

**VALUE OF MULTI-DETECTOR COMPUTED TOMOGRAPHY FOR PREDICTING NEED FOR SURGICAL INTERVENTION IN SUSPECTED BOWEL OBSTRUCTION.**

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ABSTRACT **Aim/ Purpose:-** To assess the diagnostic accuracy of Computed tomography in evaluating the spectrum of various etiologies (extrinsic, intrinsic, and intraluminal cause), point of obstruction (transition point), and complications of Intestinal obstruction. To predict the need for surgical intervention in various cases of intestinal obstruction. **Methods:-** This is a retrospective observational study that comprises 50 patients with suspected Intestinal obstruction from October 2022 to September 2023 and they will be evaluated on the basis of various causes of intestinal obstruction and its complications using various imaging modalities (Plain radiograph/ Ultrasonography and Computed Tomography) and relevant clinical history. **Results:-** MDCT improves diagnostic confidence in detecting Intestinal obstruction and its grade, point of obstruction (transition point), and causes. We found the most common cause of bowel obstruction is adhesions and other common causes are neoplasms, Crohn's disease, volvulus, intussusception, paralytic ileus, and tubercular etiology. 50 patients with bowel obstruction were evaluated on MDCT, and 10 out of them were managed conservatively their etiologies were paralytic ileus and intussusception. Out of 35 operated patients whose etiologies were adhesions, volvulus, intussusception, CT findings matched with intraoperative findings in 28 patients. **Conclusion:-** CT findings were highly significant for predicting the main surgical outcome, including degree of obstruction, and the presence of transition zone and mesenteric congestion. MDCT is the preferred modality to evaluate panoramically patient presents with intestinal obstruction for early decision for surgical intervention to prevent complications.

KEYWORDS :**INTRODUCTION: -**

Intestinal obstruction is a syndrome defined by an impediment to the aboral progression of intestinal contents by mechanical obstruction or by failure of intestinal muscle activity¹. It constitutes 15% of the patients who consulted emergency services due to abdominal pain². Intestinal obstruction leads to abdominal distension as a result of gas and fluid accumulation in the intestine. Increase in distension and intraluminal pressure leads to an increase in peristalsis in the first stage, whereas it leads to the opposite effect in latent period. If abdominal distention further progress firstly venous circulation and then arterial circulation is disrupted due to pressure increase, this leads to intestinal perforation and necrosis².

Intestinal obstruction is a clinical abnormality that is usually suspected on the basis of patient's history and clinical signs pain (colicky in early stage, severe and continuous in later stage due to decrease peristalsis), distension of abdomen, vomiting, decrease in flatus and stool passage³.

Small bowel obstruction is three to four times more frequent than colonic obstruction.

Conventional radiography is the first modality to evaluate suspected intestinal obstruction. However some unique capabilities of Multi-detector Computed tomography (MDCT) is the tertiary setting make this modality an important and additional diagnostic tool when specific disease management issue needs to be addressed. CT scan confirms the diagnosis to determine the level of obstruction (High small bowel obstruction, low small bowel obstruction, large bowel obstruction), cause of obstruction intraluminal, intrinsic and extrinsic causes), mechanism (dynamic / adynamic), nature (complete / incomplete) and It also aids in diagnosis of signs of complications and bowel inavailability.



Figure 1:- Erect abdominal X-ray showing dilatation of multiple bowel loops and multiple air-fluid levels are seen.

Concluding the findings of multiple MDCT parameters, decision could be made that it can be managed conservatively (maintaining fluid-electrolyte imbalance and decompression of gastrointestinal tract by nasogastric tube) or if clinical condition of patient worsens, surgical intervention should be considered².

Causes of intestinal obstruction :

Dynamic	Adynamic
1) Intraluminal cause Bezoar, gallstone impaction, foreign body	1) Paralytic ileus
2) Extrinsic cause Adhesions, closed loop strangulation, Hernia, Extrinsic mass	2) Mesenteric vascular occlusion
3) Intrinsic cause Adenocarcinoma, Crohn's disease, Tuberculosis, Intussusception, radiation enteropathy.	3) Pseudo-obstruction

AIMS and Purpose :

- 1) To assess the diagnostic accuracy of multidetector computed tomography (MDCT) in evaluating the causes (intrinsic, extrinsic, intraluminal), point of obstruction (Transition point), nature (complete / incomplete) and complications of intestinal obstruction.
- 2) To recognize the CT appearance of different forms of bowel obstruction.
- 3) To recognize the performance of CT in the field of bowel obstruction from the diagnostic confirmation to the orientation of the management and in predicting the need for surgical intervention.

MATERIAL METHOD:

50 patients who were admitted in our institute for suspected intestinal obstruction were included in this retrospective study. These patients underwent plain and contrast enhanced computed tomography of abdomen using intravenous 80-100 ml of iodinated contrast on 128 slice MDCT. Images are acquired after 60-70 seconds after Intravenous contrast injection (Porto-venous phase) which includes area between superior level of diaphragm and the inferior adjacent area of pubic symphysis. Axial, coronal and sagittal multiplanar reformatted images are useful in assessing the transition point and the presence of close loop obstruction.

Evaluation of MDCT imaging :

1) Analysis of bowel obstruction on MDCT imaging :

- Dimension of small bowel > 2.5 cm and of large bowel > 5-6 cm is the important criteria for diagnosis of bowel obstruction.
- Dilation of proximal bowel segment and distal bowel decompression suggests obstruction.
- “Small bowel faeces sign” - Highly specific for subacute / low-grade small bowel obstruction. Feculent material is mingled with gas bubbles in small bowel, resembling appearance of stool in colon.



Figure 2 :- Axial MDCT image showing presence of particulate (colon like) feculent matter mingled with gas bubbles in the lumen of dilated loops of small intestine.

2) Transitional point determination:-

Transition point refers to the bowel caliber change between proximal segment (dilated) to distal (collapsed bowel segment). It is important to detect transition point to find cause of obstruction .It is reported that in intestinal obstruction ,the transition point can be detected using MDCT imaging at a rate of 63-93%(2).

MDCT imaging analysis (4):-

1.	Age/sex	
2.	Transition point	(yes/no)
3.	Colon decompression	(yes/no)
4.	Small bowel thickening	(yes/no)
5.	Abnormal enhancement	(yes/no)
6.	Small /large bowel dimensions	0-no obstruction 3-high grade obstruction
7.	Degree of obstruction	0-no obstruction 3-high grade obstruction
8.	Presence of mesenteric fluid	(yes/no)
9.	Cause of obstruction	
10.	Bowel loops involved	(SBO/LBO/Both)
11.	Vascular involvement	(SMA/SMV)

On the basis of these MDCT variables we had classified patients into who can be treated conservatively and who needs surgical intervention.

3) Determining the cause of obstruction:

Adhesions :-

it is the most common cause of small bowel obstruction and is seen in the 85% of the patients. Adhesions are usually seen in patients with surgical history or having any past inflammatory disorders. Diagnosis of small bowel obstruction due to adhesion is made when all other cause of obstruction has been ruled out.

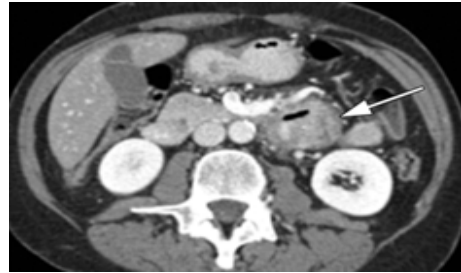
CT shows dilated jejunal and ileal loop 7.7cm with abrupt transitional zone in mid ileal loop closely abutting/ adhering to the anterior abdominal wall in midline at umbilical level likely due to adhesions.



Adenocarcinoma :-

it is more frequently seen in duodenum and proximal jejunum. At CT there is multiple variable size ,discrete- confluent heterogeneously enhancing nodular lesion with adjacent stranding and thickening in omental, bilateral paracolic, mesenteric and pelvic regions closely

abutting the adjacent bowel loops with eccentric wall thickening seen in distal ileal loop. It is usually diagnosed at late stage.



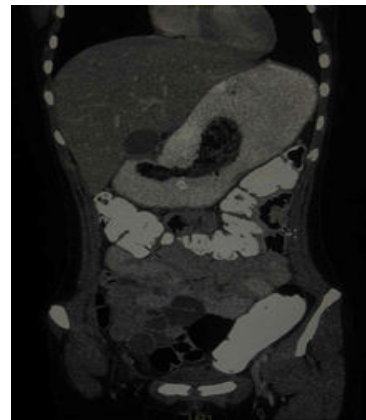
Crohn's disease:-

In advanced stage of crohn's patients presented with bowel obstruction. CT is extremely useful for determining the features of crohn's like marked irregular circumferential mural thickening in ileocaecal junction, Comb's sign, Halo sign and mural stratification(Sub mucosal fat sign – features of acute phase), pseudo-sacculation, perianal fistula.



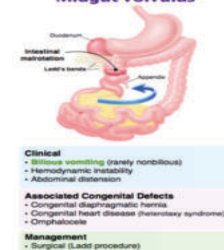
Bezoar :- it is an unusual cause of acute abdomen

CT imaging findings in obstruction due to bezoar includes intraluminal non-enhancing soft tissue attenuating lesion with internal air foci and mottled appearance in gastric lumen extend to 1st, 2nd and 3rd part of duodenum, similar lesions are seen in jejunum and is associated with mild dilatation and wall thickening in jejunum suggestive of – gastric and small bowel trichobezoar with extension of bezoar from gastric lumen into duodenum – Rapunzel syndrome.



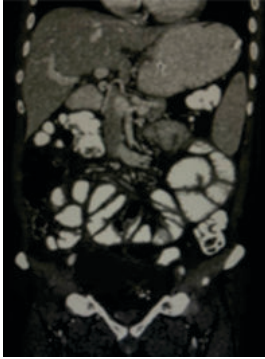
Malrotation :- intestinal malrotation is defined as an anomaly of rotation and fixation of midgut. It may be associated with congenital heart disease / Heterotaxy syndrome. It is usually an incidental finding i.e. non-crossing of duodenojejunal flexure lying of right side of abdomen with reverse SMA/ SMV configuration with whirling sign. Transverse colon is seen in pre-aortic location at renal pyramid level and displaced ascending colon and caecum in midline – malrotation.

Intestinal Malrotation with Midgut Volvulus

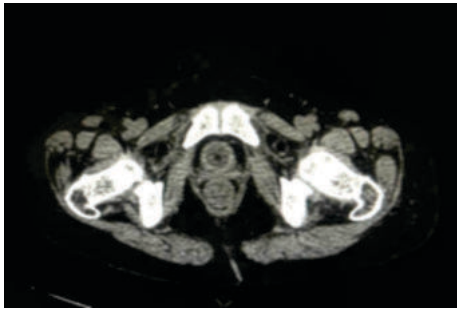


SMA syndrome / wilkie syndrome/ Cast syndrome :- is a rare vascular compression disorder in which acute angulation of SMA resulting in compression of 3rd part of duodenum leading to obstruction. CT imaging findings are : dilated duodenum, stomach and 3rd part of duodenum is compressed between SMA and aorta. The aorto-mesenteric distance is 4mm and angle between SMA and aorta is about 190 .

Tuberculosis :- ileo-caecal region is the most common site of involvement of tuberculosis in gastrointestinal tract. CT findings reveals diffuse long segment wall thickening and prominence of mucosal fold associated with lymphadenopathy, it may also presents as clumped and dilated thick walled small bowel loops in paraumbilical region which appears to be encased in thick fibrous sac suggestive of – abdominal cocoon.



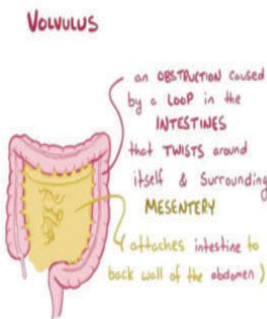
Obturator hernia:- is a rare cause of obstruction .CT is very useful in detecting the exact size and site of hernia. Obturator hernia represents as bilateral fat containing small obturator hernia lying between obturator externalis and pectineus muscle along with prominent jejunal loops.



Diverticulitis :- can also be a cause of obstruction. It is characterized by CT findings like formation of multiple diverticulae in jejunal loops, diffuse mild circumferential thickening in mid-jejunal loops.

Stricture:- it may be sequel of chronic inflammatory process or past surgical history. CT imaging findings are moderate dilation of jejunal and ileal loops is seen with multiple air-fluid levels in lumen. Abrupt zone of transition is seen in terminal ileum in right lumbar region with suggestion of mild ileal wall thickening and twisting of ileocaecal junction.

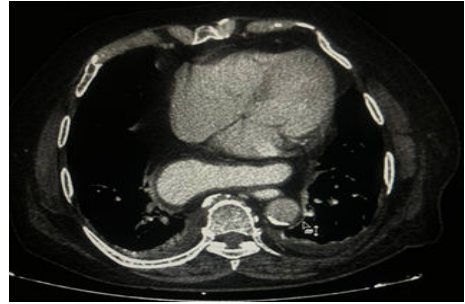
Volvulus :- it is the cause of nearly 10-15% of colonic obstruction. It indicates the rotation of intestine around itself or around another intestinal segment .



Type	Appearance	Description	Remarks
Organoid		*Fold occurs along a line connecting the centre of the twist and the pylorus along the lesser long axis of the stomach	*Rarest common type *Usually associated with diaphragmatic hernia *Vascular compromise more common
Mesenteric		*Fold occurs around a plane perpendicular to the lesser long axis of the stomach from lesser to greater curvature	*Classic appearance *Vascular compromise more common *Cystographic defects less common

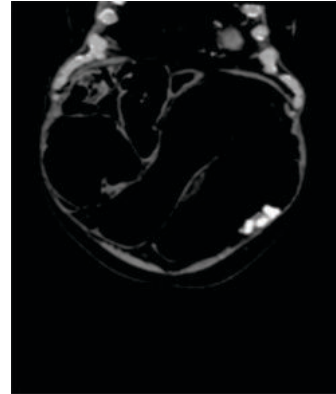
Organo-axial volvulus imaging findings reveals intra – thoracic

herniation of stomach with upside down configuration. Gastro esophageal junction is slightly superiorly located along fundus of stomach.



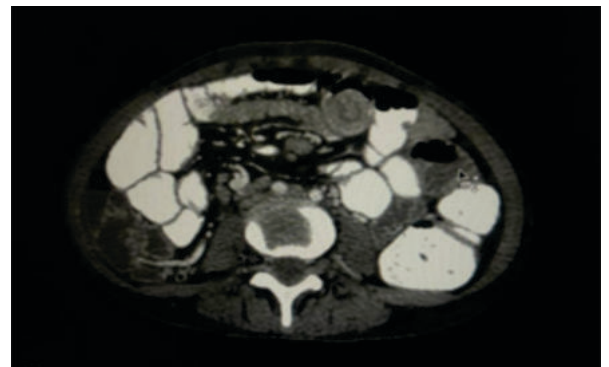
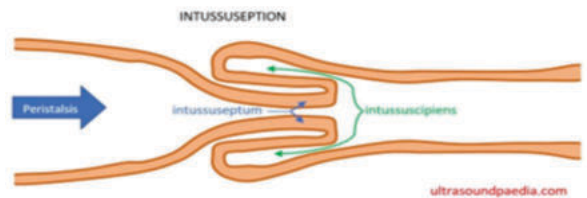
Mesentrio-axial volvulus :- in this on CT we appreciated duodenojejunal junction is situated on right side of spine. there is normal SMA and SMV configuration , however mesenteric vessels are slightly twisted.

Sigmoid volvulus :- imaging findings are U- shaped loop with its apex lying in left side of abdomen and focal areas of narrowing and twisting seen at its afferent and efferent end at same level with partial whirling of adjacent vessels.



Appendicitis :- CT is accurate in mainly diagnosis of appendicitis and its complications. Bowel obstruction is less likely due to appendicitis. CT imaging findings revealed ill defined peripherally enhancing collection showing internal air pockets in RIF with adjacent ascending colon and it insinuate in interbowel space, appendix is not superiorly visualized .

Intussusception :- it is a rare cause of obstruction in adults . it is defined as telescoping of a bowel loop into itself or neighboring loop. Almost 90% cases has a lead point.



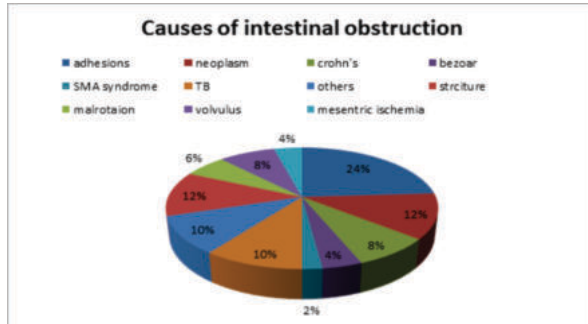
RESULTS:-

MDCT improves the diagnostic confidence in detecting intestinal obstruction its grades, transition point and causes. common causes of bowel obstruction are- Adhesions > neoplasm > crohn's disease > others.

In our study amongst 50 patients with suspected bowel obstruction has undergone MDCT analysis . mean age of patient's was 41.6 (15 days – 68 years), amongst them 33 are males and 17 are females.

Most common symptoms of patient's of intestinal obstruction are pain in abdomen , obstipation, vomiting, abdominal distension, guarding.

28 patients' diagnosed with small bowel obstruction and 22 patients with colonic obstruction.



Management plan on the basis of MDCT imaging analysis :-

