ORIGINAL ARTICLE

https://doi.org/10.3126/njr.v15i2.95804

# Correlation of Multidetector CT Findings with Intraoperative Findings in Intestinal Obstruction

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**Received:** February 10, 2026 **Accepted:** March 29, 2026 **Published:** April 10, 2026

**Cite this paper:**

Acharya S, Jayshwal R, Subedi SS, Nishad SR, Upadhyaya B, Paudel B, Sharma P. Correlation of Multidetector CT Findings with Intraoperative Findings in Intestinal Obstruction. Nepalese Journal of Radiology 2026;15(2):20-7. **https://doi.org/10.3126/njr.v15i2.95804**

## ABSTRACT

**Introduction:** Intestinal obstruction is a common surgical emergency with significant morbidity. Accurate preoperative identification of its level and cause is essential, and multidetector computed tomography (MDCT) plays a key role in timely evaluation. This study aims to assess the accuracy of MDCT in identifying the level and cause of obstruction by comparing imaging findings with intraoperative results.

**Methods:** This cross-sectional study was conducted in the Department of Radiodiagnosis and Imaging at Pokhara Manipal College of Medical Sciences between October 2024 and December 2025. Fifty adult patients with clinically diagnosed intestinal obstruction who underwent contrast-enhanced MDCT and surgery were included. CT findings on the level and cause of obstruction were compared with intraoperative findings using Fisher's exact test.

**Results:** Mean age of patients was 61.46 years, with a male predominance. Malignancy was the most common cause of intestinal obstruction, accounting for 34% of cases on both CT and intraoperative evaluation, followed by bands and adhesions. The ileum, particularly the terminal and mid ileum, was the most often involved segment. A strong and statistically significant correlation was found between MDCT findings and intraoperative diagnoses for both the level and cause of obstruction ($p < 0.01$). Small discrepancies were noted, mainly involving differentiation between adhesive bands and internal hernias.

**Conclusions:** MDCT accurately identifies the level and cause of intestinal obstruction, correlates well with operative findings, and supports early diagnosis and surgical planning.

**Keywords:** *Internal Hernia; Intestinal Obstruction; Morbidity; Neoplasms*

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## INTRODUCTION

The abdomen is often referred to as the "mystery box" because it presents a diagnostic challenge, with a broad range of potential underlying conditions that present with similar clinical symptoms. Within this spectrum, intestinal obstruction is an important consideration, as it can have serious clinical consequences. Its presentation varies widely, ranging from mild abdominal pain and distension to life-threatening conditions necessitating emergency surgical intervention. In severe cases, it may also progress to circulatory shock.[1]

Intestinal obstruction is one of the most common indications for abdominal surgery. It remains a frequent cause of acute surgical admissions and contributes significantly to patient morbidity and healthcare resource utilization. Although the anatomical distribution of obstructions has remained largely consistent over the past century, the etiological spectrum has evolved markedly, driven by shifts in dietary patterns and lifestyle factors.[2,3]

In 90% of cases, small bowel obstruction is caused by adhesions, hernias, and neoplasms. Adhesive small bowel obstruction represents 55-75% of small bowel obstruction cases ,while hernias and small bowel tumors account for the remainder. Large bowel obstruction is provoked by cancer in about 60% of cases; volvulus and diverticular disease are responsible for others 30%.[2,3,4,5,6]

The clinical features of intestinal obstruction vary widely. The most commonly reported symptoms include abdominal pain, vomiting, distension, and constipation. Accurate diagnosis and appropriate management, thus require a combination of clinical assessment, laboratory testing, and radiological imaging to timely guide treatment decisions. Early diagnosis of intestinal obstruction remains challenging, and accurate and targeted imaging interpretation by radiologists often provides essential diagnostic insights that directly inform and influence patient management.[7]

On plain abdominal radiographs, both supine and upright, small bowel obstruction is typically indicated by the presence of air-fluid levels and gaseous distension proximal to the obstruction, along with a relative paucity or absence of gas and fluid distal to the site of blockage. Ultrasonography may support the diagnosis when dilated bowel loops exceed 2.5 cm in diameter and the affected segment is longer than 10 cm. Although ultrasound can occasionally reveal the underlying cause, its diagnostic accuracy is generally lower than that of computed tomography (CT).[8,9]

When dilute barium is used as a luminal contrast agent, it often facilitates localization of the obstructing segment and helps differentiate between complete and partial obstruction, much like traditional oral contrast radiography. However, unlike oral contrast studies that are limited to the intraluminal view, CT imaging provides comprehensive visualization of both intraluminal and extraluminal structures. This capability allows for more accurate characterization of obstructions, particularly those caused by extrinsic compression or intramural malignancies. Contrast- enhanced abdominal CT has become the primary imaging modality due to its widespread availability, rapid image acquisition, and comprehensive assessment capabilities that aid in ruling out other potential causes of symptoms Furthermore, CT often reveals additional abdominal pathology, such as lymphadenopathy, hepatic metastases, ascites, or solid organ abnormalities, thereby aiding in the determination of the underlying etiology.[10,11,12]

In a meta-analysis, conventional CT had a sensitivity of 92% (range 81-100%) and specificity of 93% (range 68-100%) in detecting complete obstruction. Intravenous contrast helps in diagnosing strangulation, in identifying the specific cause of small bowel obstruction and in characterizing other pathology such as superior mesenteric artery or superior mesenteric vein thrombosis, which can produce an ileus that mimics mechanical obstruction.[13,14]

This study aims to compare CT findings on the cause and level of intestinal obstruction with intraoperative findings.

## METHODS

This prospective observational study was conducted in the Department of Radiodiagnosis and Imaging at Pokhara Manipal College of Medical Sciences from October 2024 to December 2025. Ethical approval was obtained from the Institutional Review Committee prior to study initiation. The study included patients diagnosed with intestinal obstruction based on clinical examination or on preliminary investigations, including ultrasonography or abdominal radiography. Patients who wer\s (SPSS), version 18, to determine the correlation between CT findings regarding the level and cause of intestinal obstruction and intraoperative findings. Fisher's exact test was used to assess this correlation.

## RESULTS

Seventy patients with preliminary diagnosis of intestinal obstruction underwent CT scan of abdomen and pelvis during the study period. Out of which 20 patients were either below the age of 18 years or were managed conservatively and they were excluded from the study. Maximum patients were in the age group 50-79 years, with each group range of 50-59 years, 60-69 years and 70-79 years containing 11 patients each. Mean age of the patients was 61.46 ± 16.5 years. Most of the cases were male, with Male:female ratio of 1.78:1.

The most common cause of obstruction in CT in our study was malignancy,17 patients (34 %) followed by bands,12 patients (24%). Intraoperative findings were concordant to the CT results, with malignancy remaining the leading cause of intestinal obstruction (34%), followed by bands (22%), hernias (18%), and strictures (12%). Volvulus accounted for 6% of cases, while less common etiologies included acute appendicitis, internal hernias, gallstone ileus, stercoral colitis, and malignancy with intussusception. Despite the high overall diagnostic accuracy of CT, three cases initially interpreted as bands were found intraoperatively to be internal hernias, representing misdiagnoses on CT.

In our study, on CT scan, the mid ileum was the most common level of obstruction, identified in 7 patients (14%), followed by the distal ileum, 6 patients(12%) and proximal ileum,6 patients (12%). In contrast, intraoperative findings revealed the terminal ileum as the most frequent site of obstruction (18%) followed by the mid ileum in 7 patients (14 %) and proximal ileum in 6 patients (12 %). Jejunal and ascending colonic obstructions were each observed in 8% of patients, while large bowel involvement at the rectosigmoid junction accounted for 10% of cases. Other colonic sites, including the hepatic flexure, splenic flexure, sigmoid colon, transverse colon, and rectum, were less frequently involved.

A significant association was observed between CT-determined level and cause of obstruction and intraoperative findings (Pearson chi-square, $p < 0.01$). Malignancy was predominantly associated with colonic obstruction, particularly at the rectosigmoid junction and flexures, whereas bands and strictures were more commonly related to small bowel obstruction, especially involving the ileum. Overall, MDCT demonstrated strong correlation with intraoperative diagnoses, demonstrating its accuracy and clinical utility in evaluating both the level and etiology of intestinal obstruction.

*Figure 1: CT causes of intestinal obstruction*

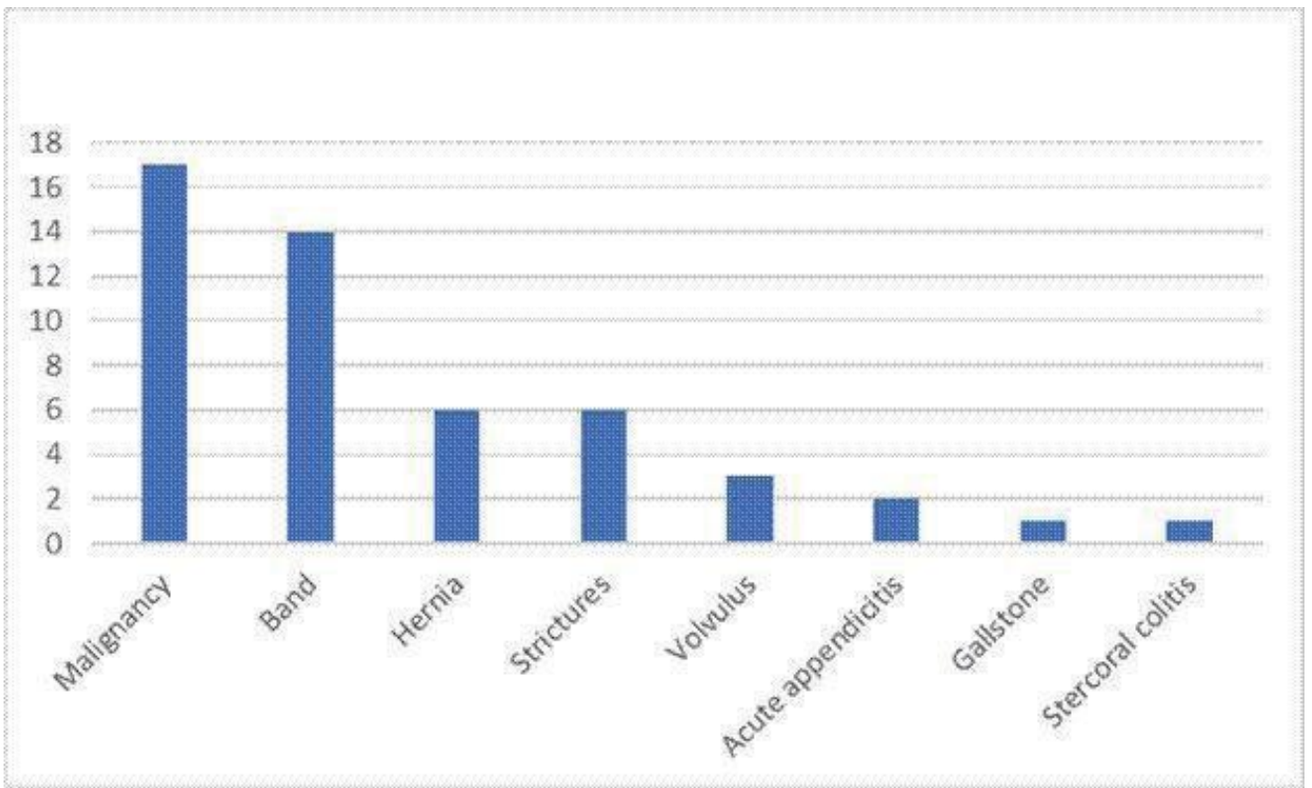


*Figure 2: Intraoperative causes of intestinal obstruction*

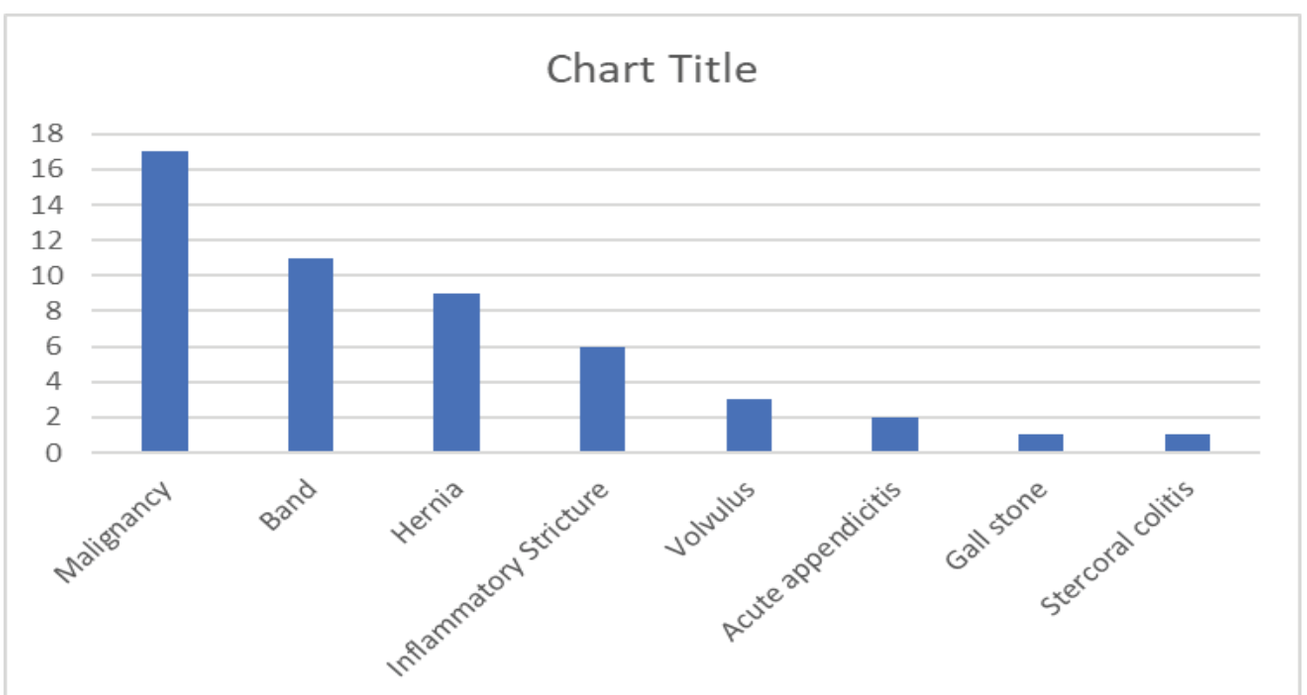

***Table 1: CT levels of intestinal obstruction***:

| CT levels of intestinal obstruction | Frequency |
|---|---|
| Terminal ileum | 9 |
| Mid ileum | 7 |
| Distal ileum | 6 |
| Proximal ileum | 6 |
| Rectosigmoid junction | 5 |
| Ascending colon | 4 |
| Jejunum | 4 |
| Hepatic flexure | 2 |
| Sigmoid colon | 2 |
| Splenic flexure | 2 |
| Transverse colon | 2 |
| Rectum | 1 |

***Table 2: Intraoperative levels of intestinal obstruction***

| Intraoperative levels of obstruction | Frequency |
|---|---|
| Terminal Ileum | 9 |
| Mid Ileum | 7 |
| Distal Ileum | 6 |
| Proximal Ileum | 6 |
| Rectosigmoid junction | 5 |
| Ascending Colon | 4 |
| Jejunum | 4 |
| Hepatic Flexure | 2 |
| Sigmoid Colon | 2 |
| Splenic Flexure | 2 |
| Transverse colon | 2 |
| Rectum | 1 |

*Figure 1: Fluid filled and dilated ileal loops with abrupt transition in distal ileum just proximal to IC junction by a linear band like structure (Yellow arrow) at the transition point suggestive of acute small bowel obstruction due to band*

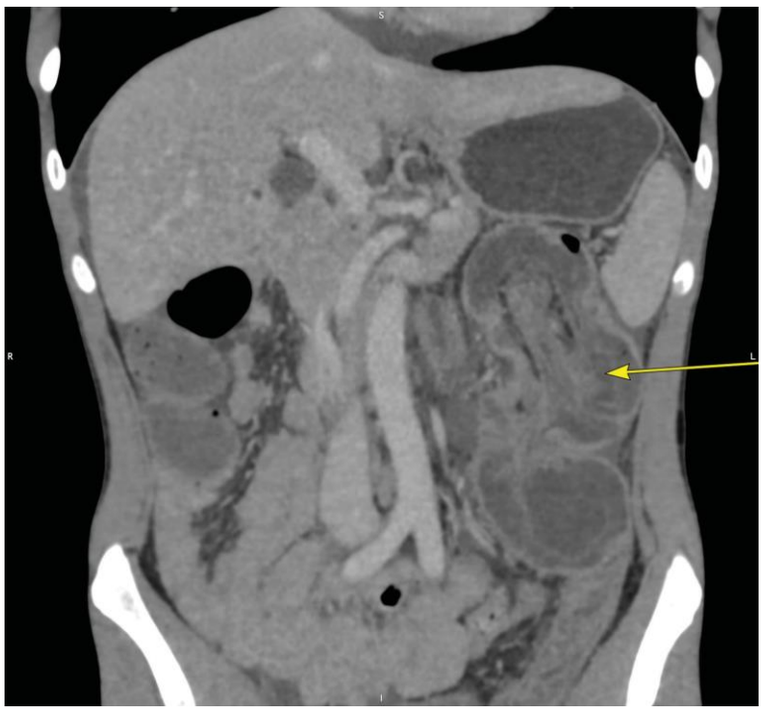

*Figure 2: Telescoping of small bowel loops into colon giving rise to target sign suggestive of ileocolic Intussusception (Yellow arrow) with small bowel loops reaching up to the mid descending colon*

## DISCUSSION

This study included 50 patients with a clinical diagnosis of intestinal obstruction and CT was performed to confirm the diagnosis and assess both the site and cause of obstruction. The MDCT findings were correlated with the operative findings where patients underwent laparotomy and the final diagnosis was made on the basis of intraoperative findings.

MDCT plays a crucial role in imaging patients presenting with acute symptoms such as nausea, vomiting, abdominal distension, abdominal pain, and diarrhea or constipation, which are indicative of intestinal obstruction. MDCT confirms the diagnosis, identifies the underlying cause of obstruction, and predicts or detects subsequent complications such as peritonitis, intestinal ischemia, perforation, and necrosis.1

Malignancy was identified as the most common cause of intestinal obstruction in our study, accounting for 34% of cases on both CT and intraoperative findings. This observation aligns with studies by Maglinte et al. and Taourel et al., who reported malignancy as a predominant cause of large bowel obstruction, particularly involving the rectosigmoid region and colonic flexures. Bands and adhesions constituted the second most common cause of obstruction (24% on CT), predominantly affecting the small bowel. Adhesive small bowel obstruction has been widely reported as the most frequent cause of small bowel obstruction in patients with a history of prior abdominal surgery. Although adhesions are not directly visualized on CT, their presence is inferred by the identification of an abrupt transition point without an obvious mass or intrinsic lesion. In our study, three cases initially diagnosed as adhesive bands on CT were later found to be internal hernias intraoperatively, highlighting one of the known limitations of CT in differentiating these entities.Hernias accounted for 12% of cases of intestinal obstruction on CT and were found in 18% cases intraoperatively. CT has proven to be highly sensitive in detecting both external and internal hernias, particularly with multiplanar reconstructions, which aid in identifying hernial orifices, sac contents, and associated complications such as strangulation. Although, there is a difference in the percentages of internal hernias identified in CT and intraoperative reports in our studies, this slight difference may beduetothe difficulty in visualizing internal hernias without classical signs. Malik et al. in their study on 229 patients with intestinal obstruction concluded that 194 patients (85%) had SBO and 35 patients (15%) had a large

bowel obstruction. They found post-operative adhesions accounted for 41% (n = 95) of the total cases, followed by abdominal tuberculosis (25%, n = 58), obstructed/strangulated hernias of different types (18%, n = 42). The most common cause of intestinal obstruction was postoperative adhesions.[16,17,18,19,20]

Despite its high accuracy, MDCT has some limitations of its own. Differentiation of adhesive bands from internal hernias and early ischemic changes may not always be easy, especially when there are no clear radiological findings. Nevertheless, the overall accuracy of MDCT is far superior than the accuracy of plain X-rays and ultrasound.

This is a single center study with limited sample size. So in future another multicentric study with large sample size could be done. In addition, only patients who underwent surgical management were included, which may potentially introduce selection bias.

## CONCLUSION

MDCT plays an effective role in the diagnosis of cause and level of intestinal obstruction because of its high sensitivity and specificity in diagnosing level and the cause of intestinal obstruction. Malignancy is the most common etiology, particularly in large bowel obstruction, whereas band and strictures are major causes in small bowel obstruction.

## CONFLICT OF INTEREST

None

## SOURCES OF FUNDING

None

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