

Small-Bowel Obstruction with Imaging Features of Strangulation and Bowel Ischemia: A Case Report Highlighting the Role of Computed Tomography in the Acute Abdomen

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Abstract: *Introduction: Small-bowel obstruction (SBO) is a frequent source of acute abdominal pain and poses a significant diagnostic challenge in emergency medicine and radiology. While many instances can initially be treated conservatively, bowel strangulation and ischemia are potentially fatal complications that demand prompt identification and surgical management. Computed tomography (CT) plays a central role in assessing suspected SBO, as it can confirm the diagnosis, locate the transition point and possible cause, and reveal signs suggesting compromised bowel viability. Case Presentation: A patient experienced acute, worsening abdominal pain along with nausea, vomiting, abdominal swelling, and reduced passage of stool and gas. Physical examination showed abdominal distension and localized tenderness. Laboratory tests revealed abnormalities suggestive of an acute intra-abdominal condition. Given the clinical picture and suspicion of mechanical obstruction, contrast-enhanced CT of the abdomen and pelvis was performed. CT revealed multiple dilated, fluid-filled small-bowel loops with a distinct transition point. The affected bowel exhibited abnormal wall enhancement and thickening, associated mesenteric edema, free intraperitoneal fluid, and engorgement of mesenteric vessels. The presence of mechanical obstruction along with secondary bowel-wall and mesenteric abnormalities raised suspicion of strangulation with impaired bowel perfusion. These findings were immediately relayed to the treating team, and the patient underwent urgent surgical assessment and operative intervention. Conclusion: This case highlights the value of systematic CT evaluation in patients with suspected SBO. Identifying a transition point confirms mechanical obstruction, while evaluating bowel-wall enhancement, mesenteric vessels, mesenteric edema, free fluid, pneumatosis, and other secondary signs is crucial for detecting threatened bowel viability. Early recognition and communication of these findings may enable timely surgical intervention and enhance patient outcomes.*

Keywords: computed tomography; small-bowel obstruction; bowel ischemia; bowel strangulation; acute abdomen; emergency radiology; diagnostic imaging

1. Introduction

Small-bowel obstruction is a common reason for visits to the emergency department and for hospital admissions. The clinical signs can be vague and may overlap with other causes of acute abdominal pain, such as ileus, gastroenteritis, inflammatory bowel disease, ischemic bowel disease, and perforated viscus. As a result, imaging is crucial for confirming the diagnosis and deciding on the best treatment approach.

The clinical importance of SBO depends not only on the presence of blockage but also on whether blood flow to the bowel is compromised. Simple obstruction can initially be treated with bowel rest, IV fluid replacement, correction of electrolyte imbalances, and decompression in suitable patients. On the other hand, closed-loop obstruction, strangulation, bowel ischemia, and perforation are potentially urgent surgical conditions.

CT has become a key part of the diagnostic work-up for suspected SBO. Besides showing dilated bowel loops and a transition point, CT allows evaluation of the bowel wall, mesentery, mesenteric vessels, peritoneal cavity, and possible underlying causes. This makes CT especially useful for detecting complications that may not be evident from clinical examination alone.

The aim of this case report is to highlight the diagnostic utility of contrast-enhanced CT in detecting mechanical SBO with imaging features suggestive of bowel compromise, and to stress the need for systematic image review and prompt communication with radiology.

2. Case Presentation

2.1 Clinical Presentation

A 54-year-old man came to the emergency department with sudden abdominal pain lasting about 18 hours, which became progressively more severe. The pain was accompanied by nausea, vomiting, and increasing abdominal bloating. The patient also noted reduced passage of stool and gas. The initial clinical assessment did not provide enough immediate clues to identify the underlying cause of the symptoms. Physical exam revealed abdominal distension and tenderness, raising concern for an acute intra-abdominal condition.

Table 1: Vital signs on presentation.

Vital sign	Value
Heart rate	108 bpm
Blood pressure	138/84 mmHg
Temperature	38.1 °C

Laboratory tests were performed as part of the initial evaluation, as summarized in Table 2.

Table 2: Laboratory results on admission.

Laboratory parameter	Result	Reference / flag
White blood cell count	$15.8 \times 10^9/L$	Elevated (leukocytosis)
Hemoglobin	13.9 g/dL	Within normal range
Serum lactate	3.4 mmol/L	Elevated
C-reactive protein	126 mg/L	Elevated
Sodium	137 mmol/L	Within normal range
Potassium	4.1 mmol/L	Within normal range
Creatinine	1.3 mg/dL	Mildly elevated

Given the severity and progression of symptoms, along with leukocytosis and an elevated serum lactate, cross-sectional imaging was requested to assess for mechanical obstruction and other potentially urgent causes of acute abdominal pain.

3. Imaging Findings

A contrast-enhanced CT of the abdomen and pelvis was performed after intravenous administration of iodinated contrast material. Images were obtained during the portal venous phase, with multiplanar coronal and sagittal reconstructions. Oral contrast was withheld due to the acute clinical presentation and suspicion of mechanical bowel obstruction.

The CT showed multiple fluid-filled, dilated loops of small bowel, with a maximal diameter of up to approximately 4.2 cm, mainly involving the distal and mid small bowel. A distinct transition point was seen in the right lower quadrant, where dilated proximal small-bowel loops abruptly changed to decompressed distal ileal loops.

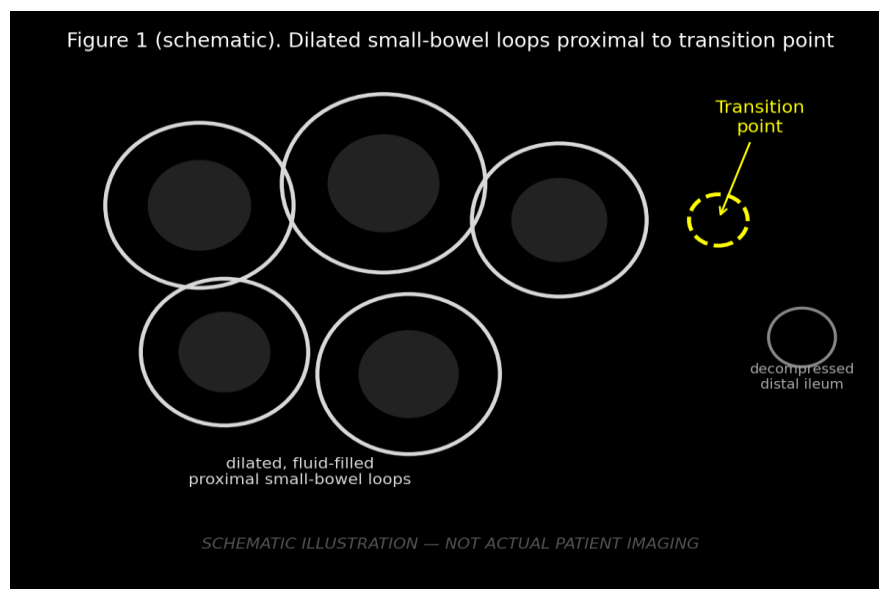


Figure 1: (schematic placeholder). Axial contrast-enhanced CT image shows multiple dilated loops of small bowel proximal to the transition point. Replace with the de-identified patient image prior to submission.

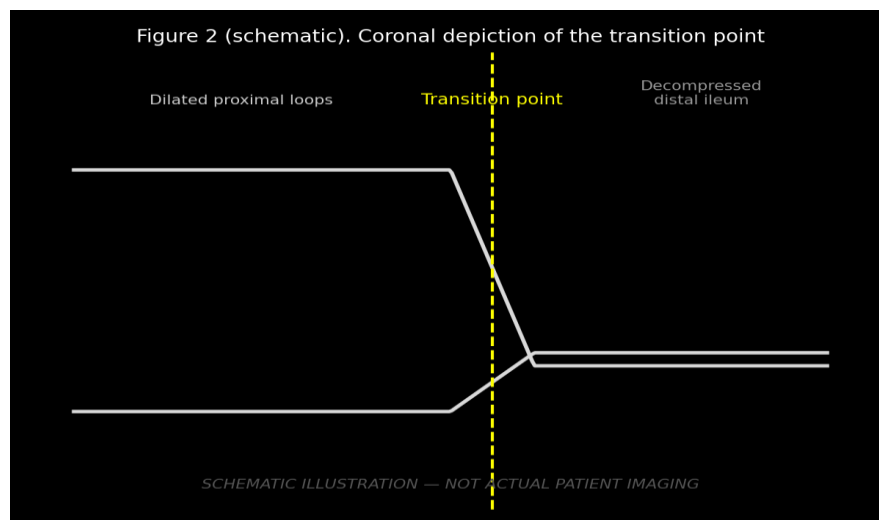


Figure 2: (schematic placeholder). Coronal reformatted CT image reveals the transition point between the dilated proximal and decompressed distal small bowel. Replace with the de-identified patient image prior to submission.

The appearance of the bowel loops suggested a mechanical rather than functional obstruction. There was associated circumferential bowel-wall thickening and heterogeneous enhancement of the affected segment. Adjacent mesenteric

edema and inflammatory fat stranding were noted, along with engorgement of the mesenteric vessels. A small-to-moderate amount of free intraperitoneal fluid was also present.

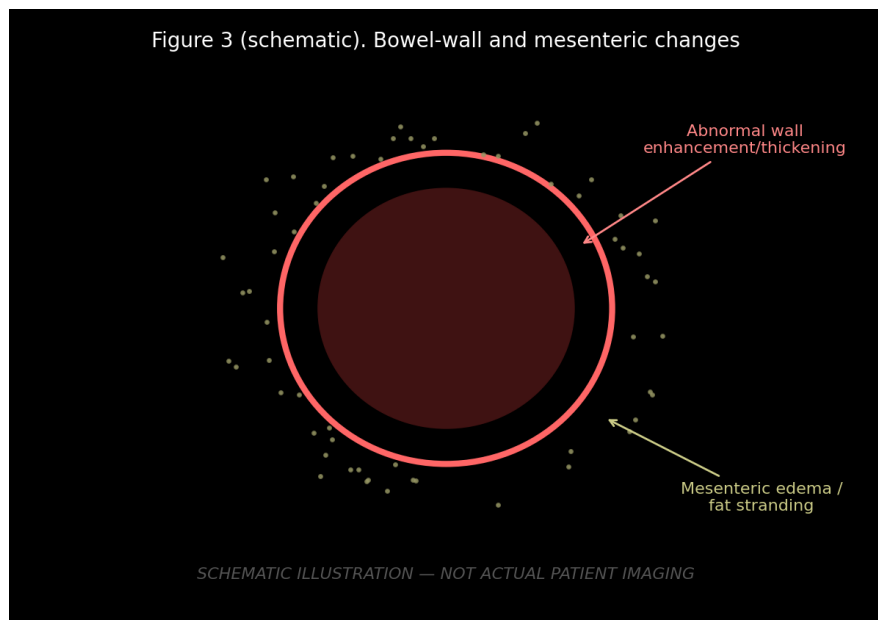


Figure 3: (schematic placeholder). Axial contrast-enhanced CT image shows abnormal bowel-wall enhancement and surrounding mesenteric inflammatory changes, raising concern for compromised bowel viability. Replace with the de-identified patient image prior to submission

Focal pneumatosis intestinalis was seen in the involved bowel segment, with a small amount of portal venous gas extending into peripheral branches of the liver. These findings, especially

when combined with the abnormal bowel-wall enhancement and mesenteric edema, raised concerns about compromised bowel perfusion and evolving bowel ischemia.

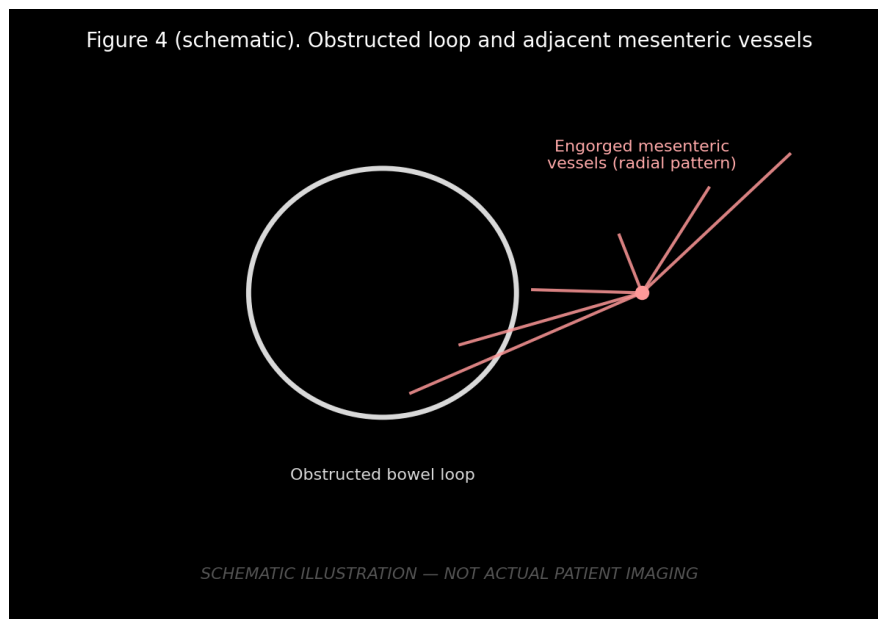


Figure 4: (schematic placeholder). Coronal CT reconstruction illustrates the relationship between the obstructed bowel loops and adjacent mesenteric structures. Replace with the de-identified patient image prior to submission.

There was no evidence of pneumoperitoneum. No clear occlusion of the proximal mesenteric artery was seen.

In summary, the imaging findings pointed to a mechanical small-bowel obstruction with a transition point in the right lower quadrant, along with CT features suggestive of

strangulation and bowel ischemia. The overall CT impression was that of a mechanical small-bowel obstruction with features raising concern for strangulation or ischemia.

Note: All images intended for publication should be appropriately de-identified and obtained with the necessary institutional and patient permissions. The figures above are schematic placeholders only.

4. Radiologic Assessment and Clinical Management

The imaging results were considered alongside the patient's clinical symptoms.

The observation of dilated small-bowel loops with a clear transition point supported the diagnosis of mechanical SBO. However, the extra findings involving the bowel wall and mesentery heightened concern for a complicated obstruction rather than a simple mechanical one.

Because of the combination of bowel-wall thickening (about 5 mm), mesenteric edema with congested mesenteric vessels, and free intraperitoneal fluid on imaging, along with clinical and laboratory signs of systemic inflammatory response and tissue hypoperfusion- including tachycardia (108 bpm), low-grade fever (38.1°C), marked leukocytosis (WBC $15.8 \times 10^9/L$), elevated C-reactive protein (126 mg/L), and an elevated serum lactate (3.4 mmol/L)- special attention was paid to the possibility of bowel ischemia.

Given the risk of progressive bowel injury, the imaging results were promptly reported to the treating clinical team.

Surgical Management and Clinical Outcome

Due to the patient's worsening abdominal pain, leukocytosis, elevated serum lactate, and CT findings suggestive of mechanical small-bowel obstruction complicated by strangulation and bowel ischemia, an urgent surgical consultation was requested. The patient underwent emergency exploratory laparotomy in the operating room.

Intraoperative findings revealed a closed-loop small-bowel obstruction involving about 35 cm of the distal ileum, with a

tight adhesive band constricting the affected bowel segment. The affected bowel was markedly dilated and congested, with areas of dusky discoloration and reduced perfusion. About 20 cm of the involved ileum showed irreversible ischemic changes.

The ischemic segment was resected with clear margins, and a primary side-to-side stapled anastomosis was performed. The remaining small bowel was examined and showed good perfusion with no additional ischemic segments. No gross bowel perforation or intra-abdominal abscess was found.

The patient was moved to the surgical ward for postoperative monitoring. After surgery, the patient's abdominal pain and leukocytosis gradually improved.

Table 3: Perioperative serum lactate trend.

Timepoint	Serum lactate
Preoperative	3.4 mmol/L
Within 24 hours postoperative	1.5 mmol/L

Bowel function gradually returned, and the patient tolerated progression from clear liquids to a regular diet without recurrent nausea or vomiting. The postoperative period was without complications. The patient was discharged home on postoperative day 6 in stable condition, with instructions for surgical follow-up.

At the 4-week postoperative follow-up, the patient reported significant improvement in abdominal symptoms and had returned to normal daily activities. Physical exam showed a well-healed surgical incision with no evidence of wound infection, recurrent obstruction, or incisional hernia.

Histopathologic examination of the resected bowel showed transmural ischemic injury with hemorrhagic congestion and mucosal necrosis, consistent with the intraoperative diagnosis of strangulated small-bowel obstruction.

5. Differential Diagnosis

When a patient comes in with abdominal pain, bloating, vomiting, and dilated bowel loops, the differential diagnosis covers several possible conditions, summarized in Table 4.

Table 4: Differential diagnosis summary.

Diagnosis	Key distinguishing feature	Relevance to this case
Paralytic ileus	Diffuse dilation, no focal transition point	Excluded- discrete transition point identified
Adhesive small-bowel obstruction	Transition point without an identifiable mass lesion	Consistent with intraoperative finding of adhesive band
Closed-loop obstruction	C-/U-shaped loop, radial mesenteric vessels, mesenteric edema	Confirmed intraoperatively (closed-loop segment, ~35 cm ileum)
Bowel ischemia	Abnormal wall enhancement, pneumatosis, portal venous gas, free fluid	Present- correlated with resected ischemic segment
Inflammatory/infectious enteritis	Wall thickening without focal mechanical transition point	Excluded- mechanical transition point present

5.1 Paralytic Ileus

Ileus can cause diffuse bowel dilation without a clear mechanical transition point. In contrast to mechanical obstruction, ileus usually shows a more widespread pattern of bowel dilation without a focal obstructing lesion. In this case, finding a discrete transition point favored mechanical obstruction.

5.2 Adhesive Small-Bowel Obstruction

Postoperative adhesions are a significant cause of SBO. Adhesions may not be directly visible on CT; however, a characteristic transition point with no other identifiable obstructing lesion can support this diagnosis in the right clinical setting.

5.3 Closed-Loop Obstruction

Closed-loop obstruction happens when a bowel segment is blocked at two points, which can lead to rapid vascular compromise. CT findings might include a C-shaped or U-shaped dilated bowel loop, radial arrangement of mesenteric vessels, mesenteric edema, and abnormal bowel-wall enhancement. Because closed-loop obstruction can quickly progress to ischemia and perforation, recognizing it is clinically crucial.

5.4 Bowel Ischemia

Bowel ischemia may result from strangulation, vascular occlusion, or severe hypoperfusion. Imaging findings can include abnormal bowel-wall enhancement, wall thickening, pneumatosis, portal venous gas, mesenteric edema, and free fluid. The presence and combination of these findings should be assessed in light of the clinical presentation.

5.5 Inflammatory or Infectious Enteritis

Enteritis can lead to bowel-wall thickening and surrounding inflammatory changes, but it generally does not cause the same pattern of focal mechanical obstruction and transition point.

6. Discussion

The primary diagnostic difficulty in SBO is differentiating simple obstruction from obstruction with potential bowel compromise. Bowel dilation by itself is not enough to determine how severe the disease is. Thus, a systematic method is required.

The initial step is confirming that an obstruction exists. This requires evaluating bowel diameter and locating a transition point between dilated and collapsed bowel. Next, the likely underlying cause must be determined. Possible causes include adhesions, hernias, tumors, inflammatory strictures, volvulus, intussusception, and other obstructing processes. The third step, which has the greatest clinical impact, is evaluating for complications.

6.1 Assessment of Bowel-Wall Enhancement

Assessing bowel-wall enhancement after giving intravenous contrast is especially important. Decreased or patchy enhancement may suggest reduced blood flow. However, bowel-wall enhancement should be interpreted cautiously, since technical factors, contrast timing, and normal physiologic variation can influence its appearance.

6.2 Mesenteric Findings

Mesenteric edema, congestion, vascular engorgement, and inflammatory stranding can offer important secondary clues to impaired venous drainage or strangulation. Therefore, the radiologist should examine not only the bowel itself but also the nearby mesenteric tissues.

6.3 Free Intraperitoneal Fluid

Free fluid may be present in uncomplicated obstruction, but it becomes more worrisome when seen with abnormal bowel-wall enhancement, mesenteric edema, or other ischemic signs.

6.4 Pneumatosis and Portal Venous Gas

Pneumatosis intestinalis and portal venous gas may be linked to bowel ischemia and should lead to a thorough assessment of the full clinical and imaging context. Importantly, these findings should not be evaluated on their own. Their relevance is determined by the patient's symptoms, lab results, hemodynamic status, and additional imaging features.

6.5 Importance of Timely Radiologic Communication

Radiology plays a key role beyond just interpreting images. When imaging reveals a potentially urgent abnormality, the radiologist must clearly and quickly communicate the finding. In suspected bowel ischemia, a delayed diagnosis can allow progression from reversible ischemia to transmural necrosis and perforation.

This case thus highlights the importance of combining pattern recognition with clinical judgment. The radiologist must identify the imaging abnormality, assess its possible clinical impact, and convey the urgency level to the treating team.

7. Learning Points

- 1) A systematic CT approach is crucial for patients with suspected mechanical SBO.
- 2) Finding a transition point helps differentiate mechanical obstruction from functional ileus.
- 3) The radiologist should actively look for imaging signs that suggest strangulation and bowel ischemia.
- 4) Bowel-wall enhancement, mesenteric abnormalities, free fluid, pneumatosis, and portal venous gas can offer important clues about compromised bowel viability.
- 5) Imaging results should be assessed alongside clinical and laboratory data.

- 6) Rapid notification of potentially life-threatening findings is a crucial aspect of radiologic practice.
- 7) The clinical utility of radiology is not limited to diagnosis; timely interpretation of images can directly affect the urgency and nature of patient care.

8. Conclusion

Small-bowel obstruction is a frequent yet potentially life-threatening abdominal emergency. Differentiating uncomplicated obstruction from obstruction with strangulation or ischemia is essential, as the latter may necessitate urgent surgical intervention.

Contrast-enhanced CT offers a thorough evaluation of bowel caliber, transition points, possible causes of obstruction, bowel-wall features, mesenteric structures, vascular anatomy, and secondary indicators of ischemia.

This case underscores the value of a systematic imaging approach and highlights the radiologist's role in detecting clinically significant complications and promptly conveying actionable findings. For radiologists, identifying the shift from a simple mechanical obstruction to threatened bowel viability is an important diagnostic skill with direct implications for patient care.

9. Patient Perspective

If suitable and available, the patient's viewpoint on the diagnostic process, imaging evaluation, treatment, and recovery should be included here, following CARE case-report guidelines.

Ethical Considerations

Written informed consent for publication should be acquired from the patient prior to submission when required by the journal and institutional policy. Patient-identifying details should be removed from the manuscript and all accompanying images.

The authors should adhere to institutional requirements regarding case reports, patient privacy, and the use of clinical images. Elsevier's current policy explicitly mandates proper written consent and safeguarding of patient privacy when case details or identifiable images are published.

Declarations

Ethics Approval

This case report was reviewed in line with the institutional guidelines governing the publication of individual case reports. Formal Institutional Review Board (IRB) approval was not necessary because the report concerned a single patient case and did not constitute systematic human-subjects research. All information in the manuscript was de-identified to ensure patient privacy.

Consent for Publication

Written informed consent was secured from the patient for the publication of the clinical data and associated radiologic images included in this case report. The patient was told that the case would be submitted for publication in a peer-reviewed medical journal and that reasonable steps would be taken to protect personal identifying information.

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Conflict of Interest

The authors state that they have no known competing financial interests or personal relationships that might have influenced the work reported in this manuscript.

Author Contributions

Orjiakor Chioma, MBBS: Conceptualization; clinical data collection; radiologic image review; literature search and review; interpretation of imaging findings; manuscript preparation; writing original draft; writing—review and editing; and final approval of the manuscript.

All authors approved the final manuscript and agree to be accountable for all aspects of the work, ensuring that questions regarding the accuracy or integrity of any part of the work are properly investigated and resolved.

Data Availability

The clinical information and imaging findings presented in this case report were obtained solely to describe the clinical course and radiologic features of the reported case. No distinct research dataset was created or examined. All information that could potentially identify patients has been stripped from the manuscript and its figures to safeguard patient privacy.

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Role of the Patient

The patient did not take part in drafting or composing the manuscript. Written informed consent for publication was secured prior to submission.

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