

# Volvulus of the Cecum

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A series of 37 patients with cecal volvulus treated at three different Swedish hospitals during the years 1952-1973 is presented. The symptoms, physical findings and radiologic features are presented. The associated factors found at operation are described and their possible role in provoking torsion is discussed. In 5 patients the diagnosis did not become clear until autopsy. Thirty-two patients were subjected to operation. The operation consisted of detorsion in 11 cases, cecopexy in 10, cecostomy in 3 and cecopexy plus cecostomy in 3 patients. The remaining 5 patients were subjected to right sided hemicolectomy. Of these 5 patients one died postoperatively. There were 6 postoperative deaths after other forms of surgery. The survivors were followed, and the mean followup period was 7 years. There was recurrence in only two patients, both treated with cecopexy. The controversial problem of the preferable surgical method is discussed and a review is given of results in series reported during the last 15 years. It was concluded that when the bowel is viable, cecopexy is the treatment of choice while hemicolectomy should be performed in cases with gangrene.

**V**OLVULUS of the cecum is an axial twist or a folding of the bowel upon its mesentery. This results in acute intestinal obstruction which may or may not be complicated by occlusion of the mesenteric vessels. The condition was first described by Rokitansky<sup>15</sup> in 1837 and for reasons which are not fully understood it seems to be more common in Scandinavia and Eastern European countries than in Western Europe and the United States. There are a number of important differences between volvulus of the cecum and the much more common volvulus of the sigmoid colon. These differences stem from localization and mobility of these two parts of the colon and they are reflected by differences in symptomatology, radiology and prognosis. Although its distinctive characteristics are perhaps not always clarified in reviews of the subject, colonic volvulus also stands apart from a therapeutical point of view. It is the purpose of the present paper to analyze a series of 37 patients treated in

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three different Swedish hospitals for volvulus of the colon. The emphasis of this analysis is on the controversial subject of surgical treatment. We reasoned that the analysis of such a large series might have a better chance for giving guidelines for therapy than the comparatively small series hitherto reported.

## Patient Series

The series comprises all 37 patients with cecal volvulus treated during the 20-year period 1952-1973 at the surgical departments of the hospitals of Umeå (12 patients), Östersund (20 patients) and Kristianstad (5 patients). There were 20 females and 17 males, the mean age of the female patients being 63 years (range 14-89 years) and that of the males 64 years (range 10-91 years).

## Symptoms and Signs

In all except 3 patients there was a history of abdominal pain. As a rule the pain was severe and colicky with acute onset. Abdominal distension was noted in only 40 per cent of the patients (14 of 37). Nausea and vomiting were present in the majority (20 of 37). The length of the history before the patients sought treatment varied considerably i.e. from 3 hours to 10 days with a mean of 2 days. Three patients gave a history of previous attacks of similar pains which had subsided without surgical intervention or other treatment.

In the great majority of our patients (30 of 37) the abdomen was distended and tympanic. Signs of acute peritonitis with wide-spread abdominal tenderness and rigidity of the entire abdominal wall were present in one patient. In this patient a gangrenous cecum was found at operation to have perforated, giving rise to a general peritonitis. High pitched bowel sounds were audible in three of the 37 patients. In only 7 patients the tempera-

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TABLE 1. Summary of 37 Patients with Volvulus of the Cecum

Pat No	Sex, Age	Duration of Illness	Previous Abdominal Surgery	Operative findings other than cecal volvulus	Operative procedure	Result
1	F, 55	24 hrs	None	Mesenterium commune Cecal gangrene	Cecostomy	Died postop Dy 1
2	M, 72	10 dys	None	Mesenterium commune	Cecopexy appen- dectomy	Died postop Dy 9
3	F, 61	2 dys	Cecopexy 8 years earlier	None	Cecopexy	No recurrence 14 yrs later
4	M, 91	2 dys	Appendectomy	No operation	Autopsy finding	_____
5	M, 83	24 hrs	None	No operation	Autopsy finding	_____
6	F, 74	2 dys	None	No operation	Autopsy finding	_____
7	F, 19	2 dys	Appendectomy, mobilization of cecum	None	Cecopexy	No recurrence 1 yr later
8	F, 66	5 dys	Incarc. umbilical hernia 29 days earlier	_____	Autopsy finding	_____
9	F, 76	24 hrs	None	None	Cecopexy + lysis of adhesions	No recurrence 10 yrs later
10	M, 87	4 dys	None	None	Detorsion	Died postop Dy 6 (pneu- monia)
11	F, 68	36 hrs	None	None	Detorsion	Died 4 mon postop from pneumonia. No recurrence.
12	F, 67	24 hrs	None	None	Cecopexy	No recurrence 2 yrs later
13	F, 74	2 dys	None	None	Right colectomy	Died postop Dy 4
14	M, 41	24 hrs	None	None	Detorsion + lysis of adhesions	No recurrence 21 yrs later
15	M, 31	3 hrs	None	None	Detorsion	No recurrence 9 yrs later
16	M, 54	30 hrs	Appendectomy	None	Cecopexy + lysis of adhesions	No recurrence 5 yrs later
17	M, 70	24 hrs	None	Cecal gangrene	Right colectomy	Good
18	F, 81	4 dys	None	Cecal gangrene	Right colectomy	Died postop Dy 15
19	M, 16	9 hrs	None	None	Cecopexy + cecos- tomy	No recurrence 17 yrs later
20	F, 89	12 hrs	Cholecystectomy	None	Cecopexy	Died 1 yr later No recurrence
21	F, 71	2 dys	Nephrectomy	Sigmoidal carcinoma	Cecopexy + cecos- tomy	Died 9 mon later No recurrence
22	F, 81	2 dys	Hernia in cicatrice 1 day earlier, appendectomy	_____	Autopsy finding	_____
23	F, 86	24 hrs	None	None	Detorsion	Died postop Dy 7 (Insuff. cordis)
24	F, 65	24 hrs	Appendectomy. Op for umbili- cal hernia	None	Cecopexy	Recurrence 10 yrs later Reop. right colectomy
25	M, 74	24 hrs	None	Cecal gangrene with perforation	I Exteriorization II Right colectomy	Good
26	M, 53	5 dys	None	None	Cecopexy + cecos- tomy	No recurrence 3 yrs later
27	F, 57	3 dys	Cholecystectomy, gastric resection	None	Cecostomy	No recurrence 11 yrs later
28	F, 75	2 dys	Appendectomy + myomectomy	None	Cecopexy	Recurrence 2 yrs, 8 mon later. Reop: Cecopexy, no recurrence 1 yr later
29	M, 91	24 hrs	None	Rectal carcinoma	Cecostomy	No recurrence Died 1 yr later
30	M, 89	2 dys	Transabdominal prostatectomy	None	Appendectomy Detorsion	Died postop Dy 18
31	F, 26	24 hrs	None	None	Detorsion + Appendectomy	No recurrence 6 yrs later
32	F, 14	30 hrs	None	None	Detorsion Appendectomy	No recurrence 10 yrs later
33	M, 75	24 hrs	None	Cecal gangrene	Right colectomy	Good
34	M, 83	15 hrs	None	None	Reduction + lysis of adhesions + appendectomy	No recurrence 1 yr later
35	F, 42	24 hrs	None	None	Cecopexy	No recurrence 7 yrs later
36	M, 69	24 hrs	None	Mesenterium commune	Reduction only	Died postop Dy 5
37	M, 10	5 days	None	Mesenterium commune	Reduction + lysis of adhesions	No recurrence 13 yrs later

ture was elevated over 38 C. Finally, although leukocytosis was conspicuously absent in many patients, the mean white blood cell count was elevated, 10,900 per mm<sup>3</sup> with a range from 4,200-20,300.

### Radiological Findings

A plain abdominal roentgenogram had been made in 29 of our 37 patients while the radiological examination had been supplemented with a barium enema in 14 cases. Characteristically a plain x-ray film showed a dilated air filled colon in the right part of the abdomen while at the barium enema the cecum was not visualized and there was a "bird's beak" deformity in the right lower quadrant. Such characteristic signs were, however, present in only 10 of the 29 radiologically investigated cases. In one case—the one with general peritonitis due to perforation of a gangrenous caecum—free gas was found to be present. In 10 cases the radiological examination led to a diagnosis of large bowel obstruction of unknown origin and in the remaining 18 cases a diagnosis of small bowel obstruction was made.

### Associated Factors

Twelve patients had previously been subjected to abdominal surgery. A survey of these previous operations is given in Table 1. As seen in Table 1 most of these operations consisted of appendectomy or cholecystectomy i.e. operations which most likely were not related to the ensuing cecal torsion. In a few patients there was a possible causal connexion and these case histories warrant special comment:

*Case 3.* A 61-year-old woman had had surgery for a cecal volvulus 8 years before. Cecopexy had been performed with catgut as suture material. She was again admitted 8 years later with similar symptoms. Cecopexy was again performed but this time silk was used. Afterwards the patient was free from abdominal symptoms until her death from an unrelated cause 14 years later.

*Case 7.* A 19-year-old girl had been subjected to appendectomy 7 years previously. Delivering the appendix had been unusually difficult and the surgeon had been forced to mobilize part of the cecum. Volvulus of the colon developed 7 years later.

*Case 8.* A 66-year-old woman underwent surgery for an incarcerated umbilical hernia. The postoperative course was complicated by infection of the wound. An abscess formed and was drained but in spite of antibiotics and intensive care her condition deteriorated and she died on the 29th postoperative day. Autopsy revealed as the probable cause of death a cecal volvulus which had gone undiagnosed during life. The abscess was found to have obstructed the transverse colon.

*Case 22.* An 81-year-old female had been appendectomized in early life. She had later developed an incisional hernia and was admitted with signs of incarceration

of this hernia and underwent immediate surgery. The patient died on the second postoperative day and at autopsy a cecal volvulus was found. Apart from these 4 patients in whom there is a reasonably certain connexion between an abdominal operation and the development of cecum volvulus there were two patients in whom the volvulus may have been related to a distal obstructing lesion. In one case such a lesion consisted of a rectal cancer and in another the lesion was cancer of the sigmoid colon. Finally, it is worthy of note that a commune mesentery was found in no less than 4 patients.

### Treatment

As seen in Table I operation was performed in 32 of the 37 patients. In the remaining 5 cases the diagnosis was made at autopsy. Three of these latter patients (cases 4, 5 and 6) died soon after admission to hospital and before surgery could be carried out. In the two other patients (cases 8 and 22) volvulus of the cecum developed postoperatively, in case 8 after an operation for incarcerated umbilical hernia and in case 22 after an operation for incarcerated incisional hernia. Table 1 shows the operative procedures performed in the remaining 32 patients. Detorsion without fixation of the cecum was performed in 11 patients. Detorsion with ensuing cecopexy was done in 10 patients. In the majority of these patients lateral wall cecopexy was carried out. Cecopexy with cecostomy was done in 3 patients. Finally right hemicolectomy with end to end ileotransverse colostomy was performed in 5 patients, in 4 of whom the cecum was considered non-viable.

### Postoperative Course

One of the 5 patients subjected to right hemicolectomy died postoperatively while there were 6 postoperative deaths among the 27 patients who had undergone other forms of surgery. These patients were followed up for a mean period of 7 years. There was recurrence of the volvulus in two patients (cases 24 and 28), both of whom had undergone cecopexy.

### Discussion

In the present series women predominated; there were 20 female as compared with 17 male patients. A similar predominance of women was found in most other series with the exception of the one by Gardiner<sup>6</sup> who found cecal volvulus to be more common in men. The mean age of our patients was just over 63 years which is comparable to that reported by Wolf & Wilson,<sup>19</sup> Krippaehne et al.<sup>8</sup> and Smith and Goodwin.<sup>17</sup> The mean age is, however, markedly higher than that in most other series.<sup>1,4,10</sup> It is also clearly higher than that in another large Swedish series.<sup>12</sup> It should be pointed out that the majority of our patients (32 of 37) stem from two counties in the North of Sweden where due to an outflow of men and women in

the actively productive ages, old people are overrepresented. In other words the difference may be due to a difference in the population at risk.

Hypofixation of the cecum is a prerequisite for torsion and in accordance with other reports such a freely mobile cecum was found in all patients of this series. In 4 patients there was a commune mesentery. In one patient in our series the cecum had been mobilized in the course of a technically difficult appendectomy. Apart from this patient there were 5 others who had earlier been appendectomized and it is of course possible that also in the other 5 patients the operation had implied some mobilization of the cecum. On the other hand, it seems reasonable to expect a certain number of earlier appendectomies in any series of patients of this age and a causal connection between the operation and the later development of cecum volvulus can hardly be suspected. Apart from this, free mobility of the cecum seems to occur rather frequently. Wolfer et al.<sup>20</sup> found the cecum to be mobile in no less than 11% of their autopsy cases. In view of the relative rarity of cecum volvulus, hypofixation does not suffice as an explanation and it is clear that there must be other precipitating factors. In the search for such provoking factors much attention has been paid to the influence of a high residual diet. Such a coarse vegetable diet could explain the higher incidence in Eastern European countries.<sup>2</sup> But, in Scandinavia the incidence is also higher than in Western Europe and the United States while there are no marked dietary differences between these geographical regions. Overeating is sometimes also mentioned as an etiological factor.<sup>13</sup> This was not a prominent feature in the present series and it could be suspected in only one patient who had eaten an unusually large quantity of raisins some hours prior to the development of symptoms.

Other provoking factors which have been discussed are left colonic obstructive lesions and adhesive bands secondary to previous operations. Ritvo et al.<sup>14</sup> found colonic lesions distal to the site of the volvulus in no less than 50% of their cases. In other series the incidence is somewhat less high. For instance Krippaehne et al.<sup>8</sup> reported distal obstruction in 8 of their 22 patients. In the present series the frequency of distal obstructing lesions was considerably lower. We found such lesions in only three of our 37 patients. In one case there was a cancer of the sigmoid colon, one patient had a rectal cancer and in the third patient the distal obstruction consisted of an abdominal abscess which constricted the transverse colon. As for the possible influence of adhesions after previous operations, the reported incidence of such operations differs widely. The highest incidence seems to have been reported by Dixon and Meyer,<sup>3</sup> only two of their 12 patients had not had previous intra-abdominal operations. This is significantly more than in the present series in which only 12 of 37 patients had previously been

subjected to abdominal surgery. Other series hold an intermediate position e.g. in the series of Wolf and Wilson<sup>19</sup> abdominal surgery had been performed earlier in 12 of 22 patients.

The frequency with which gangrene is reported in the different series does not vary as markedly. Peterson<sup>12</sup> reported gangrene in 3 of 11 patients and in the series of Krippaehne et al.<sup>8</sup> and in that of Hinshaw et al.<sup>7</sup> the incidence is about 30%. In the present series this incidence is somewhat, although not significantly, lower; we found gangrene of the cecum in 5 of our 37 patients. Clearly, the viability of the bowel is of the utmost importance for the operative procedure to be selected. Gangrene of the cecum calls for a hemicolectomy which was performed in 3 of these 5 patients or for a Mickulicz-type exteriorization which was done in one case. In the fifth patient the extent of gangrene was limited and in this case only a cecostomy was performed.

Although opinions differ on the choice of the operative procedure there is general agreement that surgery should be undertaken as soon as the patient's general condition permits. The greater the lapse of time between the onset of symptoms and the operation the greater is the mortality.<sup>7</sup> The controversy regarding the proper surgical technic of correction of cecal volvulus concerns especially those cases in which the bowel is viable. On the one hand are the advocates of cecopexy which can be combined with cecostomy, on the other are those surgeons who also recommend an emergency right hemicolectomy for these cases. Resection as treatment for cecal volvulus when the bowel is viable was introduced by Melchior<sup>9</sup> after he had experienced two recurrences following cecopexy. The danger of recurrence of the condition is still the main argument of the proponents of resection. Against this danger, which undoubtedly exists, must be weighed the increased dangers connected with an emergency hemicolectomy without prior antibiotic therapy and performed in patients who more often than not are in a relatively poor general condition. It is our belief that when confronted with this problem the surgeon should choose the procedure with the least immediate risk, i.e. cecopexy. We base this opinion on the relative rarity of recurrence. A proper estimate of the frequency of recurrence cannot be gained on the basis of one individual series but only by a study of the combined experience as reported in the literature. Table 2 gives the incidence of recurrence in non-resected patients during the last 15 years. It shows that this incidence must be considered as low. It was less than 5% in this combined series in which there were a number of patients in whom fixation of the cecum was not even attempted but surgery had been limited to detorsion. In the present series with a mean followup period of 7 years, we observed only two cases of recurrence, although in 11 of our 27 non-resected patients surgery had been restricted to detorsion.

TABLE 2. Incidence of Recurrence in Different Series of Non-resected Patients with Cecal Volvulus.

Authors	No. of Patients and Type of Operation			Detorsion	Total	Died postop	Mean Followup period	Recurrences
	Ceco-pexi	Ceco-stomy	Ceco-pexi + stomy					
Bagley et al. <sup>1</sup>	—	2	—	5	7	0	?	0
Sawyer et al. <sup>16</sup>	?	?	?	?	22	1	?	3
Wolf & Wilson <sup>19</sup>	8	2	2	5	17	4	?	0
Krippaehne et al. <sup>8</sup>	2	8	—	5	15	8	?	0
Peterson <sup>12</sup>	2	1	—	3	6	1	5 yr	0
Dowling & Gunning <sup>5</sup>	2	2	—	3	7	0	8 mon	0
Smith & Goodwin <sup>17</sup>	3	—	17	—	20	2	?	0
Present series	10	3	3	11	27	6	7 yrs	2
Total	27	18	22	32	121	22	—	5 (4%)

When the bowel is not viable the situation is of course totally different. In cases with a small area of focal gangrene, advantageously located, this area can sometimes be excised and a cecostomy tube can then be placed through the resulting defect. In our series cecostomy was performed in 3 patients. Apart from decompression of the intestine, fixation of the cecum is obtained by this simple procedure. It seems, however, that this form of fixation is not fully reliable as cases with recurrence have been described.<sup>11,18</sup>

Finally there are those cases in which gangrene is either more wide spread or not so advantageously located. In these cases the surgeon has no choice; resection consisting of right hemicolectomy with end-to-end ileo-transverse colostomy is to be preferred while in poor risk cases a Mickulicz type exteriorization could be tried.

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