



CASE REPORT

Glutaraldehyde-induced colitis: Case reports and literature review

Hsiang-Yao Shih^a, Deng-Chyang Wu^{a,b}, Wan-Ting Huang^c,
Yong-Yu Chang^{c,d}, Fang-Jung Yu^{a,*}

^a Division of Gastroenterology, Department of Internal Medicine, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan

^b Department of Medicine, Faculty of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan

^c Department of Pathology, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan

^d Division of General Internal Medicine, Department of Internal Medicine, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan

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Abstract Glutaraldehyde-induced colitis is an uncommon colitis in clinical practice. Because the involvement of colonic segment is determined by the endoscopic part where glutaraldehyde remains, a recent history of endoscopy and a demarcated involvement of colonic segment are the most characteristic signs of glutaraldehyde-induced colitis. The typical clinical scenario is acute onset of lower abdominal pain, fever, and bloody stool. Laboratory data usually show leukocytosis and elevated C-reactive protein. The endoscopic pictures of involved segments are compatible with acute colitis, including hyperemic, edematous, with or without multiple erosions. Acute ischemic colitis and infectious colitis should be differentiated at the outset of the disease. Stool pathogen tests are usually negative. Parenteral empiric antibiotic may be considered if severe transmural edema of the involved segment is observed in computed tomography. Conservative treatment, including bowel rest and parenteral hydration, is able to stabilize the condition in a week. Herein, we present two cases of acute proctocolitis caused by glutaraldehyde after uneventful colonoscopy.
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* Corresponding author. Division of Gastroenterology, Department of Internal Medicine, Kaohsiung Medical University Hospital, 100 Tz-You 1st Road, Kaohsiung 807, Taiwan.

E-mail address: gi@kmu.edu.tw (F.-J. Yu).

Introduction

Colonoscopy is a common diagnostic and therapeutic procedure in clinical practice. Although it is generally safe, complications happen occasionally, including hemorrhage, perforation, postpolypectomy coagulation syndrome, and postcolonoscopy abdominal pain. Some rare complications, such as chemical colitis, were reported [1]. Glutaraldehyde is a widely used germicide for disinfection in endoscopy units. Under regular reprocessing procedure, the residual glutaraldehyde is of trace amount. However, when the reprocessing procedure goes wrong, unexpected exposure may damage the gastrointestinal (GI) mucosa as a result. The mucosal injury results from the contact of glutaraldehyde and ranges from mild inflammation to ulceration and hemorrhage. In the severe cases, patients usually present with acute onset of lower abdominal pain and fever accompanied by leukocytosis and elevated C-reactive protein (CRP). Herein, we present two cases of acute proctocolitis caused by glutaraldehyde after uneventful colonoscopy.

Case presentation

Case 1

A 22-year-old female without significant systemic diseases was scheduled consciousness-sedated esophagogastroduodenoscopy (EGD) and total colonoscopy under the impression of prolonged dyspepsia and bowel habit change, despite of conventional treatment. She received uneventful examinations of EGD and total colonoscopy. EGD showed a duodenal ulcer scar. Total colonoscopy was unremarkable, except for mild internal hemorrhoid.

Unfortunately, she suffered acute onset of lower abdominal pain 7 hours after the endoscopy procedure and rectal bleeding followed. She also complained of tenesmus and no upper GI discomfort was demonstrated. There was no complaints of upper GI tract symptom. She visited the emergency room. Physical examination revealed lower left quadrant tenderness without peritoneal sign. Leukocytosis (27,100/ μ L) with elevated CRP (57.8 μ g/mL) was noted and computed tomography (CT) of abdomen showed extensive edema and circumferential wall thickening with infiltration from the sigmoid colon to the rectum (Fig. 1A). Under the impression of hematochezia, suspected because of acute colitis, she was admitted to our ward. Sigmoidoscopy was scheduled 48 hours after the onset of abdominal pain and disclosed a demarcated involvement from the sigmoid colon to the rectum. The mucosa of the affected segment was hyperemic, edematous, and frail. Multiple erosions with exudate were noted as well (Fig. 1B). She denied recent nonsteroidal anti-inflammatory drug (NSAID) use, antibiotic exposure, and diarrhea. Biopsies showed lymphoplasmacytic inflammatory infiltrate mainly and extravasated erythrocytes in the edematous lamina propria. Stool culture for pathogens, including *Salmonella*, *Shigella*, and *Campylobacter*, and stool toxin of *Clostridium difficile* were negative. After bowel rest, hydration, and parenteral empiric antibiotic (ceftriaxone 2 g for every 24 hours) for 6 days, her clinical condition improved 7 days after the

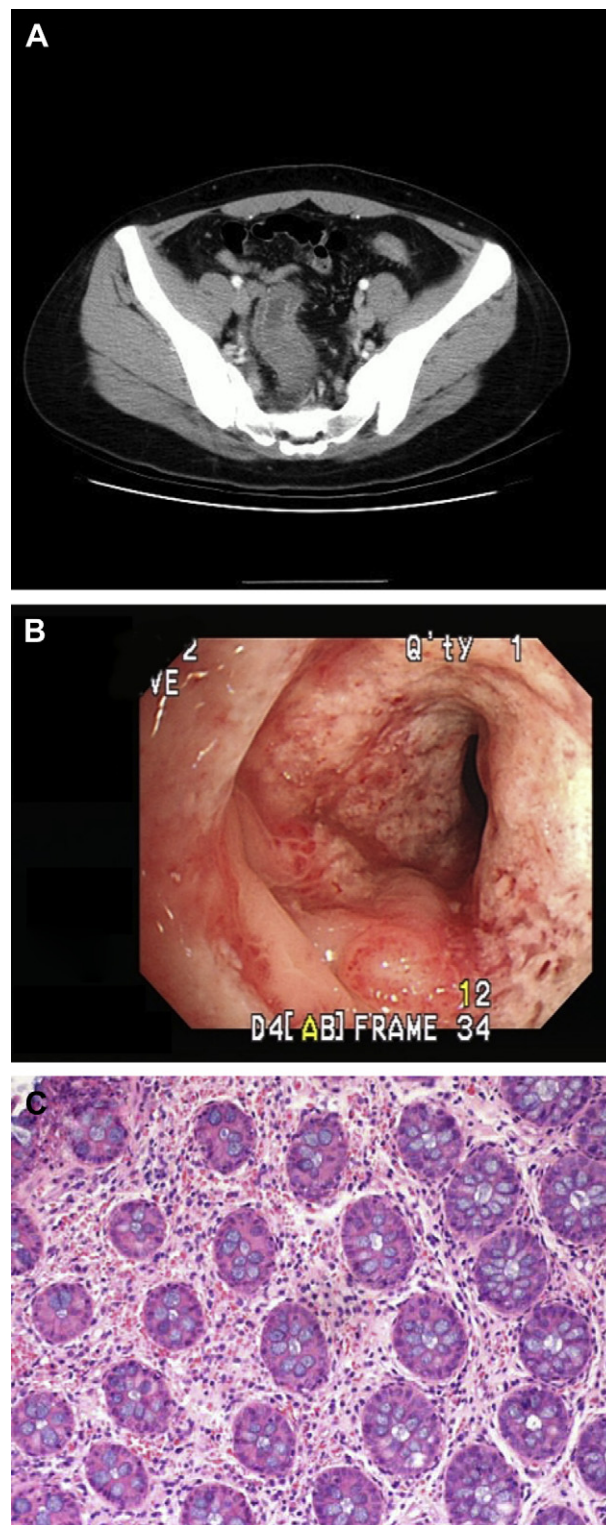


Figure 1. (A) Abdominal computed tomography disclosed extensive edema and circumferential wall thickening from the sigmoid colon to rectum. (B) The mucosa of the affected segment was hyperemic, edematous, and frail; multiple erosions with exudate were noted as well. (C) Pathology demonstrated lymphoplasmacytic inflammatory infiltrate mainly and extravasated erythrocytes in the edematous lamina propria.

onset. No bloody stool and abdominal pain were noted on her discharge.

Case 2

A 34-year-old female without significant systemic diseases was scheduled consciousness-sedated EGD and total colonoscopy under the impression of unrelieved postprandial epigastralgia and associated diarrhea, in addition to strong family history of GI malignancy. She received uneventful examinations of EGD and total colonoscopy on the same day as the first case. EGD showed erosive esophagitis, Los Angeles Grade A. Total colonoscopy was unremarkable, except for mild internal hemorrhoid. Unfortunately, she began to suffer tenesmus 1 hour after the procedure. Abdominal pain, blood per rectum, and fever developed 7 hours after the procedure. She did not demonstrate dysphagia, odynophagia, or epigastralgia. Because of progressive symptoms, she visited our emergency room. Initial evaluation disclosed tenderness over lower abdomen and leukocytosis ($17,800/\mu\text{L}$) with elevated CRP ($178.91 \mu\text{g/mL}$). CT of abdomen demonstrated edema and thickening of the wall from the sigmoid colon to the rectum (Fig. 2A). She was hospitalized and treated with bowel rest, hydration, and parenteral empiric antibiotic (ceftriaxone 2 g for every 24 hours) for 5 days. Sigmoidoscopy was repeated 48 hours after the onset of abdominal pain and revealed inflamed mucosa with hyperemia, friability, and edema from the sigmoid colon to the rectum (Fig. 2b). No history of recent antibiotic use and NSAID exposure was obtained. Biopsies demonstrated predominantly lymphoplasmacytic inflammatory infiltrate and erythrocytes in the edematous lamina propria. Stool culture for *Salmonella*, *Shigella*, and *Campylobacter* showed negative and stool toxin for *C difficile* also showed negative. Her condition was improved after 6 days after the onset and was discharged.

Discussion

Glutaraldehyde-induced colitis was first reported by Castelli et al. in 1986 [2]. At least 60 cases have been documented thereafter [3]. Although the incidence was reported from 0.1% to 4.7%, according to various reports [2], the actual incidence is hard to estimate. The 2% glutaraldehyde is a common detergent and germicide for cleansing and disinfection of endoscopes at the endoscopy units. The potential hazard is because of direct contact. In working places, the health hazard includes irritation of eye, nose, skin, and respiratory tract when exposed [4–6]. In experimental animal models, hemorrhage and necrosis of the colonic mucosa were found in exposed rats [7]. Because the involvement of colonic segment is determined by the endoscopic part where glutaraldehyde remains, a recent history of endoscopy and a demarcated involvement of colonic segment are the most characteristic signs of glutaraldehyde-induced colitis. If the residual glutaraldehyde is on the surface of the scope, the rectum is usually involved. Few diseases may involve the rectum because of its rich blood supply. Ulcerative colitis with rectal involvement should be excluded. However, given the

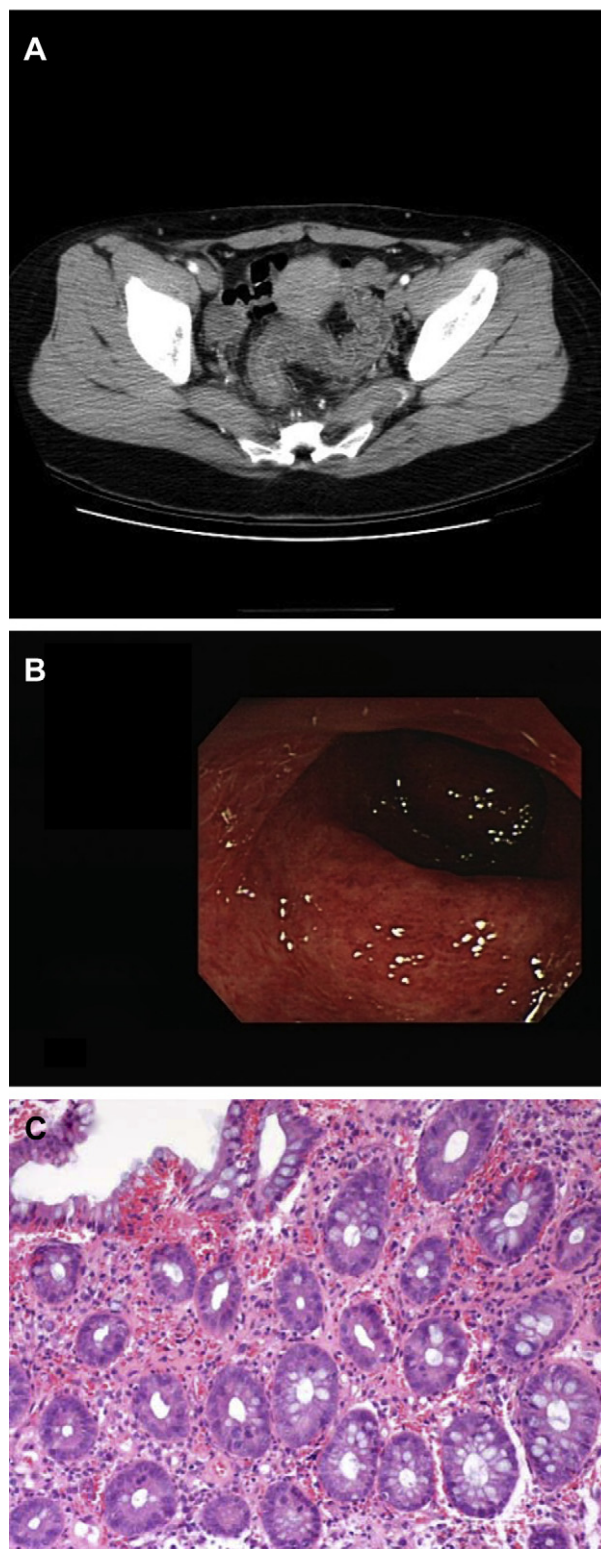


Figure 2. (A) Computed tomography of abdomen demonstrated edema and thickening of the wall from sigmoid colon to rectum. (B) Sigmoidoscopy revealed inflamed mucosa with hyperemia, friability, and edema from the sigmoid colon to the rectum. (C) Pathology demonstrated predominantly lymphoplasmacytic inflammatory infiltrate and erythrocytes in the edematous lamina propria.

chronic nature of ulcerative colitis, some endoscopic features of chronic colitis, such as pseudopolyps, may be observed and may serve as a good sign for differential diagnosis. Ischemic colitis should be excluded at the outset of the disease as well. The characteristic of ischemic colitis is rectal sparing. In the cases of glutaraldehyde-induced colitis without rectal involvement, acute ischemic colitis may be very difficult to differentiate from glutaraldehyde-induced colitis. Even the typical colonoscopic "single-stripe sign," which means a single line of erythema with erosion/ulceration oriented along the long axis of the colon [8], of ischemic colitis is not enough for differential diagnosis. In view of the acute nature of glutaraldehyde-induced colitis, infectious colitis/proctitis should be considered. However, complete history is the best clue to prompt the diagnosis of infectious colitis/proctitis because of no specific colonoscopic signs. Pseudomembranous colitis is usually excluded because of its typical endoscopic picture and nonbloody stool. Other conditions mimicking glutaraldehyde-induced colitis should be carefully differentiated, such as NSAID and oral contraceptive-induced colopathy [9]. Consequently, the history of recent colonoscopy examination and the clinical scenario of acute course may help a great deal to differentiate the two disease entities.

In most case reports, the onset of abdominal pain, diarrhea with mucus, and blood per rectum usually occurs from few minutes to less than 48 hours after the procedure [9]. Fever, chills, and tenesmus are usually observed in severe cases [2,3,10]. In our cases, the clinical scenario was surprisingly similar, and it consisted of acute onset of lower abdominal pain, which happened 1 hour after procedure, followed by fever, which happened 7 hours later, and bloody stool. Endoscopic findings range from mucosa inflammation with hyperemia to mucosa edema, ulceration with fibrinous exudates, mucosa sloughing, and even spontaneous bleeding [2,3,9,11,12]. Histopathologically, congestion and extravasation of blood cells in the superficial lamina propria and mucosal erosion/ulceration with fibrinohemorrhagic, purulent exudate are usually observed [13,14]. In severe cases, abdominal computed CT may be indicated to exclude intra-abdominal infection. The typical CT picture may show circumferential wall thickening of the colon and heterogeneous mural enhancement. Target sign might be seen [10,14]. In addition, stool pathogen tests are usually negative in glutaraldehyde-induced colitis. Supportive management is adequate to stabilize the condition, although some patients may need additional therapy, such as steroid and mesalazine. Parenteral empiric antibiotic may be considered to prevent bacteremia if toxic signs and leukocytosis with elevated CRP or if severe transmural edema of the involved segment is observed in CT [15]. The course usually resolves in 7 days [2,3,16]. Although our two cases were female, no reports demonstrated that female is prone to suffer glutaraldehyde-induced colitis based on our literature review.

Glutaraldehyde-induced colitis is an avoidable complication. The concentration of glutaraldehyde should be carefully calculated before use. Given that the standard reprocessing procedure is followed, regular check-up of the accessory tubing of endoscopy machines and washing machines is indispensable as well. According to the report by West et al. [17], high concentration of glutaraldehyde on

the surface of endoscope resulted from variable cleaning procedure was the major source of remaining glutaraldehyde responsible for most of the affected cases in their study. Residual glutaraldehyde in the tubing connecting the water bottle to the endoscope was the minor source and should not be ignored. More importantly, glutaraldehyde-induced colitis is also manageable by conservative treatment. Bowel rest, parenteral hydration, and parenteral empiric antibiotic are usually enough to resolve the condition in a week.

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