A cruel twist: post-operative cecal volvulus

Acımasız bir bükülme: Postoperatif çekal volvulus

Christopher D. SCOTT, Brian M. TROTTA, Joseph J. DUBOSE, Elihu LEDESMA, Charles M. FRIEL

Cecal volvulus is an uncommon cause of intestinal obstruction, accounting for less than 1% of cases in Western countries. In the literature, it has been described as a complication following numerous common surgeries as well as a number of minimally invasive procedures. Presumably, it is more likely to occur following any surgical procedure which might require some degree of medial visceral rotation or disruption of the fusion plane between the cecum or ascending colon with the lateral peritoneum, providing sufficient mobility to allow for cecal volvulization to occur. In addition, cadaver and autopsy studies have also suggested that 10-20% of the population may have sufficient mobility of the colon to allow for volvulization. We present a review of the literature pertaining to the diagnosis and management of cecal volvulus as well as the case of J.R., a 78-year-old male with cecal volvulus six days following a right radical nephrectomy for renal cell carcinoma.

Key Words: Cecal volvulus; cecal diseases/diagnosis/surgery; intestinal obstruction/diagnosis/surgery.

Çekal volvulus, Batı ülkelerindeki olguların %1'inden daha az bir kısmında açığa çıkan ve sık karşılaşılmayan bağırsak tıkanıklığı nedenidir. Literatürde, sık gerçekleştirilen sayısız ameliyatla birlikte bazı minimal invaziv işlemlerden sonra karşılaşılan bir komplikasyon olarak tanımlanmıştır. Çekal volvulus, oluşmasına izin vermeye yetecek, mobilite sağlayacak şekilde, belli ölçüde tıbbi viseral rotasyon gerektirebilen herhangi bir cerrahi işlem veya çekum ya da çıkan kolon ile lateral periton arasındaki birleştirme düzleminin kesintiye uğramasından sonra oluşması daha olasıdır. Kadavra ve otopsi çalışmaları da, nüfusun %10-20 kadarının volvulizasyon oluşmasını sağlamaya yetecek ölçüde kolon hareketliliğine sahip olabileceği izlemini bırakmıştır. Çekal volvulus tanısı ve tedavisine ilişkin bir gözden geçirmeyle birlikte renal hücreli karsinom nedeniyle uygulanan sağ radikal nefrektomi ameliyatından altı gün sonra gelişen bir çekal volvulus olgusu olan 78 yaşındaki J.R. isimli erkek hastayı sunuyoruz.

Anahtar Sözcükler: Bağırsak tıkanıklığı/tanı/cerrahi; çekal volvulus; çekal hastalık/tanı/cerrahi.

CASE REPORT

J.R. is a 78-year-old male with the incidental identification of a right renal mass during evaluation for prostate cancer. Magnetic resonance imaging (MRI) demonstrated a large enhancing mass in the upper to midpole region of the right kidney consistent with renal cell carcinoma. The patient underwent a right radical nephrectomy through a transverse flank incision at the 10th intercostal space in a rib-sparing fashion. Due to the bulk of the tumor the peritoneum was entered to facilitate control of the vascular hilum, necessitating partial medial visceral rotation and disruption of the lateral peritoneal attachments of the ascending colon. The right kidney and adrenal gland were subsequently resected without complication in the standard fashion. Initial post-operative course proved uneventful. On post-operative day number six, however, the patient began to complain of increasing distension and abdominal discomfort. On physical exam the patient had a distended abdomen with mild tenderness. His vital signs were otherwise normal. Laboratory evaluation was significant for a white blood cell count to 18.7.

Department of Trauma and Critical Care, Southern California University, California, USA.

Güney Kaliforniya Üniversitesi, Travma ve Yoğun Bakım Bölümü, Kaliforniya, ABD.

Correspondence *(İletişim):* Joseph J. Dubose, M.D. University of Southern California Division of Trauma and Critical Care, 90033 California, USA.
e-mail *(e-posta):* jjd3c@yahoo.com

Abdominal plain radiography was obtained (Fig. 1), demonstrating an isolated dilation of the large bowel in the mid abdomen without other significant abnormality. Contrast enhanced computed tomography (CT) was subsequently obtained which demonstrated a dilated closed loop colonic obstruction with CT "whirl sign" consistent in appearance with cecal volvulus (Fig. 2, 3). The patient was taken to the operative room for abdominal exploration through a midline incision with findings of a grossly dilated and gangrenous cecal volvulus. Attempted manipulation resulted in perforation of the friable tissues. After control of contamination, the patient underwent ileocecetomy with end ileostomy and Hartmann's pouch formation. Following surgery, the patient's recovery course proved uneventful.

Fig. 1. Abdominal film.

DISCUSSION

First noted by Hildanus in the 16th century and later reviewed by Rokitansky in 1837, cecal volvulus is estimated to be the cause of intestinal obstruction in less than 1% of cases in Western Countries.[1] Second only to sigmoid as the most common location, it represents 10 to 60 percent of all colonic volvulus in most documented series.[2-10] Cecal volvulus can be divided into axial ileocolonic (90%) and bascule (10%) subtypes[3,10,11] with bascule referring to a rotation of the cecum in a horizontal plane anteriorly upward causing obstruction at the point of folding.

A prerequisite for de novo cecal volvulus appears to be abnormal mobility of the cecum resulting from improper developmental fusion of the mesentery of the cecum and right colon with the posterior parietal peritoneum.[4,5,8,11,12] In normal in utero development, the gut rotates about the distal ileum before returning to the abdomen and undergoing fusion of the ascending mesocolon to the right gutter. Based on cadeveric studies this fusion appears to be absent in 11.2% of autopsy examina-

Fig. 2. CT of abdomen with arrowhead indicating "whirl sign".

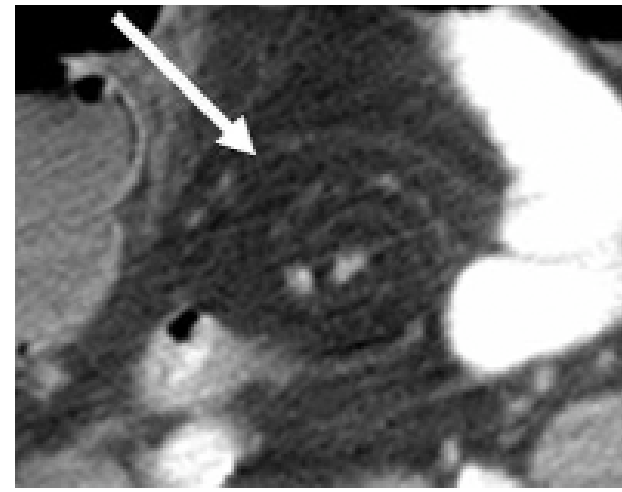

Fig. 3. Closeup of "whirl sign".

tions.[12] Dorson and Atwell, in a 1949 autopsy study, found the cecum to be sufficiently mobile in 25.6% of cases to allow cecal bascule and it has been suggested that sufficient mobility of the cecum to allow for volvulus may be present in as much as 10 to 20 percent of the population.[13] Despite this possible anatomic predisposition in certain individuals, the etiology is most likely multi-factorial. Proposed etiologic factors include adhesions,[8,9,14,15] distal obstruction,[8,16-19] pelvic masses, pregnancy[8,20,21] and recent surgical manipulation.[22]

In the post-operative setting, cecal volvulus has been described as a complication following left colectomy, cholecystectomy, gastric resection, incarcerated femoral hernia repair, appendectomy, and various laparoscopic procedures.[22-25] It has also been reported following kidney transplantation[26] and nephrectomy.[27,28] Presumably any surgical procedure which might require some degree of medial visceral rotation or disruption of the fusion plane between the cecum or ascending colon with the lateral peritoneum could provide for sufficient mobility to allow for cecal volvulization to occur.

Diagnosis of cecal volvulus can often be made with abdominal plain radiography and the identification of a characteristic "coffee bean deformity" directed toward the left upper quadrant. Several series have documented, however, that such a classic pattern may be present in only 30% of plain films.[8,9] Because the cecum is mobile, the dilated cecal loop may actually appear anywhere in the abdomen, often with a single air fluid level. The use of contrast studies in the diagnosis of cecal volvulus has been debated. It has been argued that such investigations usually serve only to delay definitive surgical treatment.[21] Other experience with contrast studies has been more favorable, with one study demonstrating that although the pathognomonic "bird's beak" sign was present in only one of 11 instances, a "column cut-off" was identified in the majority of patients and that the procedure led to the spontaneous decompression of the volvulus in one of the study participants.[4] In the modern era, the utilization of CT has proven efficacious, with suggestive findings of a closed loop obstruction and CT whirl sign leading to a rapid diagnosis[29] and timely treatment.

Cecal volvulus commonly presents in either acute fulminating, acute obstructive or recurrent intermittent forms. The rapidly fulminating variety typically presents with an acute surgical abdomen and is associated with a high incidence of bowel necrosis. In one series[4] this clinical picture was present in 22% of patients and was associated with 11% mortality. The acute obstructive subtype is usually more indolent and is coupled with symptoms related primarily to obstruction. This pattern may be present in half of all cases of cecal volvulus and has been associated with a lower incidence of necrosis and an eight percent mortality rate.[4] The recurrent intermittent form occurs in up to 30% of patients and is characterized by symptoms of vague indigestion with recurrent self-limiting episodes of severe cramping pain.[4]

Nonoperative decompression of cecal volvulus has been utilized with isolated success in small series.[8,17,30-33] In general, however, colonoscopic decompression has not been as successful for cecal volvulus[3-5,8,17] and should be discouraged in the setting of potential gangrenous changes. The majority of patients with cecal volvulus therefore require urgent surgical intervention.

The options for operative management of cecal volvulus are dictated by patient status and the viability of the involved bowel at the time of exploration. The finding of bowel necrosis, present at operation in anywhere from 20 to 100 percent of cases in various series,[5,8,17,34] portends a poor prognosis. In a review of 151 cases, Todd and Forde[32] noted a 41.4 mortality rate if gangrenous bowel was present at the time of surgical intervention as opposed to 14.5% if the bowel was viable. Detorsion in the setting of significant gangrenous changes may be particularly ill advised, as it has been shown to result in irreversible septic shock.[35,36] Resection is mandatory for gangrene and should be strongly considered when encountering a grossly distended, thin-walled cecum. Following resection, the decision of primary anastomosis or ileostomy must be based on the patient's condition and the condition of the bowel at the time of surgery. While some authorities favor a primary anastomosis the creation of an ileostomy remains viable option.

In the setting of clearly viable colon, controversy exists regarding the ideal management. Detorsion alone represents the most simplistic approach, but is associated with a recurrence rate as

high as 75%.[4,6,10,32,37] The addition of cecopexy, or anchoring of the right colon to the parietal peritoneum, may be used to prevent recurrent volvulization by eliminating prerequisite hypermobility. The method of cecopexy varies from simple placation[10,38] to the creation of a peritoneal flap.[39] Unfortunately, detorsion and cecopexy alone is associated with a recurrence rate as high as 40% and a mortality of up to 18%.[5,6,24,32,37,40,41] These findings suggest that cecopexy is a safe procedure with low mortality but has a disadvantage of relatively high recurrence rates.[5,6,24,37,40,41]

While the previous practice of tube appendicostomy has largely been abandoned, some authors consider cecostomy an important option in the operative management of cecal volvulus with viable bowel. It has the advantage of not only fixing the bowel but also decompressing the distended segment. Cecostomy has been used with variable results[16,34,38,42] and is associated with low recurrence rates,[17,32,33] but higher rates of associated morbidity and mortality compared to cecopexy.[4-6,24,37,40,41] Many authors advocate the use of cecostomy only in the unstable or high risk patient with viable bowel[4] due to its association with the threatening complications of gangrene, cecal necrosis, intraperitoneal leakage, fistula and significant risk of recurrence.[6,10,41-43] In a review of series documented in the modern literature, Madiba et al. noted no recurrences following cecostomy but an associated mortality of up to 40%. Of particular note, cecostomy performed through a perforation may prove ill advised due to the high morbidity and mortality rates documented with this particular practice.[5,6] In the setting of the atrophic and edematous bowel most frequently encountered following cecal volvulus, the condition of the tissues may also significantly hinder the placement of adequate seromuscular sutures. This in turn contributes to leakage from sutures, cecal necrosis and failure to obtain an adequate fixation or seal around the cecostomy tube with resultant complications.[7,37] Combined cecopexy and cecostomy has been performed with no recurrence and no mortality[6,17,40,44] but only seven cases of both procedures are recorded in the literature,[40] so no strong assumptions can be made on the effectiveness of this dual approach.

The role of resection in the management of non-gangrenous bowel following cecal volvulus has been debated.[4,40,45] In the review of recorded series since 1992, Madiba et al. noted that resection was performed twice as often as cecopexy and three times as frequently as cecostomy in this setting. They noted that when either cecopexy or cecostomy was compared to resection in the setting of viable bowel the results were inferior in terms of both morbidity and mortality. It is possible, however, that this finding may be due to bias in the selection of higher risk patients for nonresectional procedures.[40]

While cecopexy and cecostomy seem less effective and more morbid options than resection and anastamosis for viable bowel, their role warrants evaluation in the light of advances in minimally invasive techniques.[40] Multiple authors have described laparoscopic approaches to cecopexy[7,46] with no recurrence reported after follow-up periods ranging from 4 months to 4 years. However, due to the markedly dilated cecum in the emergency setting, the role for a laparoscopic approach to a cecal volvulus remains unclear and will likely be isolated to the few cases which resolve and can be addressed on an elective basis.

Cecal volvulus is a rare occurrence in the post-operative period. Following any surgical procedure, however, this diagnosis should be included in the differential of post-operative obstruction. This is particularly true following those surgical procedures that involve disruption of the fusion plane of the cecum and right colon to the posterior peritoneum. All surgeons and surgical sub-specialists performing these types of procedure should be aware of the means of diagnosis and modalities of treatment available for the treatment of cecal volvulus.

REFERENCES

1. Grover NK, Gulati SM, Tagore NK, Taneja OP. Volvulus of the cecum and ascending colon. Am J Surg 1973;125:672-5.
2. Pahlman L, Enblad P, Rudberg C, Krog M. Volvulus of the colon. A review of 93 cases and current aspects of treatment. Acta Chir Scand 1989;155:53-6.
3. Avots-Avotins KV, Waugh DE. Colon volvulus and the geriatric patient. Surg Clin North Am 1982;62:249-60.
4. Friedman JD, Odland MD, Bubrick MP. Experience with colonic volvulus. Dis Colon Rectum 1989;32:409-16.
5. Gupta S, Gupta SK. Acute caecal volvulus: report of 22 cases and review of literature. Ital J Gastroenterol 1993;25:380-4.
6. Rabinovici R, Simansky DA, Kaplan O, Mavor E, Manny

J. Cecal volvulus. Dis Colon Rectum 1990;33:765-9.
7. Shoop SA, Sackier JM. Laparoscopic cecopexy for cecal volvulus. Case report and a review of the literature. Surg Endosc 1993;7:450-4.
8. Ballantyne GH, Brandner MD, Beart RW Jr, Ilstrup DM. Volvulus of the colon. Incidence and mortality. Ann Surg 1985;202:83-92.
9. Burke JB, Ballantyne GH. Cecal volvulus. Low mortality at a city hospital. Dis Colon Rectum 1984;27:737-40.
10. Reilly P, Jones B, Bulkley GB. Current surgical therapy. In: Cameron J, editor. Current surgical therapy. 4th ed. Philadelphia: BC Decker; 1992. p. 170-4.
11. Haskin PH, Teplick SK, Teplick JG, Haskin ME. Volvulus of the cecum and right colon. JAMA 1981;245:2433-5.
12. Wolfer JA, Beaton LE, Anson BJ. Volvulus of the cecum. Surgical Gynecology and Obstetrics 1942;74:882-94.
13. Rogers RL, Harford FJ. Mobile cecum syndrome. Dis Colon Rectum 1984;27:399-402.
14. Wertkin MG, Wetchler BB, Waye JD, Brown LK. Pneumatosis coli associated with sigmoid volvulus and colonoscopy. Am J Gastroenterol 1976;65:209-14.
15. Wertkin MG, Aufses AH Jr. Management of volvulus of the colon. Dis Colon Rectum 1978;21:40-5.
16. Krippaehne WW, Vetto RM, Jenkins CC. Volvulus of the ascending colon. A report of twenty-two cases. Am J Surg 1967;114:323-32.
17. Anderson JR, Welch GH. Acute volvulus of the right colon: an analysis of 69 patients. World J Surg 1986;10:336-42.
18. Ritvo M, Farrell GE Jr, Shauffer IA. The association of volvulus of the cecum and ascending colon with other obstructive colonic lesions. Am J Roentgenol Radium Ther Nucl Med 1957;78:587-98.
19. Singh G, Gupta SK, Gupta S. Simultaneous occurrence of sigmoid and cecal volvulus. Dis Colon Rectum 1985;28:115-6.
20. Sorg J, Whitaker WG Jr, Richmond L. Volvulus of the right colon in the post-partum and postoperative patient. J Med Assoc Ga 1977;66:519-23.
21. Ellis H. Pseudo-obstruction of the colon. In: Ellis H, editor. Intestinal obstruction. NY: Appleton-Century-Crofts; 1982. p. 81-6.
22. Jordan GL Jr, Beahrs OH. Volvulus of the cecum as a postoperative complication; report of six cases. Ann Surg 1953;137:245-9.
23. Ulloa SA, Ramírez LO, Ortíz VN. Cecal volvulus after laparoscopic liver biopsy. Bol Asoc Med P R 1997;89:195-6.
24. Konvolinka CW, Moore RA, Bajwa K. Cecal volvulus causing postoperative intestinal obstruction: report of a case. Dis Colon Rectum 2001;44:893-5.
25. McIntosh SA, Ravichandran D, Wilmink AB, Baker A, Purushotham AD. Cecal volvulus occurring after laparoscopic appendectomy. JSLS 2001;5:317-8.
26. Guerra EE, Nghiem DD. Posttransplant cecal volvulus. Transplantation 1990;50:721.
27. Ali Khan S, Desai PG, Siddharth P, Smith N. Volvulus of cecum following simple nephrectomy. Urol Int 1985;40:1-2.
28. Etheredge EE, Martz M, Anderson CB. Volvulus of the cecum following transplant donor nephrectomy. Surgery 1977;82:764-7.
29. Frank AJ, Goffner LB, Fruauff AA, Losada RA. Cecal volvulus: the CT whirl sign. Abdom Imaging 1993;18:288-9.
30. Anderson MJ Sr, Okike N, Spencer RJ. The colonoscope in cecal volvulus: report of three cases. Dis Colon Rectum 1978;21:71-4.
31. Orchard JL, Mehta R, Khan AH. The use of colonoscopy in the treatment of colonic volvulus: three cases and review of the literature. Am J Gastroenterol 1984;79:864-7.
32. Todd GJ, Forde KA. Volvulus of the cecum: choice of operation. Am J Surg 1979;138:632-4.
33. O'Mara CS, Wilson TH Jr Stonesifer GL, Stonesifer GL, Cameron JL. Cecal volvulus: analysis of 50 patients with long-term follow-up. Ann Surg 1979;189:724-31.
34. Hiltunen KM, Syrjä H, Matikainen M. Colonic volvulus. Diagnosis and results of treatment in 82 patients. Eur J Surg 1992;158:607-11.
35. Watson RG. Ileosigmoid knot. J R Coll Surg Edinb 1984;29:100-2.
36. Shepherd JJ. Ninety-two cases of ileosigmoid knotting in Uganda. Br J Surg 1967;54:561-6.
37. Theuer C, Cheadle WG. Volvulus of the colon. Am Surg 1991;57:145-50.
38. Howard RS, Catto J. Cecal volvulus. A case for nonresectional therapy. Arch Surg 1980;115:273-7.
39. Smith WR, Goodwin JN. Cecal volvulus. Am J Surg 1973;126:215-22.
40. Madiba TE, Thomson SR. The management of cecal volvulus. Dis Colon Rectum 2002;45:264-7.
41. Frizelle FA, Wolff BG. Colonic volvulus. Adv Surg 1996;29:131-9.
42. Benacci JC, Wolff BG. Cecostomy. Therapeutic indications and results. Dis Colon Rectum 1995;38:530-4.
43. Ryan JA Jr, Johnson MG, Baker JW. Operative treatment of cecal volvulus combining cecopexy with intestinal tube decompression. Surg Gynecol Obstet 1985;160:84-6.
44. Geer DA, Arnaud G, Beitler A, Holcomb J, Homan J, James L, et al. Colonic volvulus. The Army Medical Center experience 1983-1987. Am Surg 1991;57:295-300.
45. Meyers JR, Heifetz CJ, Baue AE. Cecal volvulus: a lesion requiring resection. Arch Surg 1972;104:594-9.
46. Bhandarkar DS, Morgan WP. Laparoscopic caecopexy for caecal volvulus. Br J Surg 1995;82:323.