Like a Rolling Stone: Year-Over-Year Growth of a Rectal Fecalith

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Abstract
The inability to pass stool for a prolonged period can lead to the formation of fecaliths, which occurs most often in the colon or rectum. Although large fecaliths can lead to serious or life-threatening complications, the detailed process of their formation is unknown. This report describes a 65-year-old woman who presented with melena due to ischemic proctitis caused by a large fecalith. On computed tomography, the fecalith showed a unique multilayered calcification sign. We successfully dismantled and removed the fecalith transanally, assisted by a traction method using a balloon catheter. A review of imaging studies from 6 years ago revealed the growth of the fecalith over the previous year and provided an insight into the mechanism underlying the development of large fecaliths.

Introduction
Fecaliths can occur anywhere in the intestinal tract, though they are most common in the colon or rectum [1]. The pathophysiology of fecalith formation is usually associated with decreased peristalsis in the lower gastrointestinal tract, dehydration, and consumption of a low-fiber diet [2]. The inability to pass stool for a prolonged period can lead to the formation...
of fecaliths due to the hardening of fecal material that forms a mass separate from other bowel contents [1, 3, 4]. Fecaliths in the appendix are called appendicoliths, and they often complicate appendicitis [5]. Fecaliths are also commonly found in colonic diverticula, and their involvement in diverticulitis and diverticular bleeding has been suggested [6]. However, although fecaliths are common in clinical practice, there have been few reported cases of fecaliths that are several centimeters in diameter, and the detailed process underlying their formation remains unknown.

Fecaliths are generally considered a benign condition; however, a large fecalith can lead to more serious or life-threatening complications [7], such as intestinal obstruction, mucosal ischemia due to increased intraluminal pressure, and subsequent ulceration, bleeding, and even intestinal perforation [1, 4, 7–9]. Additionally, a large fecalith can cause hydronephrosis due to compression of the ureters or rupture of the bladder wall as a result of compression [7, 10]. Stercoraceous ulcerations due to fecaliths can be resolved with endoscopic interventions [9, 11]. However, persistent intestinal obstruction leading to bowel wall ischemia or perforation requires surgical disimpaction of the fecalith [7, 8, 12].

Herein, we report a case of intestinal bleeding due to a large, impacted rectal fecalith in a patient. Our case is unique as it shows the chronological changes that occurred in the fecalith, providing new knowledge about its development. This case also suggests that the multilayered calcification sign on radiological imaging may be of clinical importance to recognize a large fecalith.

**Case Report**

A 65-year-old woman presented with an acute, massive melena. She had an episode of subarachnoid hemorrhage (SAH) 15 years ago, for which she underwent emergency clipping of the ruptured cerebral aneurysm. Due to residual hemiplegia and cognitive impairments, she was bedridden and in need of complete assistance for routine activities. The patient lived in a nursing home and required hospitalization for pneumonia around once every few years. She was being nourished using tube feeding through a gastrostomy tube and had a history of chronic constipation requiring a daily laxative (sodium picosulfate hydrate); however, she had not received a digital disimpaction or an enema.

On examination, the patient was unable to communicate adequately due to aphasia, with a temperature of 36.2°C, a pulse of 110 beats per minute, and a blood pressure of 102/74 mm Hg. Her palpebral conjunctiva suggested mild anemia; the abdomen was flat with no tenderness or rigidity, and no obvious masses were palpable. However, a digital rectal examination revealed a hard, smooth-surfaced, tangerine-sized mass. The results of the blood tests were as follows: white blood cell count, 2,920/μL (neutrophils; 60.7%); hemoglobin levels, 12.9/μL; platelet count, 9.1 × 10^4/μL; total protein, 5.4 mg/dL (normal 6.6–8.1 g/dL); aspartate aminotransferase, 18 IU/L; alanine aminotransferase, 7 IU/L; alkaline phosphatase, 150 IU/L; gamma-glutamyl transferase, 7 IU/L; blood urea nitrogen, 7 mg/dL; creatinine, 0.28 mg/dL; C-reactive protein, 5.68 mg/dL (normal <0.14 mg/dL); prothrombin time, 11.1 s; activated partial thromboplastin clotting time, 34.3 s; and D-dimer, 1.0 μg/mL (normal 0–1.0 μg/mL).

A contrast-enhanced computed tomography (CT) scan revealed a spherical mass (major axis, 53 mm; minor axis, 50 mm) with multilayered calcifications in the distal rectum and edematous thickening of the rectal mucosa (Fig. 1c), consistent with ischemic proctitis caused by a large, impacted fecalith. After several trial-and-error attempts, we moved the fecalith closer to the anus by expanding and pulling a catheter balloon placed on the cranial side of the mass. Thereafter, the fecalith was cautiously broken using forceps and was completely removed transanally with no complications. A gray-green multilayered structure was evident on the broken surface of the fecalith (Fig. 2); subsequently, the melena stopped.
We reviewed a 1-year-old CT scan taken when she was hospitalized for bacterial pneumonia and noted that the fecalith in the proximal rectum was approximately 1 cm smaller (major axis, 43 mm; minor axis, 41 mm) than the mass we removed (Fig. 1b). Abdominal radiographs taken at the same time showed concentric abnormal shadows (Fig. 3). A CT scan obtained 6 years ago showed no fecaliths but featured multiple, high-density, 1.5–2.5 cm rectal masses, which were likely hardened feces (Fig. 1a). Currently, the patient has been receiving daily laxatives, regular enemas, and occasional digital disimpaction to avoid constipation and fecal impaction.
Discussion

Chronic constipation and anatomic or functional anorectal abnormalities can result in the accumulation of hardened feces and the development of fecaliths [3], most commonly in the rectum and sigmoid colon [1]. The time required for the formation of large fecaliths is unknown. Our case indicated that a fecalith of approximately 5 cm diameter can form within 6 years and that the diameter can increase by approximately 1 cm in 1 year.

The most likely mechanism of fecalith development in the present case is the snowball effect: small hard feces acted as primary seeds; more feces then adhered and hardened, and one of the fecal masses grew into a fecalith. Most of these would have been excreted in the feces, but one grew to a size that could not be excreted and, therefore, remained in her rectal cavity.

The spherical shape of the fecalith indicates that it gradually grew with irregular rolling and rotations, with variable axis positions and directions of rotation over time, receiving external force from stool flow and peristalsis in her rectal cavity; similar mechanisms have been reported in the formation of spherical pearls in pearl oysters [13]. The fecalith occasionally moved to the distal region, but it might have been pushed back by stool and peristalsis. When it exceeded a threshold size, it remained impacted in the distal rectum.

Large fecaliths are often made up of multilayered calcified concentric structures [3, 4, 9, 10], similar to the annual rings found on the cut surfaces of natural pearls [14, 15] and trees, suggesting that their growth rates are not constant. Since the growth rate of pearls and trees is primarily influenced by seasonal temperature, the multilayered structures follow an orderly and repetitive annual pattern [16, 17]. By contrast, the pattern of multilayered structures in the large fecaliths is generally irregular [3, 4, 9, 10]. It is presumed that complex factors such as mineral components in the diet or medication, moisture content or pH of stools, and degree of constipation may have been involved, although no details have been reported.

Elderly individuals and patients with neuropsychiatric diseases are at the highest risk of constipation and fecal impaction [1]. In the management of such patients, enema or manual disimpaction, in addition to laxative administration, and regular follow-up via a radiograph or CT scan, may be considered to avoid the formation and impaction of fecaliths. According to our reflection, the unique multilayered calcification sign on the abdominal imaging study may be of clinical importance, allowing for the distinction between large fecaliths and fecal impaction. In this case, transanal disimpaction was initially difficult due to the mobility of the fecalith, although the traction method using a balloon catheter was able to immobilize the fecalith, allowing for quick disintegration and removal with forceps without complications.

Fig. 3. Abdominal radiographs taken 1 year ago show concentric abnormal shadows.
Statement of Ethics

Since this was a single case report, the need for ethical approval was waived by the Clinical Research Department of the National Hospital Organization Matsumoto Medical Center. Written informed consent for publication was obtained from the patient's husband for publication of this case report and accompanying images.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

The first author (Kazuhiro Fukushima) and the coauthors (Yu-ichi Ito, Hidenori Tomida, Shinichiro Imai, Hideyasu Matsumura, Kan Nakagawa, Kenya Oguchi, Akinori Nakamura, Yo-ichi Takei) were all involved in medical practice and management of the patient, summarizing the case report, writing the manuscript, and proofreading the final version of the manuscript.

Data Availability Statement

All data that support the findings of this study are included in this article. Further inquiries can be directed to the corresponding author.

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