Diagnosis and treatment of caecal volvulus

E T Consorti, T H Liu

Caecal volvulus is an infrequently encountered clinical condition and an uncommon cause of intestinal obstruction. Patients with this condition may present with highly variable clinical presentations ranging from intermittent, self-limiting abdominal pain to acute abdominal pain associated with intestinal strangulation and sepsis. Lack of familiarity with this condition is a factor contributing to diagnostic and treatment delays. The objective of this review is to promote clinicians’ awareness of this disease through patient case illustration, discussion of disease pathogenesis, clinical features, and management strategies.

Caecal volvulus is characterised anatomically by the axial twisting that occurs involving the caecum, terminal ileum, and ascending colon. Caecal bascule is a variant of this condition associated with the upward and anterior folding of the ascending colon and accounts for about 10% of all caecal volvulus cases (figs 1 and 2). Although anatomically distinct, caecal volvulus and caecal bascule share many similar clinical features, including the potential for intestinal obstruction and strangulation.

The incidence of caecal volvulus is reported to range from 2.8 to 7.1 per million people per year, and the process is responsible for 1%–1.5% of all the adult intestinal obstructions and 25%–40% of all volvulus involving the colon. Patients’ ages at presentation are presumably affected by cultural and dietary influences and their effects on intestinal motility, resulting in highly variable peak ages of presentation from various geographical regions, where the average age of patients reported in India is 33 years as compared with 53 years in reports from Western countries.

ANATOMY AND PATHOGENESIS

Intestinal development during embryogenesis is a complex and sequential process, where during the final stages, the caecum rotates clockwise from the left side of the abdomen to its final position in the right lower abdomen. Simultaneous with the final rotational process is fixation of the right colon mesentery to retroperitoneal structures. People with incomplete intestinal rotation generally develop inadequate right colon fixation associated with the potential for caecal volvulus formation. Based on reports from necropsy reviews, sufficient caecal mobility for volvulus and bascule formation is found in 11% and 25% of adults, respectively.

The nearly 40-fold difference between the incidence of mobile caecum and occurrence of caecal volvulus suggests that factors other than anatomical susceptibility are involved in volvulus development. Clinical series have reported that 23%–53% of patients presenting with caecal volvulus have a history of prior abdominal surgery, and based on this association, previous abdominal surgery has been identified as an important contributor in caecal volvulus formation. It is postulated that postoperative adhesions contribute to the formation of fixation points and fulcrum of rotation for the mobile right colon, whereby promoting volvulus development.

Additional conditions such as those seen during late term pregnancy, high fibre intake, adynamic ileus, chronic constipation, and distant colon obstruction have also been implicated in caecal volvulus formation in anatomically susceptible people, presumably through caecal displacement, hyperperistalsis, and colonic distension.

CLINICAL FEATURES

The clinical findings and laboratory abnormalities associated with caecal volvulus are predominantly determined by the pattern, severity, and duration of the intestinal obstruction (box 1). The patterns of clinical presentation are broadly categorised as recurrent intermittent, acute obstruction, and acute fulminant patterns.

Recurrent intermittent pattern

The recurrent intermittent pattern has also been referred to as the mobile caecum syndrome. This clinical presentation has been reported to occur in nearly 50% of patients before the onset of acute volvulus. Typically, the patients have recurrent symptoms consisting of generalised or localised right lower quadrant abdominal pain, abdominal distension, and pain resolution after the passage of flatus. The physical findings in patients during symptomatic episodes may include high pitched bowel sounds and right lower quadrant abdominal tenderness; however, these abnormal physical findings generally disappear as the patients’ symptoms resolve.

Acute obstructive and acute fulminant patterns

Patients with acute volvulus and obstruction typically exhibit a clinical picture that is indistinguishable from acute, uncomplicated small bowel obstruction. Depending on the patients’ body habitus, tender and dilated caecum may or may not be palpable and may help to differentiate caecal volvulus from other forms of small bowel obstruction. For patients without this...
characteristic physical finding, differentiation between small bowel obstruction and caecal volvulus on clinical basis may be problematic; therefore, it is recommended that these patients undergo early radiological evaluation.

Patients with untreated acute volvulus may progress to develop intestinal strangulation and perforation leading to the acute fulminant presentation. With this clinical presentation, patients typically exhibit severe abdominal pain, peritoneal irritation, dehydration, and haemodynamic instability.

PRESENTATIONS IN PATIENTS WITH CONCURRENT ILLNESSES

There is an apparent increased propensity for acute caecal volvulus presentation during periods of concurrent acute medical illnesses, as 12%–28% of the reported patients with acute volvulus are already hospitalised for a variety of medical illnesses at the time of diagnosis. In these hospitalised patients, caecal volvulus development is believed to be associated with the increased occurrence of colon distension and intestinal dysmotility.

Recognition of acute caecal volvulus in the hospitalised patient population can be difficult because of alternative causes of abdominal distension in many of these patients. Moreover, symptoms and findings related to acute volvulus may be more easily overlooked in patients presenting with serious concurrent medical illnesses. Therefore, prompt diagnosis in this setting requires heightened clinical suspicion and timely acquisition of diagnostic imaging studies.

LABORATORY EVALUATIONS

Laboratory evaluations are neither sensitive nor specific for the diagnosis of caecal volvulus, as the laboratory values are often unremarkable in patients with intermittent symptoms and early acute obstruction. Whereas, in patients with advanced obstruction, the white blood cell count and serum chemistry abnormalities are not useful for diagnosis but reflect the fluid, electrolyte deficiencies, and inflammatory or infectious changes related to the obstructive process.

DIAGNOSTIC IMAGING

As most patients with acute caecal volvulus present with clinical pictures suggestive of intestinal obstruction, abdominal radiography is frequently obtained as the initial diagnostic imaging. It has been reported that radiological abnormalities are identifiable in nearly all patients with acute caecal volvulus, with caecal dilatation (98%–100%), single

Box 1 Clinical syndromes associated with abnormal caecal mobility and volvulus

Mobile caecum syndrome
Chronic intermittent abdominal pain with spontaneous resolution after the passage of flatus. Physical examination may show mild right sided abdominal tenderness or no abnormalities. This clinical presentation is generally not associated with bowel necrosis however may be an identifiable predecessor in 50% of patients presenting with acute volvulus

Acute obstruction
Cramping abdominal pain and vomiting that do not resolve spontaneously. The physical findings generally include tenderness of the abdomen, with or without a palpable abdominal mass, and high pitched bowel sounds. With recognition and timely treatment, this presentation is associated with comparatively low incidence of bowel necrosis

Acute fulminant
Patients generally have toxic appearance with abdominal tenderness associated with peritonitis. Patients with this presentation frequently have bowel necrosis

Figure 1 Schematic diagram of caecal volvulus showing axial twisting of the ascending colon and terminal ileum resulting in closed loop obstruction of the caecum.

Figure 2 Schematic diagram of caecal bascule showing anterior folding of the caecum resulting in closed loop obstruction of the caecum.
visualisation of a gas filled appendix has been described as a
addition to the above described pathoneumonic CT signs,
and gangrenous bowel. 121 3

patients with advanced obstruction, suspected perforation,
erally not recommended for the evaluation of critically ill
potential for contrast extravasation, barium enema is gen-
required for the completion of this procedure and the
uted to the caecal volvulus formation. Because of time
visualisation of the distal colon for the
colonoscopy, or exploratory caeliotomy.
The suspicion of caecal volvulus, which lead to subsequent
been reported after barium enema administration. The “beak
Furthermore, occasional successful volvulus reduction has
reported after barium enema administration. The “beak
sign” or a smooth tapering cut off at the efferent limb of the
obstruction is the most common confirmatory finding
visualised during barium enema. An additional value of
barium enema is in visualisation of the distal colon for the
exclusion of coexisting abnormality that may have contrib-
ted to the caecal volvulus formation. Because of time
requirement for the completion of this procedure and the
potential for contrast extravasation, barium enema is gen-
nerally not recommended for the evaluation of critically ill
patients with advanced obstruction, suspected perforation,
and gangrenous bowel. 1 2 15

 Unlike barium enema evaluations in the setting of acute
obstruction, this diagnostic modality offers limited value in
patients with intermittent symptoms related to caecal
volvulus. In these patients without ongoing intestinal
obstruction, radiological diagnosis relies on the visualisation
of caecal axial rotation and/or excessive caecal mobility. 16 In
this setting, some investigators have proposed the application
of abdominal compression during barium enema examina-
tions to facilitate visualisation of caecal mobility. 15

Abdominal CT is being increasingly used for the evaluation
of acute abdominal pain, and for this reason, CT is replacing
barium enema as the preferred imaging modality for the
diagnosis of acute caecal volvulus in many practice environ-
ments. 1 The “coffee bean”, “bird beak”, and “whirl” signs are
two of the most common CT findings associated with acute caecal
volvulus. 1 The “coffee bean” sign generally refers to an axial
view of a dilated caecum filled with air and fluid that may be
visualised anywhere within the abdominal cavity. The “bird
beaks” are images correlating with the progressively tapering
efferent and afferent bowel loops terminating at the site of
torsion. The “whirl sign” is a descriptor applied to the CT
image of a soft tissue mass within the peritoneal cavity
containing swirling strands of soft tissue and fat attenuation.
In the setting of acute caecal volvulus, the whirl is composed
of spiralled loop of collapsed caecum, with low attenuating
fatty mesentery and engorged mesenteric vessels. 1 18
In addition to the above described pathomechanic CT signs,
visualisation of a gas filled appendix has been described as a
finding associated with caecal dilatation from caecal volvu-

COLONOSCOPY

Flexible sigmoidoscopy is commonly performed for the
confirmation and initial management of sigmoid volvulus,
however the utility of endoscopic therapy in acute caecal
volvulus diagnosis and treatment is generally considered
limited, as the success rate of colonoscopic reduction of
caecal volvulus has been about 30%. 19 20 21 Given the modest
success rate, the potential for colonic perforation, and
potential delays in operative treatment associated with
unsuccessful reduction, colonoscopy is generally not recom-
manded in the initial treatment of caecal volvulus. 2 11

SURGICAL TREATMENT

It is generally agreed that patients with acute caecal volvulus
benefit from surgical intervention for the correction of
intestinal obstruction. Contemporary surgical options include
manual detorsion, caecopexy, caecostomy, and colectomy by
open or laparoscopic approaches. Given the unusual nature of
the disease, there are no prospective treatment trials to guide
management decisions in these patients. It is generally
agreed that when intestinal gangrenous changes and
perforations are encountered, the non-viable intestines
should be resected; however, the appropriate extent of the
operative therapy in patients without these complications has
remained undetermined. 2 (box 2 contains descriptions of the
therapeutic options and table 1 lists findings from represen-
tative case series).

Surgeons who are in favour of resecting the ascending
colon in treatment of uncomplicated volvulus have generally
cited recurrent volvulus and local complications associated
with caecostomy and caecopexy as basis for performing
bowel resections; whereas, the proponents of non-resectional
approaches have generally cited reduced mortality, reduced
physiological insult, and low recurrence rates as reasons for
not proceeding with intestinal resection.

While resection of the ascending colon eliminates the
possibility of volvulus recurrence, this procedure is frequently
associated with prolonged operation times and increase in
the magnitude of physiological insult to the patient.
Historically, the operative mortality associated with colect-
omy has been higher than the mortalities associated with
caecopexy and caecostomy; however, a confounding factor in
outcomes reported by these retrospective series is that colon
resection is necessitated in some patients as the result of
bowel strangulation, therefore the increased morbidity and
mortality reported may reflect patient differences rather than

<table>
<thead>
<tr>
<th>Box 2 Treatment descriptions and results</th>
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<tbody>
<tr>
<td><strong>Barium enema</strong></td>
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<td><strong>Colonoscopy</strong></td>
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<td><strong>Operative detorsion</strong></td>
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<tr>
<td><strong>Caecopexy</strong></td>
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<tr>
<td><strong>Caecostomy tube placement</strong></td>
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<tr>
<td><strong>Colectomy</strong></td>
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With advances in intraoperative care and perioperative care, the morbidity and mortality associated with colectomies performed for caecal volvulus has improved over the past decade. With the recent advances in laparoscopic technology, laparoscopic colon resections are being increasingly applied. Similarly, there have been several reports of laparoscopic treatment of caecal volvulus published. Given the physiological advantages of laparoscopy over open surgery and the continued rapid expansion of laparoscopic gastrointestinal surgery, laparoscopic right colectomy and caecopexy will probably become the mainstay of treatment in the near future.

In our opinion, the most appropriate operative strategy for a given patient can be determined only by the operating surgeon after taking into consideration the surgical expertise, patient’s physiological status, viability of the involved intestines, the potential perioperative morbidity and mortality, and the risk of volvulus recurrence.

### Table 1: Representative reports of outcome after surgical treatment

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Number</th>
<th>Mortality (%)</th>
<th>Gangren/non-gang (%)</th>
<th>Resection (m/r) (%)</th>
<th>Caecopexy (m/r) (%)</th>
<th>Caecostomy (m/r) (%)</th>
<th>Detorsion (m/r) (%)</th>
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<tr>
<td>Ballantyne et al</td>
<td>1985</td>
<td>55</td>
<td>45</td>
<td>33/12</td>
<td>39/0</td>
<td>8/0</td>
<td>0/0</td>
<td>0/20</td>
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<tr>
<td>O’Mara et al</td>
<td>1979</td>
<td>50</td>
<td>12</td>
<td>33/7</td>
<td>7/0</td>
<td>0/0</td>
<td>25/0</td>
<td>17/0</td>
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<tr>
<td>Rabinovici et al</td>
<td>1990</td>
<td>561</td>
<td>19</td>
<td>NA</td>
<td>22/0</td>
<td>10/13</td>
<td>32/14</td>
<td>22/12</td>
</tr>
<tr>
<td>Friedman et al</td>
<td>1989</td>
<td>26</td>
<td>15</td>
<td>NA</td>
<td>13/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Tejler, Jiborn</td>
<td>1988</td>
<td>25</td>
<td>16</td>
<td>NA</td>
<td>7/0</td>
<td>50/0</td>
<td>0/0</td>
<td>25/25</td>
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<tr>
<td>Tejler, Jiborn</td>
<td>1988</td>
<td>350</td>
<td>30</td>
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<td>13/5</td>
<td>10/1</td>
<td>13/13</td>
</tr>
<tr>
<td>Theuer</td>
<td>1990</td>
<td>16</td>
<td>31</td>
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<td>Wright, Max</td>
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<td>17</td>
<td>50/9</td>
<td>25/0</td>
<td>NA/0</td>
<td>NA/0</td>
<td>NA/0</td>
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</table>

Gangren/non-gang, gangrenous/non-gangrenous. (m/r), mortality/recurrence. NA, not available. *Collective reviews.

### SUMMARY

The occurrence of caecal volvulus is predisposed by excess caecal mobility that is often associated with incomplete intestinal rotation. Obstruction of the distal colon, caecal displacement, and non-obstructive caused of colonic distension are conditions that may produce acute volvulus in anatomically susceptible people. Bowel necrosis may occur as the sequelae of untreated and unresolved acute volvulus. Optimal patient management consists of metabolic support, early diagnosis, and operative therapy. The reported operative mortality has ranged from 0% to 40% with recurrence rates reported between 0% and 40% for those undergoing non-resectional treatment. Patient outcome is adversely affected by the presence of intestinal gangrenous changes and perforation, which are complications associated with delayed treatment of the condition. Based on the available evidence, which consists of retrospective case series, case reports, and collective reviews, the optimal surgical strategy has not been determined.

### ILLUSTRATIVE CASE REPORT

A 65 year old woman presented to the hospital with persistent and diffuse abdominal pain of about 24 hour duration. The patient reported that several hours after the onset of cramping abdominal pain, she developed bilious vomiting. The patient also related a history of having chronic intermittent abdominal pain of lesser intensity along with intermittent constipation for several years, which has prompted an ongoing evaluation by a gastroenterologist in the outpatient setting. Her other medical problems included hypertension, gastro-oesophageal reflux disease, hypercholesterolaemia, and osteoarthritis. Her surgical...
history consisted of previous open cholecystectomy and bilateral tubal ligation greater than 10 years ago. On physical examination, the vital signs and cardiopulmonary examinations were within normal limits. During the abdominal examination, a palpable, firm, and tympanic mass was identified in the mid-portion of the upper abdomen, and diffuse tenderness without peritoneal irritation was noted. Her laboratory studies showed white blood cell count of 13 300 cells/mm³, haemoglobin of 133 g/l, packed cell volume of 36.8%, and normal electrolytes. The plain radiographs of the abdomen showed a prominent segment of dilated intestine suggestive of caecal volvulus (fig 3). A CT scan of the abdomen was obtained confirming the diagnosis of acute caecal volvulus (fig 4).

The patient underwent an urgent caelotomy, with findings at the operation showing axial rotation of the caecum associated with pronounced congestion and oedema of the caecum and terminal ileum, and no evidence of transmural bowel infarction. The operative treatment consisted of resection of the terminal ileum and right colon followed by primary intestinal anastomosis. The patient recovered after the operation and reported no further recurrence of abdominal pain at one year after her operation.

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REFERENCES