

CASE REPORT

## 인디아잉크 타투(Tattoo)로 유발된 대장 농양

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### Colonic Abscess Induced by India Ink Tattooing

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Endoscopic tattooing with India ink is generally regarded as a safe procedure that enables ready identification of endoluminal cancer from the serosal surface. However, significant complications have been reported, including local inflammatory pseudotumor formation, peritonitis, rectus muscle abscess, small bowel infarction, and phlegmonous gastritis. Although the mechanism of complication is not completely understood, it may be related to the chemical compounds contained in the ink solution and enteric or extraenteric bacterial inoculation by injection needle or the ink itself. Authors encountered a case of a 60-year-old man with a resectable sigmoid colon cancer which was tattooed with India ink for subsequent localization in the intraoperative setting. During the laparoscopic operation, the proximal and distal margin of the lesion appeared edematous with bluish color. The distal resection margin was extended approximately 5 cm more than expected because of long extent of edematous mucosa. Histologic examination of the edematous tattooing area revealed an ink abscess spreading laterally above the muscularis propria. Although tattooing is widely used and relatively safe, the presented case indicates the risk of infection or inflammation by tattooing. (*Korean J Gastroenterol* 2014;64:45-48)

**Key Words:** Tattooing; Adverse effects; Abscess; Chinese ink

### INTRODUCTION

Precise localization of a lesion of the colon is essential for the operation in order not to resect the wrong segment. Especially in laparoscopic operation, importance of identification is emphasized because palpation is impossible. There have been several methods to facilitate localizing tumors, including double contrast barium enema, intraoperative colonoscopy, preoperative colonoscopy with mucosal metallic clips combined with intraoperative fluoroscopy, or ultrasound.<sup>1-4</sup> However, problems such as radiation, inaccurate localization due to migration or dislodging of met-

allic clips and requirement for specialized equipment make it difficult to apply in the clinical setting.<sup>3</sup>

Endoscopic tattooing is an easy to use and reliable method first introduced in 1958.<sup>5</sup> India ink is usually used and considered to remain constant in the colorectal wall without diffusion through the mesentery.<sup>6,7</sup> Other endoscopic dyes, including methylene blue, indigo carmine, and indocyanine green have a relatively short time span persisting in the colonic wall.<sup>8</sup>

Endoscopic tattooing with India ink is generally regarded as a safe procedure. However, some significant complications have been reported.<sup>9-12</sup> We describe herein a case of ink

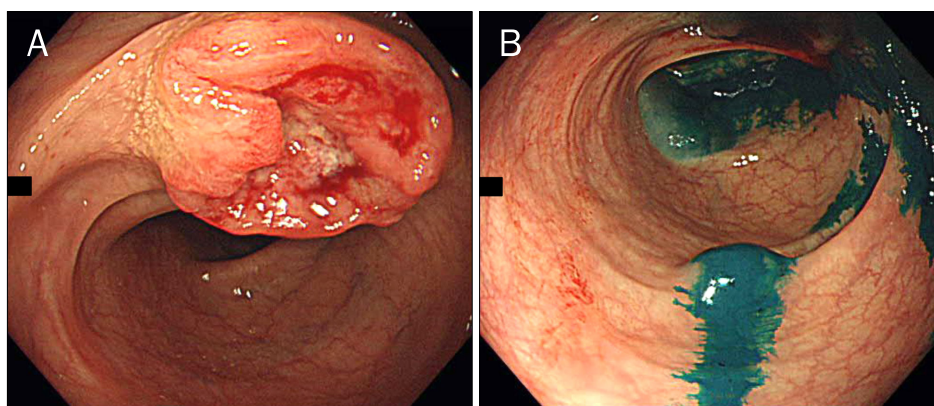
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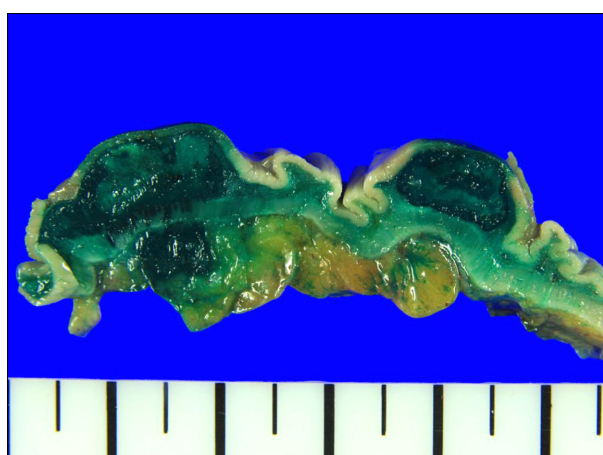
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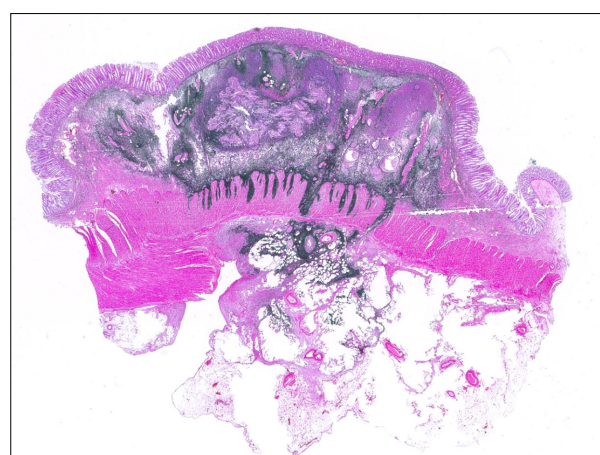
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**Fig. 1.** Colonoscopic India ink tattooing. (A) A 2-cm sized ulcerofungating mass in the mid sigmoid colon. (B) A 1.0-mL submucosal injection was made at the proximal and distal border of the lesion (total of 2.0 mL).



**Fig. 2.** Gross findings. Resected specimen shows two injection sites with edematous mucosa.



**Fig. 3.** Histologic findings. Large collection of polymorphonuclear cells, macrophages, and black pigments in the submucosa. Neutrophils infiltrated into the subserosa, invading muscularis propria (H&E,  $\times 100$ ).

abscess caused by endoscopic tattooing with India ink of sigmoid colon cancer.

## CASE REPORT

A 60-year-old man presented with a chief complaint of decreased stool caliber. He had no specific medical history. On presentation, physical examination was unremarkable. Laboratory tests showed hemoglobin 15.8 g/dL, leukocyte count  $5.89 \times 10^9/L$ , and carcinoembryonic antigen 4.29 ng/mL. Stool occult blood test was positive.

Diagnostic colonoscopy detected a bleeding 2 cm ulcerofungating mass in the mid sigmoid colon (Fig. 1A). Endoscopic biopsy revealed moderately differentiated adenocarcinoma. The lesion was tattooed with India ink tattooing by a faculty doctor for subsequent localization in the intraoperative setting. A 1.0 mL submucosal injection was made at the prox-

imal and distal border of the lesion (total of 2.0 mL), and no immediate complication or symptom was observed (Fig. 1B). There had been no fever or abdominal pain indicating complication of tattooing until the operation. After seven days from tattooing, laparoscopic anterior resection was performed. During the operation, the tattoo marks were clearly visible on the serosal surface of the sigmoid colon. However, the proximal and distal margin of the lesion appeared edematous with a bluish color. The distal resection margin was extended approximately 5 cm more than expected because of long extent of edematous mucosa. The pathology of the surgical specimen was moderately differentiated adenocarcinoma extending into the pericolic soft tissue. Regional lymph node or perineural invasion was not detected. Resection margin was negative and final stage was pT3N0M0.

Histologic examination of the edematous tattooing area

revealed a large collection of polymorphonuclear cells, macrophages, and black pigments in the submucosa. Mucosa was intact, however, neutrophils infiltrated into the subserosa, invading muscularis propria, which was probably induced by a tattooing needle. The entire black pigment area was an ink abscess spreading laterally above the muscularis propria (Figs. 2, 3).

## DISCUSSION

Based on an analysis of 447 colonic tattooing cases from 1966 to 1995, the incidence of complication with India ink tattooing is 0.22%.<sup>13</sup> Significant complications, including local inflammatory pseudotumor formation, peritonitis, rectus muscle abscess, small bowel infarction, peritonitis, and phlegmonous gastritis have been reported.<sup>9-12</sup> However, these complications are considered not related to India ink *per se*, but various organic and inorganic compounds contained in India ink are suspected as the cause of inflammatory responses.<sup>13,14</sup>

Although the mechanism of complication is not completely understood, it may be related to the chemical compounds contained in the ink solution and enteric or extraenteric bacterial inoculation by injection needle or the ink itself.<sup>10</sup> Injection technique, volume, and ink preparation are important factors for safe tattooing.

Various methods have been introduced, but, due to low incidence of complications, only a small number of injection techniques have been evaluated. Conventional tattooing, which involves injecting the dye directly into the colonic wall distal to the lesion has been widely used.<sup>15</sup> Recently, a saline test injection method involving injection of the dye combined with prior and/or subsequent injection of sterile saline into the submucosa was introduced and evaluated.<sup>7,16,17</sup> Although the amount of saline and dye used in tattooing is different from that used in studies, saline test injection method is considered to improve visualization of the dye during operation and safer than the conventional method.<sup>1,16,17</sup> This is because the prior injection of saline bleb ensures that the dye will enter the submucosal layer, preventing deep injection or spillage. Subsequent injection of saline pushes the remaining India ink solution in the needle into the tissue, although some studies omit this step.<sup>16</sup> Despite promising results for the saline injection method, the standard injection technique

has not been established, demanding evidence based studies.

The volume of India ink injected adjacent to the lesion is another factor for a safe procedure. A small volume of dye (0.1 mL to 2 mL) is preferred. According to one study, tattooing using 0.6 to 1.5 mL of India ink per injection showed a 5% spillage rate. When used 1 to 1.5 mL, the spillage rate increased to 9.5%.<sup>18</sup> However, according to a study using the conventional injection method, 1 to 4 mL of India ink was associated with no complications, although spillages were increased relative to injected volume.<sup>19,20</sup>

India ink solution, an off-the-shelf industrial product, has to be sterilized and diluted to prevent infection or inflammatory local reaction; 1 : 10 to 1 : 100 dilution and autoclave sterilization method is usually used. SPOT<sup>®</sup> (GI Supply, Camp Hill, PA, USA), a sterilized and pre-diluted solution approved by the US Food and Drug Administration, can be used.

In the case presented here, sterilized ink, an off-the-shelf industrial product, was used, but with a high volume of ink (2.0 mL) and conventional injection method. The plane of injection was too deep, with some of the ink injected into the muscularis propria layer. No peritoneal staining was found intraoperatively. However, abscess formation superficial to muscularis propria was confirmed by histology. Mesorectum, which surrounds the rectum, might be penetrated by an injection needle followed by spreading of abscess to the adjacent tissue. Another problem is the delay of operation after tattooing. Despite development of local inflammatory reaction or infection induced by tattooing, in this case, the prompt operation could overcome rare complications. To avoid complications of tattooing, preparation of sterilized ink and injections of small doses and avoidance of delaying the operation are needed. In addition, the depth of injection should be limited, considering the possibility of chemical irritation.

In conclusion, although tattooing is widely used and relatively safe, the presented case indicates the risk of infection or inflammation by tattooing.

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