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Sigmoid perforation after endoscopic clip placement in an infant: A case report

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ABSTRACT

Introduction: Intestinal perforation following endoscopic clip placement is an uncommon complication that has been reported in adult patients but, as far as we now, not in pediatric patients.
Case presentation: An 8-month-old female infant with a history of metabolic encephalopathy was admitted with a convulsive disorder requiring mechanical ventilation. On the seventh day of hospitalization in the intensive care unit, the patient experienced three bowel movements with dark blood clots. Despite being hemodynamically stable upon physical examination, her hemoglobin level decreased to 8.6 g/dL. Upper endoscopy findings were normal, and exploratory laparoscopy ruled out Meckel's diverticulum or other visible parietal causes of bleeding. Lower gastrointestinal endoscopy revealed ulcers in the rectum, sigmoid, and terminal ileum, where hemostatic clips were placed. No repeated bleeding events occurred. However, 20 days later she presented with fever, abdominal pain, and distension. Abdominal radiography revealed pneumoperitoneum, leading to an emergency exploratory laparotomy. A perforation of the sigmoid colon from one of the clips was found. We resected the short segment of sigmoid colon that contained the perforation and did an end-to-end anastomosis. She recovered well and had no complications.
Conclusion: Hemostatic clips placed endoscopically in the colon can lead to perforation even several weeks after placement.

1. Introduction

Endoscopy is commonly used to diagnose and manage gastrointestinal bleeding. Clip placement is a method employed to control hemorrhage [1]. Despite its practicality, complications such as intestinal perforation can occur [1]. Hemostatic clips are widely used in adults, with reported complications. Intestinal perforation is a relatively uncommon condition, occurring in less than 1 % of patients [1]. However, their application in pediatric patients is less documented, with limited literature regarding complications. In this case report, we highlight a rare yet substantial complication of sigmoid perforation after endoscopic clip placement in a pediatric patient.

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Abbreviations: TTS, through-the-scope; OTSC, over-the-scope clip.

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2. Case report

An 8-month-old female was admitted to the intensive care unit with tonic-clonic seizures mot responsive to anticonvulsant treatment and required orotracheal intubation and mechanical ventilation. She was delivered vaginally at 38 weeks of gestation with a birth weight of 3250 g. The pregnancy was complicated by a lower genital infection and COVID-19 in the last trimester. She was under investigation for a metabolic encephalopathy owing to poor weight gain, microcephaly, facial dysmorphisms, hypotonia, and global developmental delay. At the time of admission, encephalitis secondary to herpes virus 6 was considered as the patient had a respiratory infection and fever 5 days before admission, but the cerebrospinal fluid analysis results were normal. All other test results for etiology, including blood culture; urine culture; stool culture and virology; serology for infections including toxoplasmosis, rubella, cytomegalovirus, herpes simplex virus, syphilis, HIV, and hepatitis; cranial computed tomography; and electroencephalography, were within acceptable ranges. Brain magnetic resonance imaging revealed decreased periventricular white matter volume, mild retraction of the atria, discrete signal alteration, and thinning of the corpus callosum. The seizures were attributed to encephalopathy, and treatment with levetiracetam was continued. On the seventh day of hospitalization, the patient experienced three episodes of gastrointestinal bleeding, presenting with abundant pasty stools mixed with blood, including dark red clots, indicating enterorrhagia. The stool was not black, suggesting that the bleeding was not in the proximal bowel. She had no history of bleeding anywhere. Physical examination revealed stable vital signs, regular peripheral pulse, and a heart rate of 120 bpm. The skin and mucous membranes showed generalized pallor without bleeding stigmata. The perineal exam revealed a normal anus without lesions, and the rectal exam indicated no palpable tumors. A nasogastric tube was placed, and no bloody content was found. Hemoglobin levels dropped from 11.2 to 8.6 g/dL, hematocrit levels were at 24 %, and the platelet count was normal. Blood coagulation test results were normal. Two units of red blood cells and one unit of fresh frozen plasma were transfused. Upper gastrointestinal endoscopy findings were normal, with no lesions in the esophagus, stomach, or duodenum. In the same anesthetic procedure, an exploratory laparoscopy was performed, to assess the entire small intestine and colon extraluminally, ruling out Meckel's diverticulum and other possible causes of bleeding such as tumors or intestinal duplications. The colon was distended with dark content, indicating blood with clots. In the postoperative period, colonic lavages were performed every 8 h, and lower gastrointestinal endoscopy was performed the following day. The bleeding sources were finally located: ulcers in the distal ileum, sigmoid colon, and rectum. Biopsy samples were obtained, and to achieve hemostasis, adrenaline was injected, and hemostatic clips were placed in each one of them (Fig. 1). The patient showed favorable progression with no recurrence of gastrointestinal bleeding. Pathological anatomy examination did not yield a specific etiological diagnosis for the ulcers. The pathology report showed focally eroded mucosa, surface-lining epithelium with marked reactive and regenerative changes, mixed inflammatory exudates with polymorphonuclear leukocytes, and no crypt shortening, basal plasmacytosis, Paneth cell metaplasia, granulomas, or microorganisms in the routine or Ziehl/Neelsen staining analysis. Twenty days after clip placement, a surgical consultation was undertaken owing to abdominal pain and fever. Physical examination revealed abdominal distention, with a tense, slightly depressible, and diffusely painful abdomen. Simple abdominal radiography revealed pneumoperitoneum, so she was taken to the operating room for an exploratory laparotomy, which was done through a right supraumbilical transverse incision. We found a perforation of the sigmoid colon at the site of a previously placed clip (Fig. 2). A 3-cm segment of sigmoid colon that contained the perforation was resected, followed by end-to-end anastomosis using absorbable sutures.

The patient recovered without complications. Enteral feedings were initiated on the fourth day after surgery. Parenteral nutrition was stopped on the tenth postoperative day. The pathological anatomy report described an ulcer associated with granulation tissue comprising all organ layers up to the serosa, corresponding to the perforation sector.

3. Discussion

Gastrointestinal bleeding is a potentially severe and life-threatening event in the pediatric population. Endoscopy is widely recognized as the first-line procedure for gastrointestinal hemorrhage in pediatric and adult patients [2]. The effectiveness of endoscopic

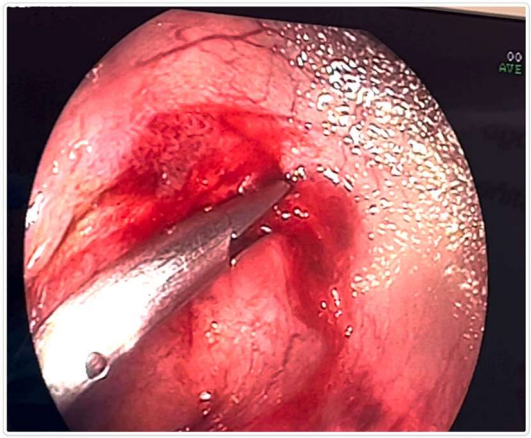

Fig. 1. Metallic clip placed endoscopically in the sigmoid colon.

Fig. 2. Sigmoid perforation at the site of the previously placed clip (arrow).

procedures in stopping bleeding has considerably reduced the need for surgical interventions in several cases. Methods for achieving hemostasis include sclerosing agents (adrenaline, hypertonic saline, polidocanol, alcohol), electrocoagulation (thermal probe, bipolar, monopolar, argon), lasers, and mechanical devices, such as clips or endoloops, used as monotherapy or in combination [3]. Clips, also known as "hemoclip" or "endoclip," are metallic devices used to achieve hemostasis through mechanical compression at the bleeding site. First introduced by Hayashi et al. in Japan in 1975, clips entered clinical practice in the early 1990s after technical modifications [4]. They have since become the most commonly used endoscopic hemostatic device and the first-line intervention for non-variceal gastrointestinal bleeding in both adult and pediatric populations [1].

Clips are used in several conditions, such as ulcers, Diueafoy's lesions, Mallory Weiss tears, diverticular bleeding, and bleeding prevention at high-risk bleeding polypectomy sites [5–7].

Although initially designed for use as a hemostatic method, clips started being used for other functions, including closure of fistulas, leaks, perforations, and mucosal defects following polypectomy or endoscopic submucosal dissection, marking of lesions, and securing accessories within the lumen of an organ, such as feeding tubes and stents [8–12].

Two types of commercially available clips exist: the through-the-scope (TTS) clip and the over-the-scope clip (OTSC) [13]. TTS clips were the first to be created and are suitable for blood vessels smaller than 2 mm and defects measuring less than 2 cm [1]. In 2021, Zhang et al. described the use of a "twing clip," a type of TTS clip designed to close wounds larger than 3 cm [14]. In the present case, a TTS clip was used. They are available in a various opening widths and jaw lengths [15], and typically slough off weeks after placement. TTS clips do not extend tissue injury and are preferred for hemostasis in thin-walled locations, patients with coagulopathy, and those on antithrombotic medications [1].

The OTSC, commonly called the "bear claw" was introduced by Kirschniak et al., in 2007 [2,16,17]. It is indicated for vessels greater than 2 mm and lesions over 2 cm [1]. Made from a shape-memory alloy (nitinol), the OTSC features an application cap attached to the endoscope's distal tip [16,17]. Unlike the traditional TTS clips, the OTSC has several advantages: the barrel-shaped transparent cap provides adequate visualization of the lumen, compression of larger quantities of tissue, allowing for maneuvering through challenging anatomic locations, enhanced grasping strength of the clip's jaws, and effective bleeding control [16–18]. They are also available in various sizes and are of two types: atraumatic, with blunted teeth useful for hemostasis, and traumatic, with sharp teeth useful for closing perforations [17]. However, using these clips increases the intubation diameter because of the application cap attached to the endoscope's distal tip [16]. This may present challenges depending on the patient's size [16]. Additionally, OTSCs are more expensive than traditional clips [19].

Despite their favorable safety profiles, clips are not free from complications. Ramai et al. [1] recently investigated the possible adverse effects of hemostatic clips. They found the following, in order of decreasing frequency: migration, hemorrhage, tissue injury, perforation, laceration, infection, death, obstruction, and allergic reactions. Perforation accounted for less than 1 % of the total complications [1]. Intestinal perforation complications have been documented in adult patients. For example, Tominaga et al. [20] detailed a case of ascending colon perforation. To the best of our knowledge, there are no relevant reported cases of intestinal perforation in children in the literature. Despite the rarity of perforations, it is crucial to remain vigilant for potential complications, especially in pediatric patients. The lack of reported cases in children does not necessarily mean that they do not occur, and clinicians should be prepared to recognize and manage such events if they arise. Further research and documentation of future cases in pediatric populations could provide valuable insights for prevention and treatment strategies.

4. Conclusion

Hemostatic clips placed endoscopically in the colon can lead to perforation even several weeks after placement.

Informed consents

Informed consent was obtained from the patient's guardians.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

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CRediT authorship contribution statement

Lucia Fein: Writing – original draft, Data curation, Conceptualization. **Gabriela Carro:** Writing – review & editing. **Bernardo Berazategui:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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