



Cecopexy, a Reemerging Treatment for Cecal Volvulus: Case Report and Systematic Review

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Abstract

Background: Cecal volvulus accounts for 25% to 40% of volvulus of the large bowel causing obstruction with varying degrees of presentation from obstructive symptoms to bowel necrosis and perforation. In the presence of viable bowel, cecopexy has previously been demonstrated as a treatment method of surgery. The authors aim to demonstrate the feasibility and reemergence of cecopexy as a laparoscopic and open technique.

Study Design: We present a case of open cecopexy in a patient with severe hyponatremia with cecal volvulus and systematic review. A systematic search (January 2017) of PubMed, Scopus, Cochrane and EMBASE databases was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for literature regarding cecal Volvulus and cecopexy. Included studies were peer-reviewed articles or academic society publications. Papers without cecopexy, non-English language, and non-adult cases were excluded.

Results: A total of 1080 articles were identified from all four databases through the systematic search 44 articles were then evaluated for surgical procedure performed; only 20 articles described Cecopexy. A total of 316 cases were documented for cecal volvulus with a mean age of 51.6 ± 13 years. Further analysis demonstrated 83 cases of resection and 114 cases for cecopexy. Overall cecopexy recurrence rate was 8.8%.

Conclusion: Operative intervention is the preferred management of cecal volvulus. Cecopexy can be performed in patients who have viable bowel and require further resuscitation. This can be performed either via open or laparoscopic approach. Patient with non-viable bowel require resection with either primary anastomosis or colostomy.

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Keywords: Cecopexy; Cecal volvulus; Cecal bascule; Literature review; Beer potomania; Hyponatremia

Introduction

Cecal volvulus causes approximately 1-3 percent of all large bowel obstructions. It is defined as the rotation or torsion of a flexible cecum and ascending colon around its mesentery [1-3]. Patients most commonly present with acute obstructive symptoms and signs, including nausea, vomiting, and abdominal pain and distension [2,4-6]. It frequently progresses to bowel obstruction, ischemia, necrosis, and perforation [7]. Initial imaging evaluation with plain abdominal X-rays can demonstrate dilated colon usually pointing to the direction of the spleen. CT Abdomen and Pelvis (CTAP) should be performed in patients without signs of perforation or peritonitis. This allows for localization of the level of obstruction. There are three types of cecal volvulus commonly described based on position and rotation around the mesentery [4,8-11]. Type 1 - An axial volvulus develops from clockwise axial torsion or twisting of the cecum along its long axis; the volvulized cecum remains in the right lower quadrant. Type II - A loop cecal volvulus develops from torsion or twisting of the cecum and a portion of the terminal ileum, resulting in the cecum being relocated to an ectopic location (typically left upper quadrant) in an inverted orientation. Most, but not all, type II cecal volvuli have a counterclockwise twist [10]. Type III - Cecal bascule involves the upward folding of the cecum rather than an axial twisting. Torsion-type cecal volvuli (types I and II) are more common, accounting for approximately 80 percent of all cecal volvuli [10]. Cecal bascules (type III) account for the remaining 20 percent. The treatment algorithm of cecal volvulus is based on bowel compromise and hemodynamic stability [12-14]. If gangrenous bowel is present this should not be untwisted to reduce risk of septic shock [14]. The standard of treatment involves surgical resection and primary anastomosis based on decreased complication rates and no recurrence of volvulus [14].

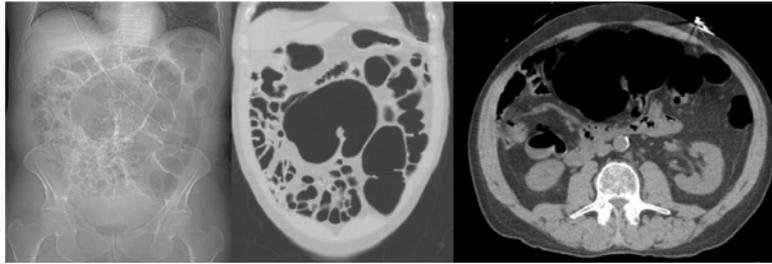


Figure 1: CT abdomen and pelvis showing midline cecum with volvulus.



Figure 2: Midline cecum with small intestine in the right lower quadrant.

Improved perioperative management may reduce complications in patients presenting with viable bowel and change this notion. The authors aim to perform a review of the literature to evaluate the feasibility, reemergence and rationale for performing cecopexy in patient with viable bowel based on a recent case of cecal volvulus.

Methods

Case report

A 71 year old male with medical history of diabetes, hypertension and alcohol abuse presented to the ED with a five day history of increasing abdominal girth, passing flatus intermittently and was able to tolerate clear liquids prior to presentation. Other symptoms included cough, and subjective fevers x 4 days, watery emesis for 3 days, and no bowel movement or flatus on the day of presentation. Patient endorses drinking 6-8 beers per day but denies smoking or illicit drug use. In the emergency room patient was a febrile (T: 98.5F), with a heart rate of 84bpm and mildly hypertensive to 167/87 mmHg. Physical examination demonstrated a soft, mildly distended abdomen with mild tenderness, without masses or guarding. Rectal examination revealed no masses, no blood, and an empty vault. Blood tests were within normal ranges except for sodium of 114 mEq/L, lactate 3.0 mmol/L and serum osmolality of 229 mOsm/kg. An abdominal plain film was performed, which demonstrated excessively distended cecum. These findings were confirmed with CTAP demonstrating cecal volvulus (Figures 1A-1C). Resuscitation was started preoperatively in the emergency room with bolus normal saline and patient taken emergently to operating room (OR). On exploratory laparotomy via a midline incision, all bowels were viable. The cecum was identified as a midline structure and was found to be volvulized, with small intestine in the right lower quadrant (Figures 2A and 2B). The cecum was untwisted and inspected; there was a 1.5 cm serosal tear on the anterior mesenteric border, but no full thickness injuries were identified. The cecum was placed back in its normal anatomic position in the right lower quadrant. A cecopexy was performed using 2-0 Vicryl sutures to approximate epiploic appendages to the lateral abdominal wall to secure the cecum in place and prevent future volvulus. Postoperatively patient

transferred to Surgical Intensive Care Unit (SICU) intubated and further resuscitated with repeat sodium of 127 mEq/L. The patient was extubated on Post Op Day (POD) 1 and transferred to floor with NGT. Patient received IVF at 84ml/hr normal saline and clear liquid diet started on POD 2 with addition of salt tabs. The patient recovered uneventfully and was discharged POD 9 with resolving hyponatremia (Na 135 mEq/L). Patient has had no evidence of recurrence after 6 months and continues to follow up.

Study design and search strategy

An initial search of the international prospective database of systematic reviews (PROSPERO) revealed no ongoing or published systematic reviews assessing cecal volvulus or cecopexy protocols. According to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic review of PubMed, Scopus, Cochrane database and EMBASE was performed on January 5, 2017. The employed search strategy including all Medical Subject Heading (MeSH) terms consisted of the following: (“Cecal volvulus” OR “Cecal bascule”) AND (“cecopexy”). Filters were then applied to select for English language papers. To identify additional citations missed by electronic searches, references of included studies were checked manually.

Inclusion and exclusion criteria

All studies, published up to January 5th, 2017, evaluating cecal volvulus and cecopexy were included. The add-on requirements had been: Case studies; Literature review. Studies were then analyzed to determine if there was cecopexy performed for cecal volvulus.

Study selection

Two authors (FJRP and PS) individually reviewed the papers, assessed the study quality, with confirmation of cecopexy performed for cecal volvulus, and cross-checked after initial review. Any difference of opinion within the two reviewers’ data collection was reviewed until a general opinion was attained; if agreement could not be reached a third independent author (SK) was included in the dialogue as a final referee. The details of the final studies included the authors, publication year of the research and journal (Table 1).

Table 1: Summary of Final Studies Obtained from Systematic Review.

Ref. No.	Study title	Authors	Journal and year published
6	Volvulus of the Colon Incidence and Mortality	Ballantyne, GH, Brandner, MD, Beart, RW Jr, Ilstrup, DM	Annals of Surgery 1985
15	Cecal Volvulus: A Lesion Requiring Resection	Meyers, J.R., Heifetz, C.J., Baue, A.E.	Archives of Surgery
16	Cecal Volvulus	Smith, W.R., Goodwin, J.N.	The American Journal of Surgery
17	Volvulus of the cecum.	Andersson A, Bergdahl L, Linden W.	Ann Surg. 1975
18	Cecal volvulus: analysis of 50 patients with long-term follow-up.	O'Mara CS, Wilson TH JrStonesifer GL, Stonesifer GL, Cameron JL.	Ann Surg. 1979
19	Volvulus of the cecum: choice of operation.	Todd GJ, Forde KA.	Am J Surg. 1979
20	Acute volvulus of the right colon: An analysis of 69 patients	Anderson, J.R., Welch, G.H.	World Journal of Surgery
21	Cecal volvulus: review of 12 cases.	Wright TP, Max MH.	South Med J. 1988
23	Cecal volvulus causing postoperative intestinal obstruction: report of a case.	Konvolinka CW, Moore RA, Bajwa K.	Dis Colon Rectum. 2001
24	Laparoscopic cecopexy for mobile cecum syndrome manifesting as cecal volvulus: report of a case.	Tsushimi T, Kurazumi H, Takemoto Y, Oka K, Inokuchi T, Seyama A, Morita T.	Surg Today. 2008
25	Mobile caecum and ascending colon syndrome in a Nigerian adult	Makama, J.G., Ahmed, A., Ukwenya, Y., Mohammed, I.	Annals of African Medicine
26	Cecum volvulus complicated by septic jaundice.	Batista TP, Rolim JC, Gomes AA, Carvalho WL, Santos RJ.	Rev Col Bras Cir. 2010
27	Cecal volvulus associated with intestinal malrotation presenting as postoperative intestinal obstruction.	Arulmolichelvan A, Sivaraman A, Muthukrishnan A.	Med PrincPract.
28	Laparoscopic detorsion and cecopexy for treatment of cecal volvulus.	Jones RG, Wayne EJ, Kehdy FJ.	Am Surg. 2012
29	Minimal invasive management of acute cecal volvulus: colonoscopy followed by laparoscopic cecopexy.	Ortega PM, Rotellar F, Arredondo J, Baixauli J, Zozaya-Larequi FJ, Betes M, Hernandez-Lizoain JL.	Rev EspEnferm Dig. 2014
30	Cecal bascule herniation into the lesser sac.	Makarawo T, Macedo FI, Jacobs MJ.	World J Clin Cases. 2014
31	Suspected cecal volvulus as a reason for abdominal pain after gastric bypass: a case series.	Sujka J, Teixeira AF, Jawad MA.	SurgObesRelat Dis. 2015
33	Cecal bascule after spinal cord injury: A case series report.	Ishida Y, McLean SF, Tyroch AH.	International Journal of Surgery 2016
32	Acute caecal volvulus: A diagnostic paradigm.	Chaudry TH, Jamil M, Niaz K, Basher G.	J Pak Med Assoc.

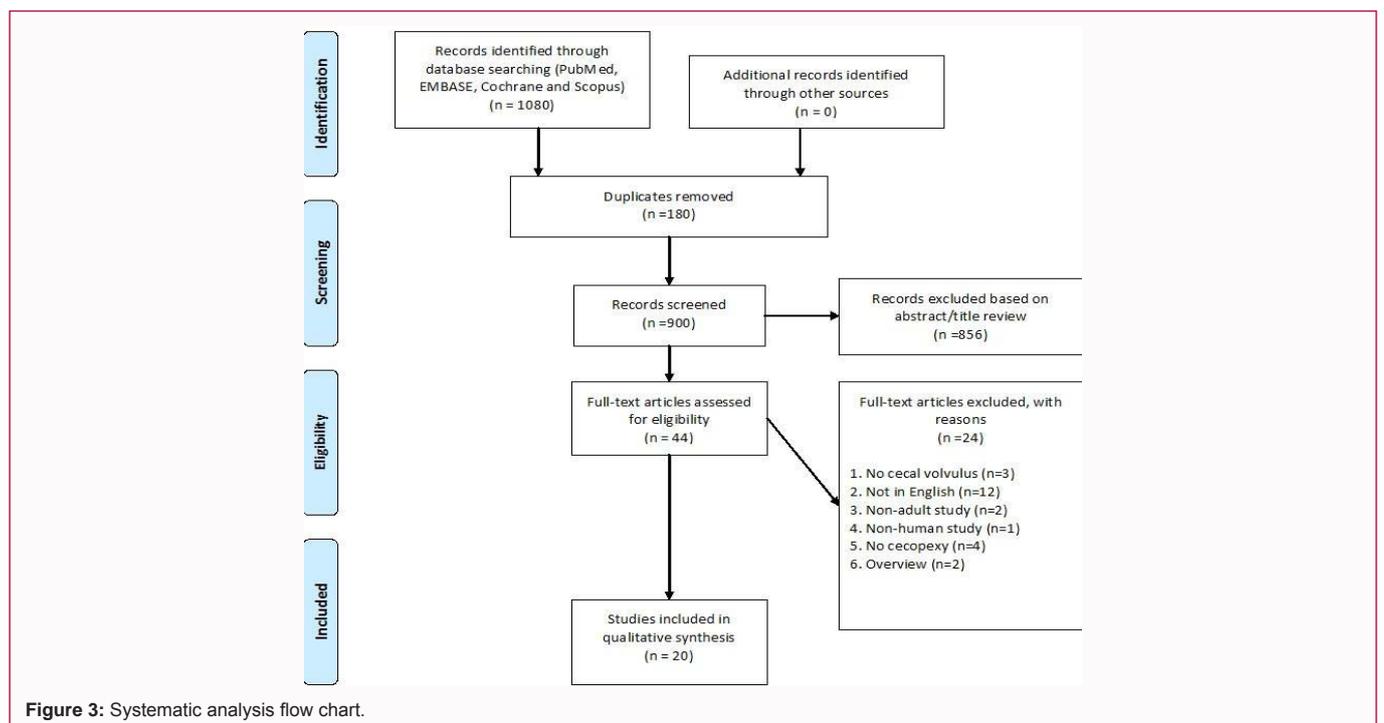


Figure 3: Systematic analysis flow chart.

Statistical analysis

Statistical analysis was performed using SPSS v22 (IBM corporation, New York, USA). An independent sample student T-test was used to compare groups for continuous data and chi-squared used for categorical data. Continuous data comparisons were expressed as means with standard error. Tests were considered

significant if $p < 0.05$.

Results

A total of 1080 articles were identified from all four databases through the systematic search. After removing the duplicates, the title and abstract of 900 references were screened for meeting the

Table 2: Analysis of final studies meeting selection criteria.

Author/ Ref No./ Year	Age range/ (mean)	Total No. of cases	No. with resection/No. of Recurrence	No. with cecopexy/No. of Recurrence	Follow up period (years)	Overall mortality
Ishida [33]	51-63 (57.67)	3	01-00	2 (1)/0	1 month-1.25	NS
Chaudry [32]	30-45 (36.36)	11	09-00	2-02	1-4 (2.2)	1 (9%)
Sujka [31]	34-50 (39.33)	3	0/0	03-00	NS	NS
Makarawo [30]	75	1	0/0	Jan-00	1	NS
Ortega [29]	36	1	0/0	Jan-00	1	NS
Jones [28]	55	1	0/0	Jan-00	2 weeks	NS
Arulmolichelvan [27]	23	1	0/0	Jan-00	1 month	NS
Batista [26]	55	1	0/0	Jan-00	NS	NS
Makama [25]	42	1	0/0	Jan-00	1	NS
Tsushimi [24]	44	1	0/0	Jan-00	1.7	NS
Konvolinka [23]	75	1	0/0	Jan-00	NS	NS
Shoop [22]	37	1	0/0	Jan-00	NS	NS
Wright [21]	43-84-62.3	12	Apr-00	Feb-00	4 months-16	2 (17%)
Anderson [20]	14-91 (60)	69	24/0	25 (10)/3	6.8-12.6 (8.2)	13 (19%)
Ballantyne [6]	1-91 (55)	71	35/0	Dec-00	1.2-15 (5.6)	12 (17%)
Todd [19]	16-80 (54.6)	18	Mar-00	Jun-00	1.5-14 (6)	3 (17%)
O'Mara [18]	14-88 (53)	50	Jul-00	18/0	1 month -17 (5.7)	6 (12%)
Andersson [17]	14-89 (63.1)	37	Apr-00	13 (3)/2	1-17 (7)	7 (19%)
Smith [16]	21-94 (60)	24	Apr-00	20 (17)/0	NS	3 (13%)
Meyers [15]	29-64 (48.67)	9	May-00	3-Mar	1.6-4	1 (11%)
TOTAL	51.6 ± 13	316	83/0	114/10		

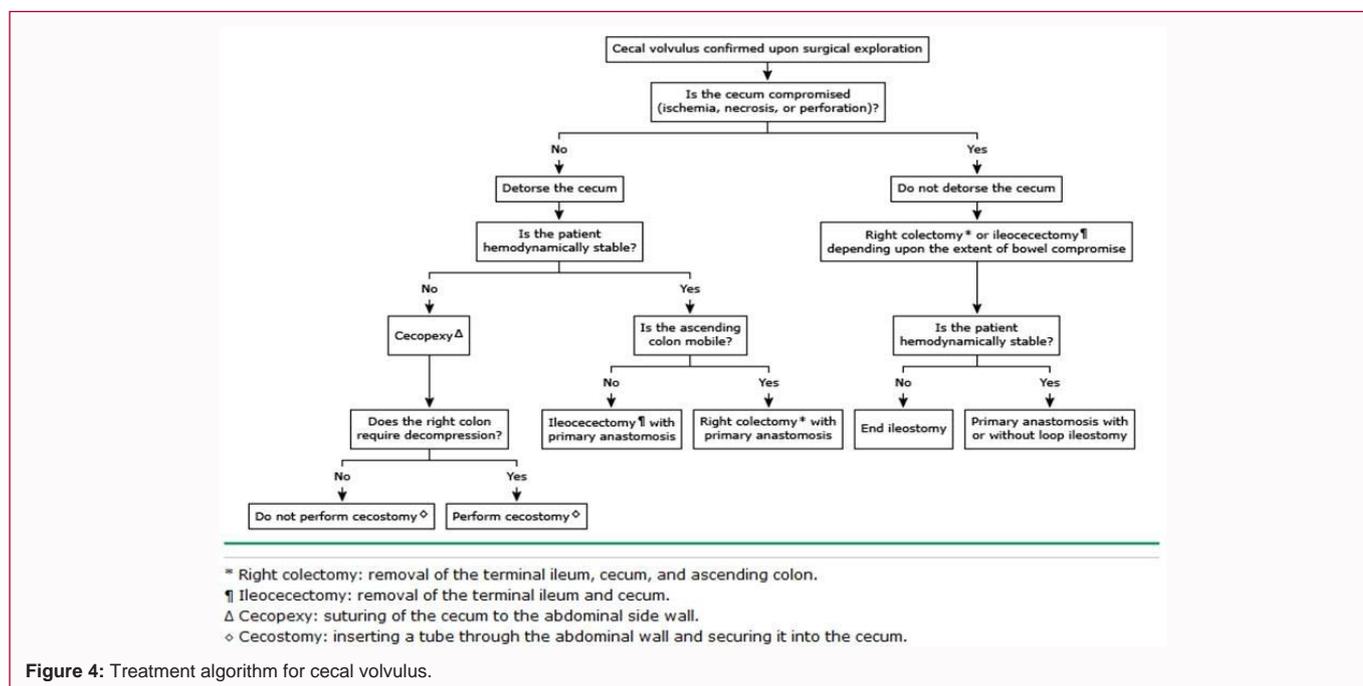


Figure 4: Treatment algorithm for cecal volvulus.

inclusion criteria. A total of 62 articles were found with a combination of keywords “Cecal volvulus” or “cecal bascule” and “Cecopexy”. Using the inclusion criteria of keywords and English full text articles 44 articles remained. No additional studies were obtained following a manual reference list search of included studies. The 44 articles were then evaluated for surgical procedure performed; only 20 articles described Cecopexy depicts the systematic analysis to achieve the final twenty studies for synthesis in the PRISMA flow diagram (Figure 3).

Analysis of final studies

Further analysis of age, total cases, number of cases with resection and cecopexy with number of recurrences is tabulated in (Table 2). Of the 20 articles [6,15-33], a total of 316 cases were documented for cecal volvulus with a mean age of 51.6 ± 13 years. Further analysis demonstrated 83 cases of resection and 114 cases for cecopexy. There were a total of 10 recurrences in cecopexy group with an overall recurrence rate of 8.8%. Overall mortality range in all studies

Table 3: Mortality rate based on procedures.

Procedure	Mortality rate	Source
Detorsion	12-Feb	O'Mara [18]
	4-Feb	Andersson [17]
	18-Mar	Ballantyne [6]
Detorsion w/appendectomy	3-Jan	Andersson [17]
Cecopexy	18-Jan	Anderson [20]
	3-Jan	Russel 1973
	12-Jan	Ballantyne [6]
Cecopexy w/appendectomy	1-Jan	Andersson [17]
Cecostomy	2-Jan	Todd [19]
	3-Jan	Andersson [6]
	Jan-41	O'Mara [18]
Cecostomy and cecopexy	17-Jan	Russel 1973
Resection and primary anastomosis	14-Mar	Anderson [20]
	7-Feb	O'Mara [18]
	4-Jan	Russel 1973
	4-Feb	Andersson [17]
	May-60	Ballantyne [6]
Resection and end ileostomy	4-Feb	Anderson [20]
	14-Jan	Ballantyne [6]
Ileocelectomy	5-Feb	Todd [19]

was 9% to 19%. Table 3 demonstrates mortality by procedure with higher mortality in cases when appendectomy was performed and ileocelectomy.

Discussion

This study aimed to review the available literature to assess the feasibility and reemergence of cecopexy for cecal volvulus base on a recent case at performed. The case demonstrates a patient who presented with severe hyponatremia which can be a combination of malnutrition or intoxication both due to alcoholism. Malnutrition described primarily in beer drinkers (hence called beer potomania or beer drinkers' potomania), leads to low dietary solute intake. Presentation is usually of hyponatremia and low osmolality with decreased solute excretion and dilute urine [34]. Management goals include increasing serum sodium <10 mEq/L in first 24 hr and increasing serum sodium by <18 mEq/L in first 48 hr. This should be performed in an intensive care unit with judicious monitoring of fluid intake and serial serum sodium levels [34]. The case was also complicated with the presence of cecal volvulus, management of which is primarily surgical [14,35]. There is an increased risk of complications with non operative management with a less than five percent (<5%) success rate [12-14,35]. Review of the literature reveal two major options for viable bowel in cecal volvulus. These are cecopexy in cases of hemodynamic instability or resection and primary anastomosis in cases of hemodynamic stability. Treatment algorithm for cecal volvulus is illustrated in (Figure 4) [36]. A review of the major reports relating to choice of operation follows. Looking at early literature, Todd et al. [19] assessed recurrence rate of several prior studies comparing patients who had resection, cecostomy, cecopexy and detorsion [19]. The overall recurrence of cecopexy is noted to be 6.9% (8/116), and there was no noted recurrence in their series of patients. There were no recurrences with resection or

tube cecostomy. They concluded no evidence to support resection was associated with lower recurrence than tube cecostomy. A larger study Ballantyne et al. [6] a total of 71 patients was noted to have cecal volvulus [6]. Further subdivisions of two groups were created, patients with cecal fold volvulus or full cecal volvulus. There were no recurrences noted in patients who underwent procedure of cecopexy (N=12) or resection and primary anastomosis (N=35) or resection and stoma (N=4). Mortality was higher in patients with gangrenous bowel 33% vs. 12% in patients with viable bowel. Although no definitive conclusion was stated from this study for cecal volvulus. Cecopexy showed no recurrence and one mortality which were comparable to resection group of a total of 39 patients with no recurrence and 6 cases of mortality [6]. Konvolinka et al. [23] reported on a case with previous left hemicolectomy, complicated with cecal volvulus. Cecopexy was the preferred treatment to preserve colonic function as significant portion of the left colon had previously been resected [23]. More recent literature has shown several laparoscopic case studies demonstrating the use of minimally invasive technique as both diagnostic and therapeutic. The earliest of which was by Shoop et al. [22] which demonstrated the feasibility of the procedure however had no follow up on recurrence. Ortega et al. [29] reported on a 36 year old who presented with cecal volvulus and pneumatosis intestinalis, with no recurrence after one year follow up and resolution of symptoms. The most recent case series noted in this review was conducted by Ishida et al. [33]; In 2016. They reported to three cases of cecal bascule after spinal cord injury. The longest follow up was fifteen months with no recurrences. Case 1 and 2 both had cecopexy with case 2 additionally having a cecostomy tube placed. Case 3 had right hemicolectomy and ileocolonic anastomosis. There were no mortalities stated however case 2 was complicated by return to hospital for tube dislodgement requiring replacement. They concluded that right hemicolectomy is the preferred surgical treatment, where as cecopexy is also an acceptable treatment option if hardware is inserted.

Study Limitations

This manuscript is subject to bias in study selection as the included databases, search terms, and inclusion and exclusion criteria may not have retrieved an exhaustive list of existing literature of cecopexy and cecal volvulus or bascule. For example, exclusion of studies in which cecopexy was performed after cases of appendicitis were excluded. However, attempts at maintaining broad search terms and utilizing multiple databases, including EMBASE which contains citations from an extended list of European and Asian journals, were made to facilitate widespread literature study retrieval. Moreover, while the search was systematic, final analysis and summarization of steps for the examination protocol was based on the authors' experience and clinical expertise. Analysis was also based on available documentation which was limited to several case studies and case series. No level II or higher studies were noted due to the severity of disease process. The authors also aimed to compare cecopexy to cases of resection as demonstrated to be the preferred modes of therapy.

Conclusion

The recommendations based on this study include early resuscitation with appropriate imaging preoperatively. Operative intervention is the preferred management of cecal volvulus. In the setting of bowel compromise resection with either primary anastomosis or end ileostomy should be performed. Cecopexy can be performed in patients who have viable bowel and require further

resuscitation due to level of instability. This can be performed either via open or laparoscopic approach. Special considerations should include patients with previous resections as well. The case presented demonstrates a patient who is hemodynamically stable however due to the level of hyponatremia in the setting of chronic alcohol use and malnutrition could be managed with a cecopexy as the procedure is shorter and patient required further resuscitation in the intensive care unit.

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