REVIEW ARTICLE

Cecal Volvulus

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Abstract A twisted loop of the bowel and its mesentery on a fixed point is known as volvulus and it may arise more frequently in the sigmoid colon and cecum. Cecal volvulus as an uncommon cause of acute intestinal obstruction is axial twist of the cecum, ascending colon and terminal ileum around their mesenteric pedicles. Although there are many different etiologic and predisposing factors for cecal volvulus, exact etiology is most likely multifactorial in presence of mobile cecum. Its clinical presentation is highly variable, ranging from intermittent episodes of abdominal pain to abdominal catastrophe depending on pattern, severity and duration of cecal volvulus causing intestinal obstruction. Due to its rarity and nonspecific presentation, preoperative diagnosis is rarely achieved in most cases. Abdominal radiographs as an initial diagnostic test are usually abnormal and can detect cecal volvulus in half of cases. Nowadays, computerized tomography is used for more accurate diagnosis and differentiation from other acute emergent conditions. Resection with right hemicolectomy and primary ileocolic anastomosis has been recommended for surgical treatment of cecal volvulus.

Keywords Intestinal obstruction · Intestinal volvulus · Cecum · Diagnosis · Surgery

Introduction

A twisted loop of the bowel and its mesentery on a fixed point at the base is known as volvulus, and it may arise in

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the sigmoid colon, cecum, splenic flexure, and transverse colon, in descending order of frequency [1, 2]. Therefore, cecal volvulus (CV) as an uncommon cause of acute intestinal obstruction is the axial twist of the cecum, ascending colon, and terminal ileum around their mesenteric pedicles [3].

According to the several studies, CV accounts for 10–60 % of all colonic volvulus [1, 2, 4–6] and can be divided into two major subgroups: the first is loop axial ileocolic volvulus, which accounts for 90% of cases, and the second is cecal bascule, which accounts for the remaining cases [1, 7]. The classic ileocolic volvulus is a clockwise or counterclockwise rotation of the cecum with distal ileum in an oblique pattern. However, the counterclock-type is more commonly seen. In cecal bascule, there is an upward folding of the cecum, either anteriorly or posteriorly [8].

Pathogenesis

Etiology and predisposing factors for CV include chronic constipation, abdominal masses, late-term pregnancy, previous abdominal surgery, prolonged immobility, high-fiber intake, paralytic ileus, and colonoscopy [4, 7, 9–12]. According to the clinical series published before, previous abdominal surgery was identified as an important contributing factor for formation of CV, based on the fact that 23–53 % of the patients presenting with CV have had a history of prior abdominal surgery [4, 9]. However, this finding has not been observed as an important cause for development of CV in other studies [7, 10, 11].

During embryologic development of the colon, fixation to posterior parietal peritoneum occurs following normal anatomical rotation of 270°, but development of deficient fixation with normal rotation or elongation of the colon

caused by over-rotation causes mobile cecum [8]. It is commonly believed that a mobile cecum with lack of fixation of the right colon, cecum, terminal ileum, and mesentery to the posterior parietal peritoneum is primarily required for CV to occur [1, 2, 8, 13]. Despite this possible anatomic predisposition in certain individuals, the exact etiology is most likely multifactorial [1].

Incidence of CV varies according to the presence of mobile cecum, which was found to be present in almost 25% of the general population based on cadaveric examinations and the other predisposing factors [14, 15]. Because of the issues mentioned above, exact incidence varies widely from 2.8 to 7.1 per million people per year in different regions [7, 9].

Patients' age at presentation is affected by several geographical and dietary influences and their effects on intestinal motility. The average age in developed countries was around 50–65 years, whereas CV has been reported in younger age groups in Far East countries. Female or male predominance was also reported in several reports [3, 6, 9–11, 13, 16, 17]. Small number of the CV cases reported from different geographical regions may cause this contradiction with regard to gender predominance.

Diagnosis

Clinical presentation is highly variable, ranging from intermittent episodes of abdominal pain to abdominal catastrophe, depending on the pattern, severity, and duration of intestinal obstruction [1, 4, 9]. Abdominal pain associated with nausea, vomiting, and abdominal distension was reported as the most common symptom in CV patients [7, 10–12]. Patients with acute CV and obstruction present a clinical picture similar to small bowel obstruction. In most cases, physical examination may not be helpful for differentiation of the cause for obstruction. Intestinal strangulation and perforation may be seen in untreated acute CV cases in which severe abdominal pain and findings of peritoneal irritation are present. Fulminant CV with strangulation and possible perforation is responsible for a toxic situation with hemodynamic instability and development of severe complications [4, 18].

Laboratory investigations especially with white blood cell count and serum C-reactive protein may be helpful only in acute fulminant cases. It should also be kept in mind that elevations with regard to these parameters are not specific for CV. Electrolyte abnormalities, if present, may reflect a late stage [1, 4].

Preoperative diagnosis of CV is rarely achieved in most cases because of its rarity and nonspecific presentation which can be seen in many serious concurrent medical illnesses, even in hospitalized patients [4, 8]. It is believed that abdominal radiographs that should be obtained as the initial diagnostic test in cases of obstruction often can be abnormal and can detect CV in 44.4–56% of the cases [3, 7, 10–12, 19, 20]. The point of the coffee bean deformity in CV is directed toward the left upper quadrant. A dilated ectopic cecum, a single air-fluid level in the right lower quadrant, small bowel dilatation laterally localized to the dilated cecum, and absence of gas in the distal colon are reported as the most commonly seen abnormalities in CV [1, 4]. Because of the non-specific nature of these radiological findings, diagnosis of CV only with radiographs may not be possible in each case, but they may play a critical role in the early evaluation of patients suspected of having volvulus.

Traditionally, barium enema was accepted as the principal imaging technique for CV, with the findings of the beak sign, a smooth tapering cut-off at the efferent limb of the obstruction, and visualization of the distal colonic segments [19]. Spontaneous reduction of CV during barium enema was another advantage. But longer time requirement for this technique, possibility of barium extravasation into the abdomen, and potential risk of obscuring visualization during subsequent computerized tomography (CT) may prevent its use in most CV cases with advanced obstruction, suspected perforation, and gangrenous bowel [4]. This technique can be used only in CV cases in the absence of clinical peritonitis and severe constitutional symptoms.

CT is usually used for more accurate diagnosis of CV and differentiation from the other acute emergent conditions in recent years [1, 4, 13, 19–24]. There were many specific radiological signs and findings which have had different sensitivity and specificity for CV such as the whirl sign which was defined as twisted loops of collapsed cecum encircling mesenteric vessels, involvement of the ileum in torsion as the ileocecal twist, the coffee bean sign representing an axial view of a dilated cecum filled with air and fluid as in radiographs, the split wall sign representing the split wall appearance of a twisted loop caused by invagination of surrounding pericolic fat, and the X-marks-the-spot sign representing a complete winding of the twisted bowel loop limbs onto each other [20, 22, 24]. The whirl, ileocecal twist, X-marks-the-spot, and split wall signs were shown to be highly specific for CV [22]. However, a collapsed or decompressed sigmoid colon in the presence of the dilated cecum, filled with air and fluid (the coffee-bean sign), and suggestive findings of closed-loop obstruction detected on CT topograms usually lead to a rapid diagnosis and timely treatment. Location of the whirl sign either in the midline/left which is usually seen in CV or in the right of midline is highly accurate finding in discriminating from sigmoid volvulus [24]. These all advantages bring on the consideration of CT as the primary imaging modality.

Colonoscopy as a diagnostic and therapeutic modality can be used in selected cases [1, 3]. Colonoscopic reduction

for CV is less invasive than surgery, so when the patient's general condition is stable and surgery is not considered as emergent, it may be suggested to perform colonoscopy to reduce CV [7]. But it should be remembered that the success and the recurrence rates after colonoscopic decompression are higher in CV than the rates in sigmoid volvulus [4, 9].

Treatment

Immediate surgical reduction of the twisted segment is the most effective treatment to prevent progression to necrosis, which increases the morbidity and mortality rates about several folds [7]. Resection is mandatory for gangrene and perforation, which were seen in almost half and about one-quarter of CV patients, respectively [3, 5–7, 10, 11]. Surgical removal of the twisted bowel should also be strongly considered when encountering a grossly distended and thin-walled cecum [8]. Following resection, reconstruction as primary anastomosis or ileostomy with a mucous fistula should be chosen based on the patient's condition and the condition of the bowel at the time of surgery [3, 5, 6, 11]. The main advantage of the resection, which can be performed either by open or laparoscopic approaches, is the elimination of recurrences with low morbidity and mortality [1, 9]. In addition to resection, cecopexy by approximating the tinea of the remainder of the right colon to the peritoneum of the right paracolic gutter with permanent sutures was also recommended to prevent recurrences [3]. If the detorsed cecum is viable and there is no suspicion about its viability, there are several different procedures including operative detorsion via cecopexy and cecostomy [6, 10–12]. Operative detorsion without cecostomy or cecopexy should not be used anymore because of high risk of recurrence [1]. Although there were several reports in which cecopexy accepted as an efficient treatment for CV, it was thought that fixation of the cecum without resection that was adequate for preventing future volvulus could be difficult to obtain. So, cecopexy alone is usually not recommended due to the high recurrence for the treatment of CV [1, 6, 7, 11, 25]. Cecostomy has been associated with low recurrence rates, but higher rates of morbidity and mortality compared to cecopexy [1]. Many authors advocate the use of cecostomy only in the unstable or high-risk patients with viable bowel due to its association with the life-threatening complications such as cecal necrosis, intraperitoneal leakage, and fistula [4, 11]. Resection with primary anastomosis has been the preferred surgical technique for the past several decades in comparison to previous studies in which cecostomy or cecopexy was frequently applied for CV patients [3, 5, 6, 11, 12]. In summary, right hemicolectomy and primary ileocolic anastomosis have been recommended for the management of CV [3, 9, 11, 12].

In some studies, high mortality after resection for CV has been reported [7, 10, 26, 27]. Morbidity after surgical treatment of CV could be seen in up to 60% of the patients including cardiac and pulmonary complications. Surgical complications such as prolonged recovery of intestinal motility, wound infection, and anastomotic leakage were seen in descending order of frequency [3, 5–7, 10–12]. Physical status and associated serious medical illnesses of the older patients with CV such as prior abdominal surgery and prolonged immobility may be important factors for such a high rate of morbidity. However, mortality after such operations has been decreased and outcomes have markedly been improved with the advances in surgical techniques and perioperative measures for the past several years [1].

Conclusion

The occurrence of CV is a multifactorial process in the presence of abnormally mobile cecum. Prompt recognition and urgent treatment may avoid gangrenous changes of the bowel, which was believed to be an important cause for high morbidity and mortality. Although abdominal radiographs may play a role in early diagnosis, CT of the abdomen should be considered as the primary imaging modality. Resection and primary anastomosis should be the choice of the operation depending on the general condition of the patient.

References

1. Madiba TE, Thomson SR (2002) The management of cecal volvulus. Dis Colon Rectum 45:264–267
2. Valsdottir E, Marks JH (2008) Volvulus: small bowel and colon. Clin Colon Rectal Surg 2:91–93
3. Majeski J (2005) Operative therapy for cecal volvulus combining resection with colopexy. Am J Surg 189:211–213
4. Consorti ET, Liu TH (2005) Diagnosis and treatment of caecal volvulus. Postgrad Med J 81:772–776
5. Mulas C, Bruna M, García-Armengol J, Roig JV (2010) Management of colonic volvulus. Experience in 75 patients. Rev Esp Enferm Dig 102:239–248
6. Lau KC, Miller BJ, Schache DJ, Cohen JR (2006) A study of large-bowel volvulus in urban Australia. Can J Surg 49:203–207
7. Ballantyne GH, Brandner MD, Beart RW Jr, Ilstrup DM (1985) Volvulus of the colon. Incidence and mortality. Ann Surg 202:83–92
8. Tirol FT (2005) Cecocolic torsion: classification, pathogenesis, and treatment. JSLS 9:328–334
9. Katoh T, Shigemori T, Fukaya R, Suzuki H (2009) Cecal volvulus: report of a case and review of Japanese literature. World J Gastroenterol 15:2547–2549
10. Neil DA, Reasebeck PG, Reasbeck JC, Effeney DJ (1987) Caecal volvulus: ten year experience in an Australian teaching hospital. Ann R Coll Surg Engl 69:283–285
11. Ruiz-Tovar J, Calero García P, Morales Castiñeiras V, Martínez Molina E (2009) Caecal volvulus: presentation of 18 cases and review of literature. Cir Esp 85:110–113

12. Tuech JJ, Pessaux P, Regenet N, Derouet N, Bergamaschi R, Arnaud JP (2002) Results of resection for volvulus of the right colon. Tech Coloproctol 6:97–99

13. Delabrousse E, Sarliève P, Sailley N, Aubry S, Kastler BA (2007) Cecal volvulus: CT findings and correlation with pathophysiology. Emerg Radiol 14:411–415

14. Wolfer JA, Beaton LE, Anson BJ (1942) Volvulus of the cecum. Anatomical factors in its etiology report of a case. Surg Gynecol Obstet 74:882

15. Donhauser JL, Atwell S (1949) Volvulus of the cecum with a review of 100 cases in the literature and a report of six new cases. Arch Surg 58:129–148

16. Gupta S, Gupta SK (1993) Acute caecal volvulus: report of 22 cases and review of literature. Ital J Gastroenterol 25:380–384

17. Khaniya S, Shakya VC, Koirala R, Pokharel K, Regmi R, Adhikary S, Agrawal CS (2010) Caecal volvulus: a twisted tale. Trop Doct 40:244–246

18. Tsushimi T, Kurazumi H, Takemoto Y, Oka K, Inokuchi T, Seyama A, Morita T (2008) Laparoscopic cecopexy for mobile cecum syndrome manifesting as cecal volvulus: report of a case. Surg Today 38:359–362

19. Peterson CM, Anderson JS, Hara AK, Carenza JW, Menias CO (2009) Volvulus of the gastrointestinal tract: appearances at multi-modality imaging. Radiographics 29:1281–1293

20. Lepage-Saucier M, Tang A, Billiard JS, Murphy-Lavallée J, Lepanto L (2010) Small and large bowel volvulus: Clues to early recognition and complications. Eur J Radiol 74:60–66

21. Green P, Swischuk LE, Hernandez JA (2007) Delayed presentation of malrotation and midgut volvulus: imaging findings. Emerg Radiol 14:379–382

22. Rosenblat JM, Rozenblit AM, Wolf EL, DuBrow RA, Den EI, Levsky JM (2010) Findings of cecal volvulus at CT. Radiology 256:169–175

23. Suárez Vega VM, Martí de Gracia M, Verón Sánchez A, Alonso Gamarra E, Garzón Moll G (2010) Trapped on the "whirl": diagnostic sign on emergency CT. Emerg Radiol 17:139–147

24. Macari M, Spieler B, Babb J, Pachter HL (2011) Can the location of the CT whirl sign assist in differentiating sigmoid from caecal volvulus? Clin Radiol 66:112–117

25. Yang SH, Lin JK, Lee RC, Li AF (2000) Cecal volvulus: report of seven cases and literature review. Zhonghua Yi Xue Za Zhi (Taipei) 63:482–486

26. Anderson JR, Welch GH (1986) Acute volvulus of the right colon: an analysis of 69 patients. World J Surg 10:336–342

27. Påhlman L, Enblad P, Rudberg C, Krog M (1989) Volvulus of the colon. A review of 93 cases and current aspects of treatment. Acta Chir Scand 155:53–56