

*Research Article*

## The Role of Multi Detector Computerized Tomography In Evaluation of intestinal obstruction

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### Abstract

**Introduction:** Intestinal obstruction is a common clinical condition that occurs secondary to mechanical or functional obstruction of the bowel, preventing normal transit of its contents and for which effective treatment depends on a rapid and an accurate diagnosis. **Aim of The Work:** The study is aiming to assess the role of multi detector CT in the evaluation of intestinal obstruction. **Patients and Methods:** The study included 50 Patients with different ages and sex were presented to the emergency department with acute abdomen and suspected of having intestinal obstruction underwent multi-slice CT at the Radiology Department of Minia University at the period from June 2016 to January 2017. Image interpretations performed by independent radiologists were compared with the final diagnosis that was based on all available clinical and lab information as well as surgical findings at operated cases.

**Results:** Fifty patients with suspected intestinal obstruction were recruited in the study, their ages ranged between 8 m. and 75 years with mean age 46.65 years  $\pm$  21.76 standard deviation. They were 36 males and 14 females. All patients were subjected to the following (full history taking X-ray abdominal & pelvic ultrasound MDCT examination).

**Keywords:** MDCT: The first versions of modern, GIT: the gastrointestinal tract

### Introduction

Intestinal obstruction is a common clinical condition that occurs secondary to mechanical or functional obstruction of the bowel, preventing normal transit of its contents and for which effective treatment depends on a rapid and an accurate diagnosis. It is a frequent cause of hospitalization and surgical consultation, representing 20% of all surgical admissions for acute abdominal pain.<sup>(1-2)</sup>

Clinical signs and symptoms do not provide sufficient information for diagnosis or to guide management. Despite advances in imaging and the better understanding of bowel pathophysiology, Intestinal obstruction is often diagnosed late or misdiagnosed, resulting in significant morbidity and mortality.<sup>(3-4)</sup>

years, in fact, many patients will be successfully managed conservatively with nasogastric suctioning and bowel rest.

Surgery may be needed if conservative treatment fails and emergent surgery is indicated in the presence of bowel ischemia. For guiding surgical management, it is critical to differentiate simple uncomplicated obstruction from that with superimposed ischemia or incarceration.<sup>(5-6)</sup>

A comprehensive approach that includes patient history, clinical findings and triage examinations such as plain abdominal radiography will help the clinician develop an individualized treatment plan. Radiology assumes considerable relevance in assisting the therapeutic decision of the surgeon in cases of by addressing the following questions: Is the bowel obstructed? How severe is the obstruction? Where is it located? What is its cause? And is strangulation present?<sup>(3)</sup>

CT has become a mainstay in diagnosing bowel obstruction. Because the management of obstruction has dramatically changed with a decrease in the proportion

of patients who need surgery, of the time of surgery, which may be delayed and the type of surgery, with sometimes a coelioscopic procedure, a precise CT evaluation is now both the gold standard and the common approach in patients with suspected bowel obstruction.<sup>(4)</sup>

Multidetector CT (multislice CT, multidetector-row CT, multisection CT) represented a breakthrough in computed tomography (CT) technology. It has transformed CT from a transaxial cross sectional technique into a true 3D imaging modality that allows for arbitrary cut planes as well as excellent 3D displays of the data volume. Multidetector CT scanners provide a huge gain in performance that can be used to reduce scan time, reduce section collimation (SC) or to increase scan length substantially.<sup>(7-8-9)</sup>

MDCT has the potential to provide high-resolution multiplanar imaging. This high-quality reformatted series and particularly coronal reformatting is useful in the identification of the transition point and in the analysis of the cause and of the mechanism of the obstruction, also allow accurate delineation of various pathological conditions. Furthermore, the rapid acquisition of images within one breath-hold reduces misregistration artifacts than can occur in critically ill or uncooperative patients also has overcome peristaltic intestinal artifacts, allowing optimal bowel visualisation and contrast enhancement.<sup>(4-10)</sup>

### **Aim of the Work**

The study is aiming to assess the role of multi detector CT in the evaluation of intestinal obstruction.

### **Patients and Methods**

The study included 50 Patients with different ages and sex were presented to the emergency department with acute abdomen and suspected of having intestinal obstruction underwent multi-slice CT at the Radiology Department of Minia University at the period from June 2016 to January 2017. Image interpretations performed by independent radiologists were compared with the final diagnosis that was based on

all available clinical and lab information as well as surgical findings at operated cases.

### **Every patient was subjected to the following:**

1. Full history taking.
2. Through clinical examination of the abdomen and pelvis
3. Laboratory assessment : renal function test ( urea and creatinin)
4. Abdominal X-ray in erect position
5. Abdominal and pelvic ultrasound examination.
6. MDCT examination:

All MDCT examinations were performed using 16 detectors CT scanner (Brilliance Philips, medical system, Netherland).

### **MDCT Technique**

#### **Patient preparation:**

- First the radiologist should explore the examination to the patients to be cooperative during examination.
- Patient should be fasting 4hrs before examination.
- Backboards and other dense materials should be out of the scanning field.
- All the exams were interpreted in axial scans in addition to coronal and sagittal reconstruction.
- Oral positive and neutral contrasts as well as the different phases of IV contrast (arterial, venous and delayed phases) were tailored according to the presentation of the patients.
- Images obtained from the dome of the liver to perineum
- Sagittal images helpful in assessing the origin of the mesenteric arteries & variations
- Acquisition of both unenhanced and contrast-enhanced CT necessary.
- Unenhanced CT identify vascular calcification, hyperattenuating clotting, and intramural hemorrhage

#### **CT scanning**

This is the final scan before transferring images to the workstation. When the scan was completed, the images were quickly checked. It should cover the complete abdomen and pelvis with included lung bases. The first (superior) image location should be at mid chest. The last (inferior)

image location should be below the symphysis pubis(1).

### Image evaluation

Axial images were transferred to the diagnostic workstation and were reconstructed for each patient and analyzed for motion artifacts. Both axial images and multiplanar reformatted (MPR) images were instrumental in detecting abdominal abnormality. Although two-dimensional and three-dimensional reformatting techniques such as maximum intensity projection, multiplanar reformation, and volume rendering (VR) may facilitate

interpretation and improve communication with referring physicians, axial images still remain the cornerstone of the evaluation, as virtually all pathologies can be recognized (1-2).

### Results

Fifty patients with suspected intestinal obstruction were recruited in the study, their ages ranged between 8 m. and 75 years with mean age 46.65 years  $\pm$  21.76 standard deviation. They were 36 males and 14 females. All patients were subjected to the following ( full history taking X-ray abdominal & pelvic ultrasound MDCT examination.)

**Table 1: Shows different causes of intestinal obstruction**

Diagnosis	n=50
Adhesions	10
Hernia	9
Intussusception	8
Volvulus	6
Vascular	5
Mass	4
crohns	2
Endometriosis	2
Teratomous	1
T.B.	1
Hematoma	1
Post-radiation	1
Site	
Small intestine	40
Large intestine	10

intestinal obstruction is more common than the large intestinal obstruction, 40 cases of small intestinal obstruction accounting for 80% to 10 cases of large intestinal obstruction accounting for 20%.

common cause of intestinal obstruction were adhesion that seen in 10 cases accounting for about 20%. The second

common cause was hernia seen in 9 cases accounting for about 18%. The third common cause were intussusception that seen in 8 cases accounting for about 14% of the cases then volvulus seen in 6 cases accounting for about 12% then tumors seen at 5 cases accounting for about 10% followed by other causes as endometriosis, T.B ,hematoma, post radiation, every cause seen at one case accounting for about 4% .

**Signs of intestinal obstruction seen by MDCT****Table 2: shows signs of intestinal obstruction by CT:**

CT	Case (n=25)
<b>Dilatation of bowel loop</b>	
No	0(0%)
Yes	50(100%)
<b>Bowel within bowel sign</b>	
No	44(88%)
Yes	6(12%)
<b>Transitional zone</b>	
No	40(80%)
Yes	10(20%)
<b>Diffuse masses</b>	
No	45(90%)
Yes	5(10%)
<b>Associated finding</b>	
<b>Lymphadenopathy</b>	
No	44(88%)
Yes	6(12%)
<b>Thickened peritoneum</b>	
No	43(86%)
Yes	7(14%)
<b>Twisting bowel stock</b>	
No	44(88%)
Yes	6(12%)
<b>Caseating LNS</b>	
No	49(98%)
Yes	1 (2%)

This table shows the accuracy of C.T in diagnosis of intestinal obstruction by group of signs show at C.T.

Bowel dilatation is constant C.T finding in all causes of I.O ,other signs and associated finding seen at the table that each of them refers to such cause.

**Specific CT signs for each cause Adhesion****Table 3: shows CT signs of adhesions**

CT signs	Number of cases ( 10 )
<b>Single abrupt transitional zone</b>	10
<b>whirl sign</b>	8
<b>Radiation distribution of mesenteric vessels</b>	6
<b>Beak sign</b>	2
<b>Fat notch sign</b>	0

CT is useful for differentiating BO caused by adhesive band from BO due to matted adhesions by group of signs.

Although adhesive bands are not directly visualized on CT, but it diagnosed by group of signs seen at CT .

**Case 1.**

**Clinical history:**

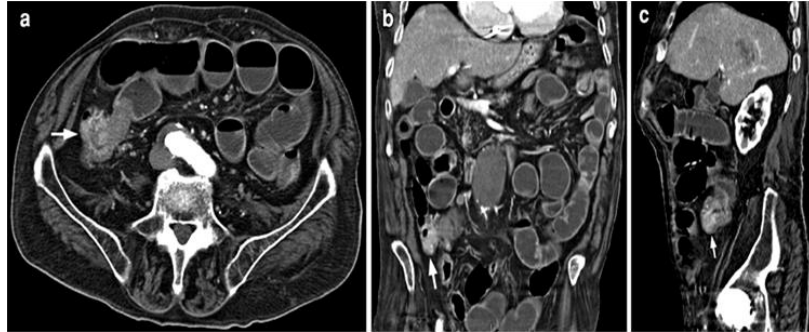
Male patient 68 years old presented with abdominal pain, vomiting, Weight loss and diffuse tenderness

**Finding:**

Dilatation of the entire small bowel and short thickening of the terminal illeal wall That suggesting a malignant tumor of the terminal ileum. With heterogenous enhancement.

**Diagnosis :**

Mass lesion of the terminal ileum ( by biopsy adenocarcinoma of terminal ileum )



**Case 2**

**Clinical history:**

Male patient 50 years old presented with abdominal pain, vomiting, Weight loss and diffuse tenderness

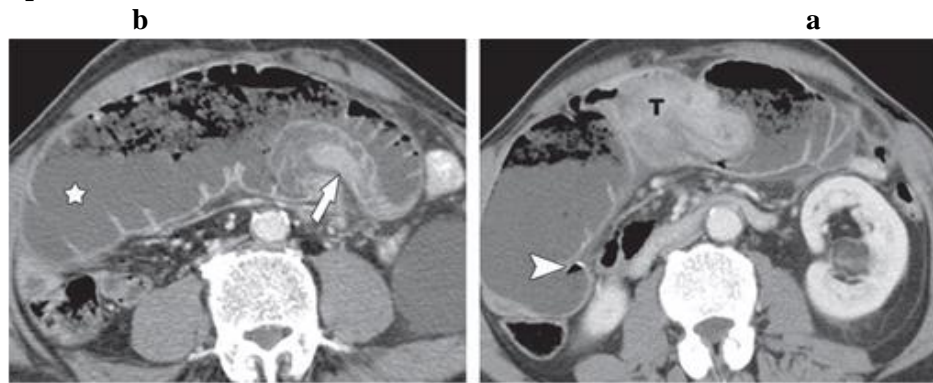
**Finding:**

Bowel mass attaining the characteristic target sign where abowel loop is projecting within another .

The intussusceptum (arrow in a) invaginating into the intussusciens (\* in a) secondary to a submucosal tumor (T in b)

**Diagnosis:**

**Intussusception**



**Discussion**

Bowel obstruction is a relatively common condition, with diagnosis based on clinical signs, patient history, and radiographic findings. Intestinal obstruction can be very difficult to assess by conventional radiography or US because of the complex anatomy of the intestine.

MDCT scan images have superior resolution compared to plain films. They are also better for helping to delineate

multiple causes of intestinal obstruction. When intestinal obstruction is suspected

physical examination, diagnostic imaging is charged with the task of verifying the presence of obstruction and to give information on the site, and probable cause of the obstruction. By providing this broad range of anatomic information, imaging impacts directly on patient management, specifically addressing the crucial question

of whether a trial of non operative therapy should be instituted rather than resorting to immediate surgery because of the possibility of strangulation. Radiology is playing a vital role in the clinical decision making of patients with known or suspected bowel obstruction since it provides important anatomic and functional information.

MDCT has the potential to provide high-resolution multiplanar imaging.

This high-quality reformatted series and particularly coronal reformatting is Useful in the identification of the transition point and in the analysis of the cause and of the mechanism of the obstruction, also allow accurate delineation of various pathological conditions. Furthermore, the rapid acquisition of images within one breath-hold reduces misregistration artifacts than can occur in critically ill or uncooperative patients also has overcome peristaltic intestinal artifacts, allowing optimal bowel visualization and contrast enhancement .

The role of MDCT in the diagnosis of bowel obstruction has recently expanded. CT is recommended when clinical and initial radiographic findings remain indeterminate. It clearly demonstrates pathologic processes involving the bowel wall as well as the mesentery, mesenteric vessels, and peritoneal cavity.

MDCT should be performed with intravenous injection of contrast material, and use of thin sections is recommended to evaluate a particular region of interest. In

n patients with vomiting and we depend on the fluid within the intestine as oral contrast. MDCT scanner coupled with a modern workstation has become an essential diagnostic tool for any emergency department to attain the best possible accurate diagnosis and management of intestinal obstruction. It is imperative for the surgeon to understand the morphology and extent of the pathology.

MDCT is helpful in detection, evaluation, characterization, and treatment planning of intestinal obstruction. The MPR images give excellent structural detail, and the 3-D images help in understanding the spatial relations.

### Summary & Conclusion

Since the early 1990s, the management of intestinal obstruction has dramatically changed. Currently, patients without evidence of strangulation are treated conservatively. As many of the other causes of acute abdomen are treated surgically, identification of intestinal obstruction is critical to reduce morbidity and mortality due to unnecessary surgery.

The clinical diagnosis of intestinal obstruction classically depends on four

vomiting, constipation and abdominal distension. Conventional abdominal radiography is the preferred initial radiological examination.

The diagnosis is often not straightforward and frequently not established on the basis of clinical and radiographic findings. Moreover, closed loop and strangulated obstructions (true surgical emergencies) are not easily diagnosed clinically.

Ultrasound (US) of the bowel can be done in order to correlate the results with those of the abdominal plain film, but has its own limitation that it is operator-dependent and having inherent limitations in the evaluation of gas-containing structures.

The advance of computed tomography (CT) from single-detector to multidetector equipment has overcome peristaltic intestinal artifacts, allowing optimal bowel visualisation and contrast enhancement (CE). As a result, this permits a finer representation and a more accurate evaluation of the bowel and mesentery. Furthermore, technological advances now allow high-quality reformatted series particularly coronal reformatting useful in

in the analysis of the cause and of the mechanism of the obstruction.

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