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Case Report

Three case reports of glutaraldehyde-induced chemical colitis

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Abstract: Currently, chemical colitis in clinical practice is mainly caused by iatrogenic factors. The disinfectant glutaraldehyde is one of the common drugs that can cause chemical colitis, but there are few reports about it. From August 2019 to August 2022, 1457 cases of colonoscopy were performed in the endoscopy room of the Second Affiliated Hospital of Zhejiang University School of Medicine and Songyang County People's Hospital, and 3 cases of chemical colitis caused by glutaraldehyde residue are discussed in this report. All 3 cases occurred on the same endoscopic system and same day. These 3 patients were hospitalized and treated with bowel rest, hydration, peroral Kangfuxin solution, dexamethasone combined with Kangfuxin solution local enema treatment, and empiric antibiotic. In conclusion, standardized management of cleaning and disinfection should be strengthened in departments carrying out enteroscopy, especially those using the concentrated glutaraldehyde immersion solution and cleaning after immersion, to prevent the occurrence of acute chemical enteritis related to disinfectant.

Keywords: Glutaraldehyde, chemical colitis, colonoscopy

Introduction

Chemical colitis is acute damage to the colonic mucosa caused by using exogenous chemical agents [1]. The main clinical symptoms are abdominal pain, distension, tenesmus, mucus and bloody stool. These are generally not accompanied by systemic symptoms such as fever, chills, nausea, vomiting, or weight loss [2, 3]. At present, most clinically common chemical colitis is from iatrogenic factors. The common drugs that can cause chemical colitis are water-soluble contrast shadow meglumine, disinfectant glutaraldehyde, standard enema, peracetic acid, and use of soap and water, even Chinese herbal medicine, sauce, vinegar, and enema opening filling [4, 5].

Glutaraldehyde is the most commonly used disinfectant for the thorough disinfection of medical equipment, and it is widely used in the disinfection of various endoscopes [6]. Chemical colitis due to glutaraldehyde is rarely reported. From August 2019 to August 2022, 1457 cases of colonoscopy were performed in the endoscopy room of our hospital, and 3 cases of chemical colitis caused by glutaraldehyde residue are reported below.

Case presentation

The first patient, a 62-year-old male, received endoscopic mucosal resection (EMR) for colonic polyps in the endoscopy room of the Second Affiliated Hospital of Zhejiang University School of Medicine and Songyang County People's Hospital in March 2022. After 38 hours of EMR, the patient presented with bloody stools, tenesmus without fever, and abdominal pain. The emergency colonoscopy showed that the sigmoid colon and rectal mucosa were extensively hyperaemic with erosive bleeding. Bloody fluid was seen in the intestinal lumen (**Figure 1A**). The wound from EMR was intact. The titanium clip was in position (**Figure 1B**). The second patient, a 36-year-old male, underwent a colonoscopy due to a change in bowel habits, and the total colonoscopy was unremarkable. He began to suffer periumbilical abdominal pain 4 hours after the procedure, and fever developed 28

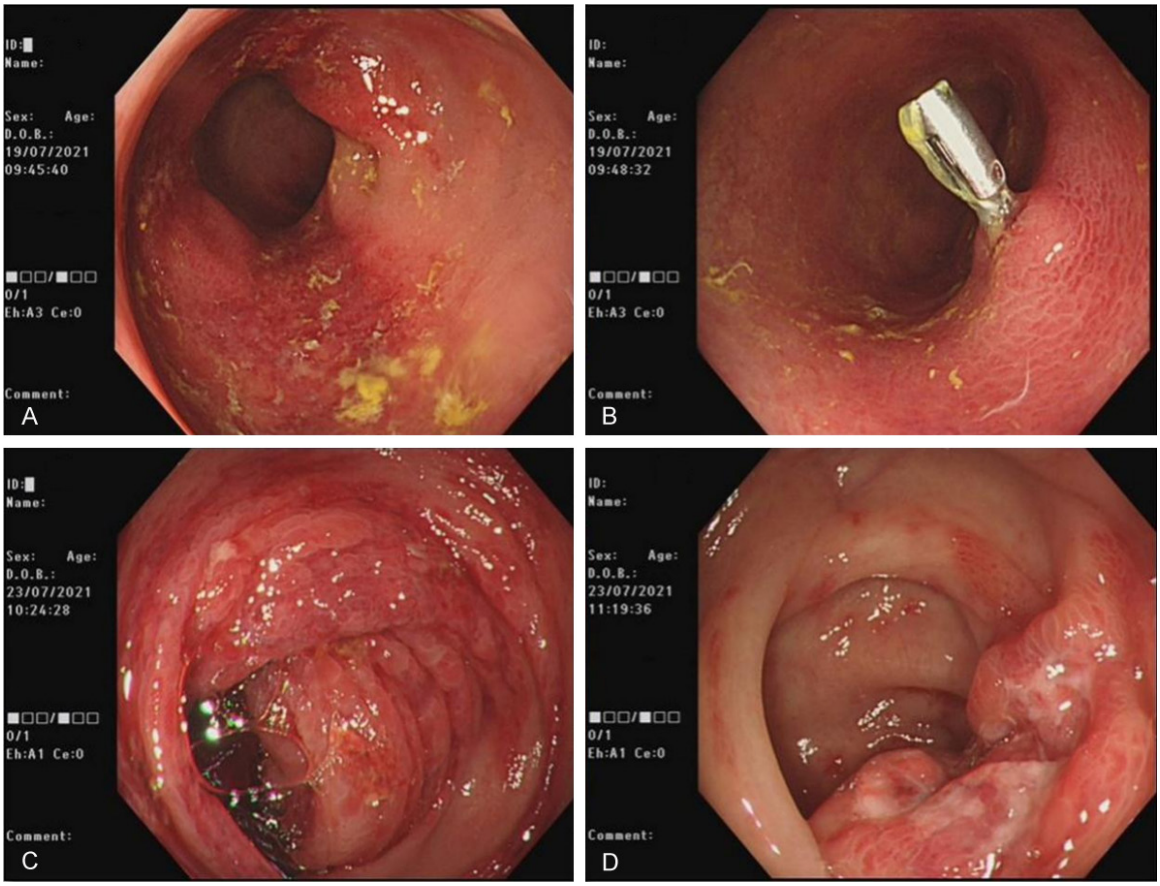

Figure 1. Relevant examination and clinical characteristics of colonoscopy. A. Sigmoid colon and rectal mucosa were extensively hyperemic with erosive bleeding, and bloody fluid was seen in the intestinal lumen. B. The wound of endoscopic mucosal resection was basically intact, and the titanium clip was in position. C. An emergency colonoscopy shows extensive hyperaemia and edema of the transverse colon with multiple superficial ulcers. D. An emergency colonoscopy shows multiple deep ulcerations with hyperemia.

Figure 2. Computed tomography of abdomen showed extensive edema and thickening with infiltration from the transverse to the descending colon.

hours after the process. Leucocytosis (11,100/mL) was elevated. Computed tomography of the abdomen showed extensive edema and thickening with infiltration from the transverse to the descending colon (**Figure 2**). The emergency colonoscopy showed extensive hyperemia and edema of the transverse colon with multiple superficial ulcers (**Figure 1C**). The third patient was a 60-year-old female without significant systemic diseases who underwent colonoscopy for tumours screening. Paroxysmal abdominal pain with hematochezia appeared 28 hours after the colonoscopy. Physical examination revealed abdominal tenderness and suspicious rebound pain, with active bowel sounds. An emergency colonoscopy showed multiple deep ulcerations with bleeding. Leukocytosis (18,100/mL) with elevated CRP (52.0 mg/mL) was noted. It showed extensive edema and thickening with infiltration from the liver area to the transverse colon (**Figure 1D**). These 3 patients underwent colonoscopy on the same day, and had no history of hypertension, diabetes or athetosis.

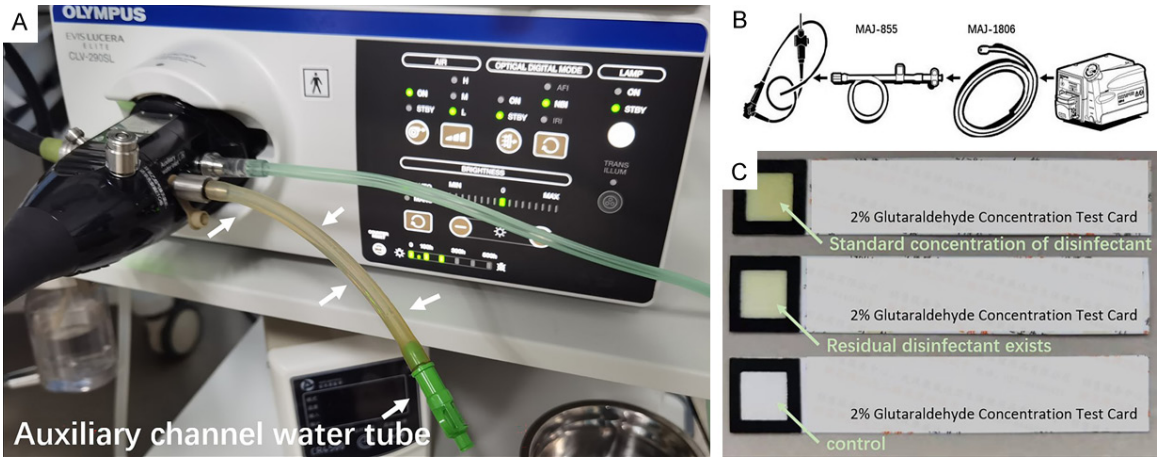

Figure 3. Brief introduction to endoscope system. A, B. The endoscope system is connected to an endoscopic flushing pump through a short auxiliary channel water tube (MAJ-855) and a long tube (MAJ1806); C. The residual amount was determined in the water by glutaraldehyde test paper after doing the retrospective disinfection process more than 3 times.

Discussion

These 3 patients were hospitalized and treated with bowel rest, hydration, peroral Kangfuxin solution, dexamethasone combined with Kangfuxin solution local enema, and empiric antibiotics [8]. Their clinical symptoms all improved a week after the onset. An enema with mucosal protective agents may be effective for lower colonic ulcers.

Patients with glutaraldehyde-induced colitis present with nonspecific symptoms, usually within 48 hours after colonoscopy. Typical symptoms include abdominal pain, mucus, pus and bloody stools, fever and tenesmus [7]. Endoscopy showed nonspecific erosion and ulceration, similar to ischemic enteritis, inflammatory bowel disease, or infectious enteritis [1]. Since patients develop abdominal pain and haematochezia shortly after the first colonoscopy, and the results of colonoscopy are significantly different before and after, it is necessary to be alert to residual disinfectant.

All three cases occurred on the same endoscopic system, and the same day. We monitored the residue of bacteria and disinfectant. After repeated cultures, the etiological results were all negative. Through repetition of the endoscopic decontamination procedure, glutaraldehyde residue was detected in the auxiliary channel water tube (**Figure 3A**). The endoscope system was connected to an endoscopic flushing pump through a short additional channel water tube (MAJ-855) and a long line (MAJ1806) (**Figure 3B**). To save the cost of disinfection, the short auxiliary channel water tube (MAJ-855) was sterilized together with the endoscope (**Figure 3C**).

At present, glutaraldehyde is the first choice disinfectant for medical devices not resistant to high temperatures and corrosion, especially as a sterilizing agent for endoscopes [9]. It is a toxic irritant whose vapour can irritate the eyes, nose, and respiratory tract and cause inflammation in direct contact with the skin [10]. It is effective against acid bacteria, hydrophilic viruses, and spores [11]. Therefore, if the endoscope is not cleaned, glutaraldehyde may remain in the lumen and surface of the endoscope, thus directly contacting the colonic mucosa and damaging the crypt epithelial cells of the large intestine [12]. Later, glutaraldehyde may cause tissue necrosis, resulting in severe abdominal pain, bloody diarrhea, anaesthesia and other symptoms within two days [13]. Animal studies have also demonstrated bloody stools and chemical enteritis after direct contact with glutaraldehyde in colonic mucosa [14]. Currently, reports of chemical colitis caused by glutaraldehyde is increasing gradually, and the incidence is rising yearly [15]. Because some patients have mild symptoms and the disease itself is self-limited, the actual incidence of the disease may be higher than reported [16]. From August 2019 to August

2022, 1457 cases of colonoscopy were performed in the endoscopy room of our hospital, and only 3 cases of colitis caused by glutaraldehyde were found, which is generally consistent with the data reported in other literature [11].

Symptoms of chemical colitis caused by glutaraldehyde are nonspecific. Current diagnostic criteria are mainly based on colonoscopy, abdominal symptoms (abdominal pain, mucous bloody stool and tenesmus, etc.), the time (usually within 48 h), clear evidence of glutaraldehyde exposure to the intestinal mucosa or ruling out other causes of enteritis [17]. Bacterial colitis was ruled out by bacterial culture in all cases in our department. The histologic features of chemical colitis are marked hyperemia and red blood cell exudation in the lamina propria of the mucosa, absence or reduction of the epithelium and glands, fibrinous and purulent exudation on the surface, and infiltration of inflammatory cells. The mucosa showed vascular congestion with moderate macrophage infiltration and crypt destruction [7].

The symptoms of the 3 patients in our department all appeared within 24 hours after the colonoscopy examination, and all patients had severe abdominal pain, bloody stool, and tenesmus. None of the 3 patients had fever. Symptomatic support therapy such as antibiotics, oral mesalamine or prednisone can cure the symptoms.

It is also necessary to add that although colonoscopy can cause ischemic enteritis, the endoscopic manifestations of the 3 patients in our hospital were nonspecific erosion and ulceration. Even though the endoscopic findings of ischaemic enteritis, inflammatory bowel disease, and infectious enteritis are similar, ischaemic enteritis has its predisposing risk factors, and the rectum is rarely involved because of its dual blood supply [18]. The 3 patients reported in this paper were of all ages, and none had risk factors for ischemic enteritis. A colonoscopy showed that the affected intestinal segments were limited to the rectum and sigmoid colon. Therefore, we believe that the previously reported ischemic enteritis caused by colonoscopy is a type of chemical enteritis caused by glutaraldehyde.

In sum, an endoscopic diagnosis and treatment of patients 2 days after surgery who have acute abdominal pain, diarrhea, chills, and fever, as well as insufficient blood volume and blood interleukin increased, should include disinfectant associated-acute chemical colitis in the differential diagnosis. Patients with severe symptoms should get active treatment measures, especially blood volume replenishment, prevention and treatment of shock, spasmolysis, anti-inflammatory, other symptomatic treatment, and hormonal therapy if necessary. If coagulation necrosis, persistent bleeding, perforation, or stenosis occur, endoscopic and surgical treatment may be required. In addition, it is essential to strengthen the standardized management of cleaning and disinfection, especially the concentration of glutaraldehyde immersion solution and cleaning after immersion, to prevent the emergence of disinfectant-related acute chemical enteritis.

Disclosure of conflict of interest

None.

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References

[1] Ahishali E, Uygur-Bayramiçli O, Dolapçioğlu C, Dabak R, Mengi A, Işik A and Ermiş E. Chemical colitis due to glutaraldehyde: case series and review of the literature. Dig Dis Sci 2009; 54: 2541-2545.

[2] Birnbaum BA, Gordon RB and Jacobs JE. Glutaraldehyde colitis: radiologic findings. Radiology 1995; 195: 131-134.

[3] Coche G, Izet T, Descombes P, Duchman JC, Sevenet F, Dupas JL, Vanthournout I and Capron JP. Chemical colitis caused by glutaraldehyde. J Radiol 1997; 78: 215-217.

[4] Espinel J, Pinedo E, Bailador C, Herrera A, Domínguez A and Olcoz JL. Glutaraldehyde colitis. Rev Esp Enferm Dig 2006; 98: 149-150.

[5] Fukunaga K and Khatibi A. Glutaraldehyde colitis: a complication of screening flexible sigmoidoscopy in the primary care setting. Ann Intern Med 2000; 133: 315.

[6] Kim SJ and Baek IH. Colonic mucosal pseudolipomatosis: disinfectant colitis? Gastroenterol Nurs 2012; 35: 208-213.

[7] West AB, Kuan SF, Bennick M and Lagarde S. Glutaraldehyde colitis following endoscopy: clinical and pathological features and investi-

gation of an outbreak. Gastroenterology 1995; 108: 1250-1255.
[8] Li HB, Chen MY, Qiu ZW, Cai QQ, Li DT, Tang HM and Chen XL. Efficacy and safety of Kangfuxin liquid combined with aminosalicylic acid for the treatment of ulcerative colitis: a systematic review and meta-analysis. Medicine (Baltimore) 2018; 97: e10807.
[9] Kurdaş OO, Sezikli M, Cetinkaya ZA, Güzelbulut F, Yaşar B, Coşgun S and Değirmenci AS. Glutaraldehyde-induced colitis: three case reports. Indian J Gastroenterol 2009; 28: 221-223.
[10] Mohamad MZ, Koh KS and Chong VH. Gluteraldehyde-induced colitis: a rare cause of lower gastrointestinal bleeding. Am J Emerg Med 2014; 32: 685, e1-2.
[11] Rodriguez-Nogales A, Algieri F, De Matteis L, Lozano-Perez AA, Garrido-Mesa J, Vezza T, de la Fuente JM, Cenis JL, Gálvez J and Rodriguez-Cabezas ME. Intestinal anti-inflammatory effects of RGD-functionalized silk fibroin nanoparticles in trinitrobenzenesulfonic acid-induced experimental colitis in rats. Int J Nanomedicine 2016; 11: 5945-5958.
[12] Shih HY, Wu DC, Huang WT, Chang YY and Yu FJ. Glutaraldehyde-induced colitis: case reports and literature review. Kaohsiung J Med Sci 2011; 27: 577-580.
[13] Stein BL, Lamoureux E, Miller M, Vasilevsky CA, Julien L and Gordon PH. Glutaraldehyde-induced colitis. Can J Surg 2001; 44: 113-116.
[14] Tsai MS, Chiu HH and Li JH. Education and imaging. Gastrointestinal: glutaraldehyde proctocolitis. J Gastroenterol Hepatol 2008; 23: 1460.
[15] Vila V, Brullet E, Montserrat A, Bella R, Campo R, Colomer L and Junquera F. Glutaraldehyde-induced iatrogenic rectocolitis. Gastroenterol Hepatol 2001; 24: 409-410.
[16] Wang X, Han Z, Li Y, Guo Y, Xu W and Liu S. A case of acute glutaraldehyde-induced colitis following polyps treated by EMR. Int J Colorectal Dis 2015; 30: 277-278.
[17] Zhang F, Zhong X, Miao L, Liu Z, Huang G, Wu P, Fan Z and Ji G. High concentration glutaraldehyde-induced severe procto-sigmoiditis: treatment experiences and the 20-month follow-up. Dig Liver Dis 2008; 40: 483-484.
[18] Yen HH and Chen YY. Glutaraldehyde colitis. Endoscopy 2006; 38 Suppl 2: E98.