

## Original Research Article

# Clinical study on role of CECT abdomen in intestinal obstruction

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### ABSTRACT

**Background:** Intestinal obstruction is a common clinical occurrence and can be either dynamic or adynamic. The old saying “Never let the sun set or rise on an obstructed bowel” taught to minimize missing strangulation. Helical CT with its multiplanar reformatted imaging can accurately characterize the level, degree, cause and associated complications of obstruction. Aim of the study was to depict the spectrum of MDCT findings in cases of small and large bowel obstruction and correlation of CT scan with intraoperative findings and the cause of intestinal obstruction.

**Methods:** Contrast enhanced MDCT examination of 50 patients were prospectively included in the study who had evidence of clinical as well as MDCT evidence of bowel obstruction and in whom surgical/clinical follow-up for final diagnosis was available. CT scan was done in all the patients with MDCT (Brightspeed GE 16 slice system). The axial sections were reconstructed in coronal and sagittal planes to determine site and cause of bowel obstruction.

**Results:** The commonest cause of intestinal obstruction in adults in this study series was adhesions/bands in 38% cases. Out of 47 operated patients for intestinal obstruction, CT findings matched with intraoperative findings in 43 patients (91%) whereas cause of intestinal obstruction matched with CT findings in 37 patients (74%).

**Conclusions:** Management decisions in intestinal obstruction remain notoriously difficult, relying on a combination of clinical, laboratory, and imaging factors to help stratify patients into conservative or surgical treatment. CT in these patients can help surgeon to go for surgery early and prevent complications.

**Keywords:** Acute abdomen, Adhesions, CT scan, Constipation, Laparotomy, Obstruction

### INTRODUCTION

Intestinal obstruction is a common clinical occurrence and can be either dynamic or adynamic. Small bowel obstruction (SBO) is usually mechanical (dynamic) in nature, occasionally it may result from mesenteric vascular occlusion.<sup>1,2</sup> The clinical manifestations vary according to the nature of presentation-acute or subacute, complete or partial and simple or complicated. Surgical intervention is indicated in acute intestinal obstruction due to organic pathology, closed loop obstruction, complications like strangulation or perforation.<sup>3</sup>

Oral administration of contrast is not required in high grade obstruction where retained fluid acts as a natural

negative contrast agent.<sup>4</sup> However, in cases of partial obstruction administration of oral contrast medium (1.2% barium or 2% iodinated water-soluble contrast material) 30-120minutes before scanning is preferred for identification of enteric abnormalities in mildly distended loops. CT enteroclysis (CTE) is preferred in cases of low grade partial obstruction.

The primary imaging modality is plain abdominal radiography, however it has a sensitivity of 48% to 80%. CT has emerged as an important diagnostic tool in the evaluation of small bowel obstruction and has a reported sensitivity of 93%, specificity of up to 100% and accuracy of 94% in diagnosing SBO.<sup>5,6</sup>

CT enteroclysis (CTE) is preferred in cases of low grade partial obstruction. At our institution, we perform MDCT (Brightspeed GE 16 slice system), with a detector collimation of 2.5mm, a section thickness.

**METHODS**

Prospective hospital based study was conducted in Department of Surgery, PDU Medical College and Hospital, Rajkot, Gujarat, India.

Duration of study was from May 2016 to August 2018, with patients presenting to Department of Surgery, with complaints suggestive of Intestinal Obstruction. 50 patients were involved in this study. Data were collected from the patients by their clinical history, examination and appropriate investigations.

Documentation of patients, which included, identification, history, clinical findings, diagnostic test, operative procedure, intra-operative findings and complications during subsequent follow-up period, were all recorded on a proforma specially prepared.

Study was done with positive or neutral oral contrast depending upon clinical condition. The axial sections were reconstructed in coronal and sagittal planes to determine the anatomical site, extent, cause of bowel obstruction.

The etiology and the decision for its management depended on CECT (Abd+Pelvis). Post-operative follow up was done to note for complications.

**Inclusion criteria**

All patients who were admitted in the ward with acute abdomen and clinically suspected of having intestinal obstruction.

**Exclusion criteria**

- Paediatric patient (≤12 yr of age),
- Pregnant woman,
- Seriously ill patients,
- Patient having allergic reaction to contrast.

**RESULTS**

In this study, out of 50 patients, 31 patients (62%) were male and 19 patients (38%) were female. The male to female ratio in this study was 1.6:1 (Table 1).

**Table 1: Incidence of intestinal obstruction in different gender.**

Gender	No of patients (n=50)	Percentage
Male	31	62%
Female	19	38%

In this study, out of 50 patients, maximum incidence of intestinal obstruction was found in age group 51-60 (26%) whereas the least incidence was found in age >71(4%) (Table 2).

**Table 2: Incidence of intestinal obstruction in different age groups.**

Age (yrs)	No of patients (n=50)	Percentage (%)
12-20	06	12%
21-30	12	24%
31-40	04	8%
41-50	07	14%
51-60	13	26%
61-70	06	12%
>71	02	4%

In our study, out of 50 patients of intestinal obstruction studied, the most prominent symptom found was abdominal pain (100%) followed by vomiting (80%), constipation (58%) and lump (6%) (Table 3).

**Table 3: Symptom distribution of patients.**

Symptoms	No of patients (n=50)	Percentage (%)
Abdominal pain	50	100%
Vomiting	40	80%
Constipation	29	58%
Lump	03	6%

In our study of 50 patients, tenderness was present in all patients (100%) followed by distension (48%), guarding (38%), rigidity (28%), rebound tenderness (18%) and palpable mass was present in 6% of the patients (Table 4).

**Table 4: Positive sign distribution of patients.**

Positive signs	No of patients	Percentage (%)
Tenderness	50	100%
Rebound tenderness	09	18%
Guarding	19	38%
Rigidity	14	28%
Distension	24	48%
Palpable mass	03	6%

In our study, out of 50 patients, most common cause of intestinal obstruction was found to be Adhesions and Bands (38%) followed by carcinoma (14%) and intussusception (14%) while least common cause was mesenteric ischaemia (4%) and volvulus (4%) (Table 5).

In our study, out of 50 patients, 17 patients (34%) patients had a history of previous abdominal surgery whereas 33 patients (66%) patients did not have a history of previous abdominal surgery (Table 6).

**Table 5: Distribution according to etiology.**

Etiology	No of patients	Percentage (%)
Adhesions	10	20%
Bands (extraluminal)	09	18%
Stricture	05	10%
Meckel's diverticulum	04	8%
Mesenteric ischaemia	02	4%
Sigmoid/ caecal volvulus	02	4%
Koch's abdomen	05	10%
Carcinoma	07	14%
Intussusception	07	14%
Others	04	8%

**Table 6: History of previous abdominal surgeries.**

Previous surgery	No of patients	Percentage
Yes	17	34%
No	33	66%

Out of 50 patients undergoing CT scan in cases of intestinal obstruction, free fluid was present in 78% of patients followed by partial obstruction (72%), transition point in 42% of patients, complete obstruction (28%), whereas free air and closed loop obstruction were found in 2% of patients each (Table 7).

**Table 7: Computed Tomography signs positivity.**

CT signs	No of patients(n=50)	Percentage (%)
Free air	01	2%
Transition point	21	42%
Complete obstruction	14	28%
Closed loop	01	2%
Free fluid	39	78%
Partial obstruction	36	72%

In our study, out of 47 patients operated for intestinal obstruction, intraoperative findings of obstruction matched with CT findings in 43 patients (91%) while not matched with 4 patients (9%) (Table 8).

**Table 8: Correlation of CT findings with intraoperative findings of intestinal obstruction.**

CT matched	No of patients (n=47)	Sensitivity (%)
Yes	43	91%
No	04	9%

Out of 50 patients of intestinal obstruction, cause of obstruction matched with CT findings in 37 patients (74%) while not matched with 13 patients (26%) (Table 9).

In our study, out of 50 patients diagnosed as intestinal obstruction, 47 patients (94%) needed operative

intervention whereas 3 patients (6%) were treated conservatively (Table 10).

**Table 9: Correlation of CT findings with the cause of intestinal obstruction.**

Cause of obstruction matched	No of patients(n=50)	Percentage (%)
Yes	37	74%
No	13	26%

**Table 10: Approach to treatment of intestinal obstruction.**

Treatment	No of patients (n=50)	Percentage (%)
Conservative	3	6%
Operative	47	94%

In our study, out of 47 operated patients, post-operative complications were absent in 33 patients (70%), wound infection in 10 patients (22%), wound dehiscence and bowel fistula in 1 patient each (2%) whereas death occurred in 2 patients (4%) (Table 11).

Our study group comprised of 50 patients, who presented in emergency or OPD and underwent CT scan for intestinal obstruction (Table 12).

The sensitivity of MDCT according to our study is 91.48% whereas the specificity is 33.33% (Table 13).

**Table 11: Post operative complications.**

Complications	No of patients (n=47)	Percentage (%)
Absent	33	70%
Wound Infection	10	22%
Wound dehiscence	01	2%
Bowel Fistula	01	2%
Death	02	4%

**Table 12: Evaluation of sensitivity and specificity as a diagnostic tool.**

CT	Operative	Conservative	Total
Positive	43	2	45
Negative	4	1	5
Total	47	3	50

**Table 13: Statistical analysis.**

Values	Percentage
Sensitivity	91.48%
Specificity	33.33%
Positive Predictive value	95.55%
Negative predictive value	20%
% of False Positive	4.45%
% of False Negative	80%

## DISCUSSION

### *Age incidence*

Intestinal obstruction although occurs in all age groups, the age spectrum in our clinical study was above 12 years. Our study showed peak incidence in the age group 41-60 years which is comparable with the previous studies by Adhikari S et al, Cole GJ et al and Harban Singh et al.<sup>7-9</sup>

Though intestinal obstruction occurs in all age groups, in our study, the youngest patient was 16 years and oldest patient was 78 years. Studies by Eggleston G, has reported 17% of cases in the age group of 50-60 years and 60% of the cases of intestinal obstruction occur in the age group of 30-60 years.<sup>10</sup> Their studies almost correlate with the present study. However, studies reported by Singh H and Ramachandran CS say that the maximum number of cases occurs in the age group of 21-40 years, of these the etiological factors were obstructed hernia.<sup>11</sup>

### *Sex incidence*

In present study, there are 31 male and 19 females. Among previous studies, Budharaja et al and Singh H et al, reported 4:1 and Shakeed found equal incidence.<sup>12,13</sup>

### *Clinical features*

The common clinical features of intestinal obstruction are abdominal pain, vomiting, constipation and abdominal distension. Abdominal lump, bleeding per rectum etc. are other rare features. Not all are present in a patient.

In the present study, the clinical features of vomiting (78%), constipation (86.66%) and distension (90%) were comparable with the other study groups like Adhikari S et al and Khan JS et al.<sup>14</sup>

### *Etiology*

The cause of intestinal obstruction differs in different geographical locations. In present study of 50 cases of intestinal obstruction, 38 % of the cases were due to adhesions and extraluminal bands.

The most common etiological factor in the present study is adhesion which included postoperative, inflammatory and congenital bands. Postoperative adhesion occurs in 93% of cases of previous abdominal surgery, of these every third patient will be having one of the other clinical signs and symptoms related to adhesion. Playforth et al shows that adhesions/bands are the most common cause of intestinal obstruction.<sup>15</sup>

Among 93% of the postoperative adhesions, 5% of the cases can develop acute intestinal obstructions; most of them will be within first year (39-60%). In the present

series 38% of the cases of obstruction are due to adhesion and bands.

McIver found that 80% of adhesions and 21% are due to congenital causes, Perry et al, found that 79% were post operative adhesions, 18% inflammatory and 28% were congenital.<sup>16,17</sup> In the inflammatory causes 42% followed acute appendicitis, 14.5% diverticulitis and other resulted from pelvic infection, Crohn's disease and Cholecystitis.

### *Mortality*

In our study we had mortality rate of 4%. The decrease in overall mortality is due to better understanding of pathophysiology of obstruction, imaging techniques, improvement in resuscitative and supportive treatment, aggressive surgical therapy in combination with improved technique in anaesthesia.

The mortality in intestinal obstruction is high in individuals who develop strangulation and gangrene of the bowel, those present beyond 72hours and in those are having pre-existing associated diseases and elderly people, though early treatment can reduce the mortality, advanced age and associated metabolic, cardiopulmonary diseases, still leads to high rate of mortality.

### *Correlation of CT scan with intraoperative findings of intestinal obstruction and statistical values of CT scan in bowel obstruction*

Majority of patients (91.48%) CT findings matched with perop/intraoperative findings whereas in 8.52% patients, CT findings did not match with intraoperative findings.

Saini DK et al, performed a single centre prospective follow up study.<sup>18</sup> Out of 40, 30 patients underwent exploratory laparotomy and it was found that MDCT was 85% sensitive and 70% specific in diagnosing bowel obstruction. Association between MDCT findings suggestive of obstruction and intra-operative findings turn out to be significant (P=0.003). MDCT findings were consistent with intraoperative findings in 22 out of 30 patients (73%).

In our study, CT had the sensitivity of 91.48%, Specificity 33.33%, PPV 95.55%, NPV 20%. Similar results were obtained by Mallo RD et al who conducted a systemic review.<sup>19</sup> This review was designed to describe the diagnostic performance of computed tomography (CT) in assessing bowel ischemia and complete obstruction in small bowel obstruction (SBO).

Seven of 15 studies evaluated the CT classification of complete obstruction based on 408 patients. The aggregated performance characteristics of CT for complete obstruction were sensitivity of 92% (range, 81-100%), specificity of 93% (range, 68-100%), PPV of 91% (range, 84-100%), and NPV of 93% (range, 76-100%). This review demonstrates the high sensitivity of

CT for ischemia in the setting of SBO and suggests that a CT scan finding of partial SBO is likely to reflect a clinical condition that will resolve without surgical intervention.

## CONCLUSION

Any surgeon involved in evaluating patients with abdominal distension and abdominal pain where obstruction becomes a distinct diagnostic possibility should be aware of the attributes and limitations of this modality to provide the best patient care. Intestinal obstruction remains an important surgical emergency. Late presentation of the patient with complications possesses a challenging problem to the surgeons for management. Postoperative adhesions are the common cause to produce intestinal obstruction as abdominal and pelvic surgeries are on rise. Management decisions in intestinal obstruction remain notoriously difficult, relying on a combination of clinical, laboratory, and imaging factors to help stratify patients into conservative or surgical treatment.

Majority of the patients of intestinal obstruction needs surgical intervention as per our study. X-ray abdomen and USG of abdomen cannot always predict the requirement of surgery. CT abdomen along with CT scoring system can predict the need of surgery early in majority of patients and prevent the delay in surgery with reduced morbidity and mortality in those patients. It also helps in preventing negative laparotomies in patients when there is dilemma for surgeon to go for conservative or surgical approach. Preoperative CT scan helps in managing bands or adhesions by laparoscopic approach which prevents laparotomy incisions with reduced post operative complications and shorter hospital stay.

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