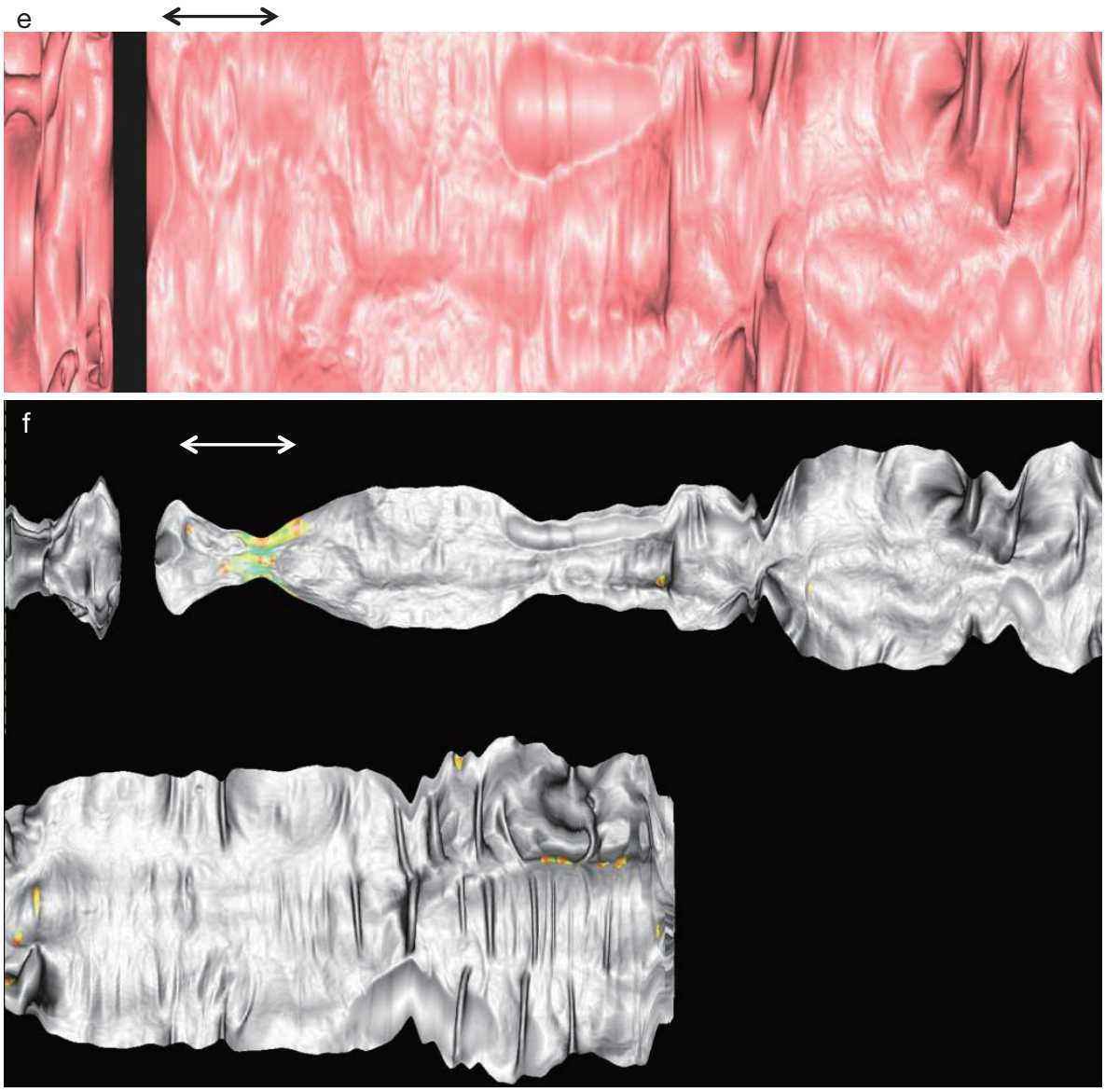

Fig. 1 CT colonographic images (continue)
e: The lesion was detected poorly on virtual colon dissection image with same-width distension of the colonic wall (black both ends arrow). f: Virtual colon dissection image, with the original width of the intestinal tract kept, revealed a flat elevated lesion (white both ends arrow). Shape analysis filter was able to mark the cancer lesion (colored area). Other multiple-pointed color marks showed pseudo-lesions due to feces. Both ends arrows (d, e) showed cancer region.

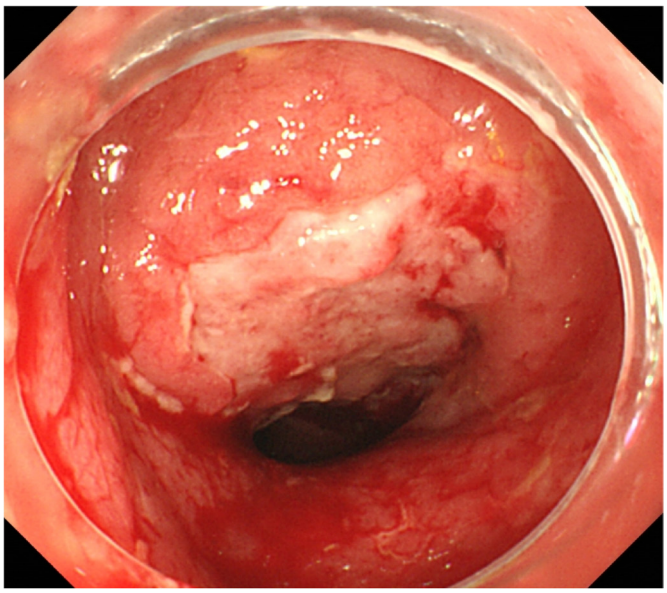

Fig. 2 Conventional colonoscopy
A flat elevated lesion with swollen ulcer was seen on the sigmoid colon.

ysis filter (Hitachi Medical Co.) (Fig. 1f). By CTC and conventional colonoscopy, the lesion was diagnosed as an advanced, flat, elevated cancer with shallow ulceration in the sigmoid colon. There was no metastasis on whole body CT scanning. Proctocolectomy with ileal pouch-anal anastomosis was performed and temporary loop ileostomy was created. The tumor was 4cm in diameter and the lesion was histologically diagnosed as subserous invasive, moderately-differentiated adenocarcinoma; the final diagnosis was type 4 cancer, pT3N0M0 (Fig. 3a–c). UC showed chronic active phase, however there was no dysplasia around the cancer. Ileostomy takendown will be planned in the near future.

DISCUSSION

Colorectal cancer is the most serious complication of IBD [1–3]. The increased cancer risk in long-standing UC has been well-established and was thought to be dependent on duration and extent of disease [1–3]. The risk factors of associated cancer include prolonged disease duration, diagnosis at young age, and coexisting condition of primary sclerosing cholangitis [2, 6]. The most important risk factor is the prolonged disease duration; duration of IBD less than 8 years are uncommon and the median duration of disease to the diagnosis of cancer has been reported 18 years in UC patients with colorectal cancer [2]. In our case, the age of the onset of IBD was 17 years old and the duration of IBD was 12 years. The type of UC is one of the important risk factors for development of colon cancer; the risk in patients suffering from pancolonic and left colonic types is higher than that in those suffering from rectal type [6, 7]. Our patient had left colonic type. Unlike sporadic colorectal cancer, colitis-associated colorectal cancer usually derives from focal or multifocal dysplastic mucosa in the areas of inflammation through an inflammation–dysplasia–carcinoma sequence [8]. To reduce the risk of colorectal cancer in patients with UC, mucosal healing by an adequate therapy is important.

Majority of cancers associated with IBD are colorectal adenocarcinoma, which are more frequently located in the sigmoid colon and rectum [6]. Colorectal cancer associated with UC located in the left colon in 64% cases [2]. On our case location of cancer was in the sigmoid colon.

Several reasons were advocated to explain the failures in the early detection of colorectal cancer in IBD [1, 2, 5, 6]. One reason was that colorectal cancer may develop in an area of stricture which cannot be reached and consequently, cannot be properly evaluated by optical colonoscopy. Another reason is that colorectal cancer associated with IBD may progress in the form of a scirrhous and flat lesion [5, 6, 9]. To discriminate cancer from an inflammatory stenosis in UC can be usually performed by endoscopy with biopsy [4]. However, colorectal cancer associated with IBD may be undetected by standard colonoscopy in some patients because of their appearance. Therefore, it is now recommended to use chromoendoscopy and systemic biopsies to improve diagnostic efficiency [6].

We found only one paper that described the CT appearance of advanced colorectal cancer associated with UC [6]. Hirstova *et al.* reported two different and individualized CT patterns of advanced colorectal cancer associated with IBD, including a clearly visible soft tissue mass or stenosis with a marked inflammation-resembling circumferential thickening; however, because of the small sample size, the specific CT findings of colorectal cancer associated with UC were not described [6].

There were a few reports on CTC being applied for the evaluation of IBD. Andersens *et al.* emphasized the high accuracy of CTC in the detection of chronic IBD findings, with 100% overall sensitivity and specificity [10]. On CTC, the extent of disease was correctly assessed not only endoluminally but also extraluminally. Carrascosa et al reported that CTC findings at the subacute or chronic stage were the irregular thickening of the colonic wall, narrowing of the colonic lumen, presence of pseudopolyps, and loss of haustral folds; these findings could be clearly observed in our case [11].

Findings from imaging techniques suggesting malignancy, such as asymmetric mural thickening, focal loss of mural stratification, and mural thickening greater than 1.5 cm, could be detected more on CTC than on conventional CT without preparation or colonic distension. On our case, detailed evaluation of asymmetric mural thickening and focal loss of mural stratification were depicted on CTC. Especially, on fusion image of virtual endoscopic and two-dimensional images, asymmetric mural thickening with ulceration was clearly seen (Fig. 1c). Our case was diagnosed as type 4 cancer with shallow ulcer using both conventional and virtual endoscopic images, which showed very similar results (Fig. 1d, 2). Overall colonic deformity was seen on lucent 3D air image and colonic deformity with irregular ulceration could be visualized on the solid 3D air image (Fig. 1a, b). The cancer lesion in narrowing area was poorly visualized due to an extension on virtual colon dissection image with same width distension of colon wall, in contrast the same lesion could be detected clearly on the virtual colon dissection image with no change in the original intestinal width (Fig. 1e, f). CAD could detect the cancerous region and marked the non-cancer area with irregular surface opposite side of the cancer. However CAD marked other points such as pseudolesions of feces, and did not detect inflammatory changes. CAD has been used widely for cancer screening by polyp detection but it cannot always depict carpet lesion or flat cancer [12–16]. However, it may be useful in promoting awareness of flat cancer detection, such as in our case.

Andersen *et al.* reported the potential of CTC in the evaluation of patients with IBD, and their analysis emphasized the high accuracy of CTC in detecting chronic IBD findings with 100% overall sensitivity and specificity [8]. However, in the acute stages of UC, the diagnostic abilities of CTC seem questionable. Toxic megacolon, which is commonly seen in UC, represents an absolute contraindication to insufflation of air because of the extreme risk of perforation [3]. Indications for CTC in IBD patients should proceed with caution because of the risk for colonic perforation and radiation dose exposure.

In conclusion, we reported a case of type 4 colon

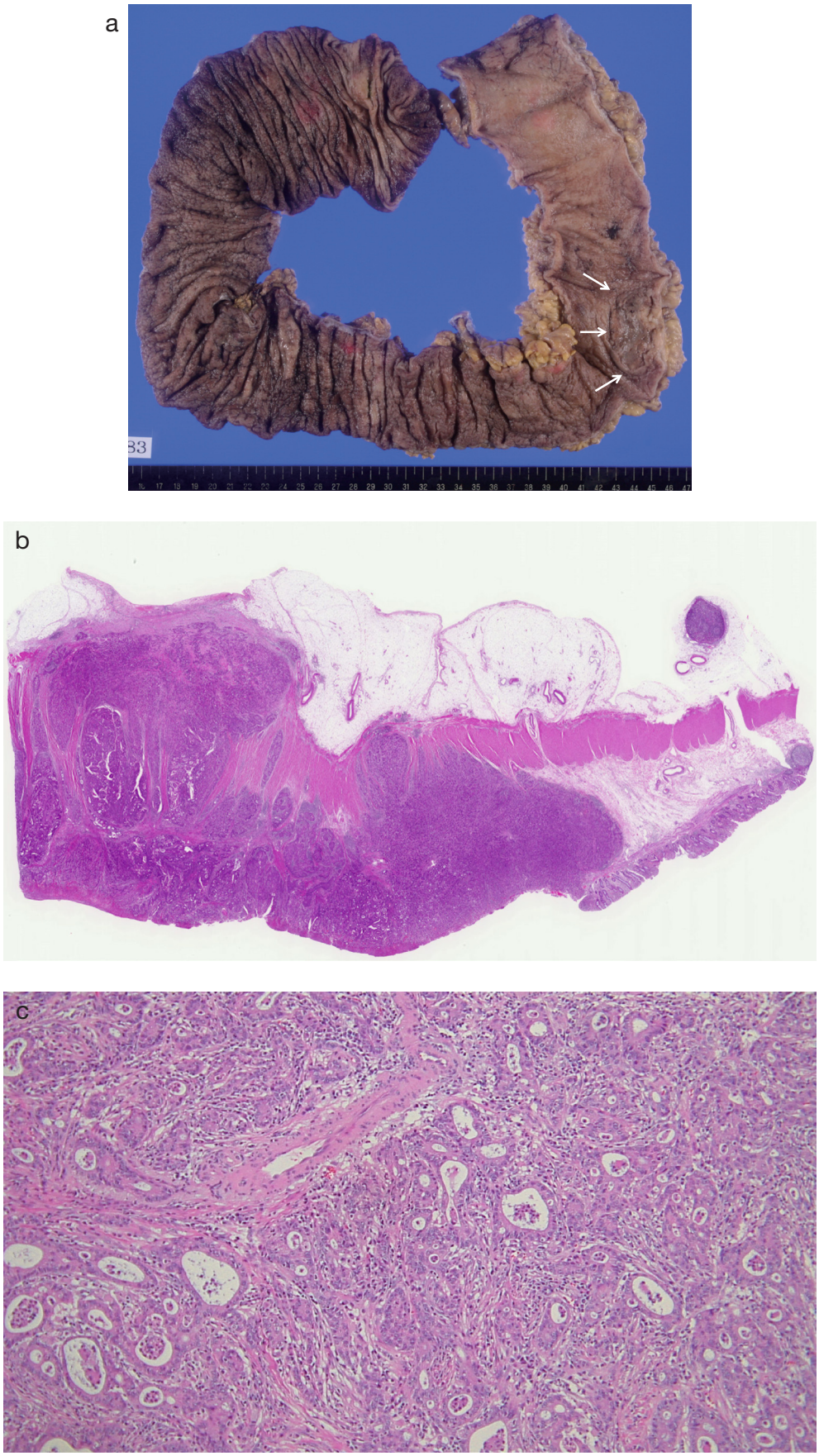

Fig. 3 a. Gross pathologic image showed a flat irregular elevated lesion on the sigmoid colon (white arrows).
b, c. Photomicrographic images of the resected colon cancer (hematoxylin–eosin stain, b: rupe view, c: low power field). Histological diagnosis was subserous invasive, moderately-differentiated adenocarcinoma.

cancer that was associated with UC, and evaluated the CTC findings and compared with those of conventional colonoscopy images and CAD.

ACKNOWLEDGEMENT

We thank Dr. Perry J Pickhardt, Dr. Reiko Kunisaki, Miss Shino Tanaka, Mrs.Yuko Aoki and Mr. Tetsuo Nakazawa for their helps.

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