Original Research Article

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Role of CT scan in evaluation and management of intestinal obstruction

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ABSTRACT

Background: Intestinal obstruction is one of the most common diseases in abdominal surgery. It can slowly lead to changes in intestinal structure and function, and in extreme cases it can be life-threatening. CT allows imaging of the abdominal contents outside the lumen, because of this advantage, the nature and site of the obstruction, especially extraluminal or intramural process, can be established.

Methods: Prospective Hospital Based study. From January 2016 to November 2016 (11 months). 50 Patients presenting to Department of Surgery, whether in OPD or Emergency, with complaints suggestive of intestinal obstruction with in study duration eligible as per inclusion criteria will be included in the study.

Results: In present study Majority (52.0%) of study population belonged to 41-60 years age group. The most common symptom was pain abdomen (94%). Majority (66%) patients showed multiple air fluid level on X-ray. In CT imaging, maximum 36% presented with dilated bowel loops. 86% were diagnosed as sub-acute intestinal obstruction, in USG. In present study, 60% patients were treated by surgery. Majority of patients (86.67%) CT findings matched with perop/ intraoperative findings. Accurate CT findings were helpful in guiding patient management. In our study, CT had the sensitivity of 86.67%, Specificity75%.

Conclusions: Management decisions in intestinal obstruction remain notoriously difficult, relying on a combination of clinical and imaging factors to help stratify patients into conservative or surgical treatment.

Keywords: CT Scan, Extraluminal, Intestinal obstruction

INTRODUCTION

Bowel obstruction was recognized, described and treated by Hippocrates. The earliest recorded operation as treatment was performed by Praxagoras circa 350 BC, when he created an enterocutaneous fistula to relieve the obstruction of a segment of bowel.¹

Bowel obstruction occurs when the normal flow of intraluminal contents is interrupted. Obstruction can be functional (due to abnormal intestinal physiology) or due to a mechanical obstruction, which can be acute or chronic.^{2,3} The most common causes of mechanical small bowel obstruction are postoperative adhesions and hernias.

Acute, mechanical small bowel obstruction is a common surgical emergency.⁴ It is estimated that over 300,000 laparotomies per year are performed in the United States for adhesion-related obstructions.^{5,6}

The first imaging procedure used in patients with bowel obstruction is conventional radiography with 46-80% accuracy in determining the presence of obstruction. The next step in patients with indeterminate radiographic findings is radiography with intraluminal injection of contrast material. Its use should be avoided in patients with markedly diminished intestinal peristalsis. On ultrasonography, bowel obstruction is considered to be present when dilated loop measures >2.5 cm and length of segment is >10 cm.

Unlike oral contrast radiography, which provides imaging of only the luminal surface, CT allows imaging of the abdominal contents outside the lumen. 8.9 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. 10

METHODS

Prospective hospital based study conducted in Department of Surgery, PBM Hospital attached to S. P. Medical College, Bikaner, Rajasthan, India. Duration of study January 2016 to November 2016, with patients presenting to Department of Surgery, whether in OPD or Emergency, with complaints suggestive of Intestinal Obstruction. Consecutive sampling till 50 patients were selected. 50 patients involve in this study

Inclusion criteria

- Clinically presented as intestinal obstruction
- Patients who gave an informed consent.

Exclusion criteria

- Severely decompensated patients
- Pregnancy
- Patients with deranged kidney function test
- Patients below 14 years of age
- Patients who didn't give informed consent.

A Pre-tested pre-structured questionnaire

After obtaining permission from institutional ethical committee and consent from eligible study participants as per inclusion and exclusion criteria, 50 consecutive patients presenting with suggestive signs and symptoms of intestinal obstruction to Surgery OPD as well as Emergency, PBM Hospital attached to S. P. Medical College, Bikaner; within duration of January-November 2016 were enrolled in this study. In this study, multislice (64 slice) CT scanner was used. The patients were given 720 mL of 1.5% water soluble contrast medium orally 2 h prior to the scanning. Then a bolus dose of intra venous contrast medium with 35-40 gm of iodine was given. CT scanning of entire abdomen and pelvis was done with contiguous axial 5 mm sections with pitch of 1.5. In over distension of abdomen and vomiting oral contrast was not given.

Statistical analysis

The information thus collected was entered into Microsoft Excel sheet. Thereafter the data were analyzed

with the help of SPSS 22.0 software in terms of mean, SD, Range, sensitivity, specificity and appropriate test of significance wherever required.

RESULTS

Table-1 Majority (52.0%) of study population belonged to 41-60 years age group, <20 years age group had minimum number of participants. Mean age of participants was 51.62 ± 17.46 years.

Table 1: Distribution of study population according to age.

Age groups	No.	0/0
<20	1	2
21-40	11	22
41-60	26	52
>60	12	24
Total	50	100.0

Table 2: Distribution of study population according to sex.

Sex	No.	%
Male	31	62
Female	19	38
Total	50	100.0

In our study 62% were males whereas 38% study participants were females.

Table 3: Distribution of study population according to signs and symptoms.

Signs and symptoms	No.	%
Pain abdomen	47	94
Vomiting	31	62
Abdominal distension	34	68
Constipation	38	76
Tachycardia	18	36
Abdominal tenderness	29	58
Guarding	34	68
Obstipation	7	14

Table 3 depicts the signs and symptoms the participants presented. The most common symptom was pain abdomen (94%). Minimum 14% patients had presented with obstipation.

Table 4 shows that in CT imaging, maximum 36% presented with dilated bowel loops followed by constriction/bands-18%, sub-acute intestinal obstruction-16%, 10% as intussusception cases.

Table 5 shows distribution of study population according to line of management. 60% patients were treated by

surgery. 40% patients were treated by conservative management.

Table 4: Distribution of study population according to CT findings.

CT findings	No.	%
Acute intestinal obstruction	1	2
Dilated bowel loops	18	36
Constriction/bands	9	18
Sub-acute intestinal obstruction	8	16
Malignancy	4	8
Intussusception	5	10
Perforation	2	4
Enlarged lymph nodes	3	6

Table 5: Distribution of study population according to line of management.

Management	No.	%
Conservative	20	40.0
Surgery	30	60.0
Total	50	100.0

Table 6: Distribution of study population according to whether CT findings matched or not with Intra operative findings.

CT Matched	No.	%
Yes	26	86.67
No	4	13.33
Total	30	100.0

Table 7: Evaluation of sensitivity and specificity of CT as diagnostic tool.

CT		Conservative management	Total
Positive	26	5	31
Negative	4	15	19
Total	30	20	50

Table 6 shows that out of 30 patients who were treated by surgery, majority of patients (86.67%) CT findings matched with perop/ intraoperative findings whereas in 13.33% patients, CT findings did not match with intraoperative findings.

- Sensitivity of CT = 86.67%
- Specificity of CT= 75%
- Positive predictive value of CT for its ability to detect Intestinal Obstruction = 83.87%
- Negative predictive value of CT = 78.94%.

Table 7 shows that how accurate CT findings were helpful in guiding patient management (Operative/Conservative). Also, the difference between

the two management lines was also found to be statistically significant (p<<0.05).

DISCUSSION

Majority (52.0%) of study population belonged to 41-60 years age group followed by 24% patients in >60 years age group and 22% in 21-40 years age group. <20 years age group had minimum number of participants. In our study 62% were males whereas 38% study participants were females.

Randen V et al, conducted a prospective trial, Between March 2005 and November 2006, 1021 patients, 55% female, mean age 47 years (range, 19-94 years), were included. In 117 of 1021 patients. Achiek MM et al studied a total of 105 adult patients, 65 males and 40 females. A mean age of 46 years and an age range 22-75years for Juba patients and a mean age of 64 years with an age range 21-95 years for KCH, London. The most common symptom was pain abdomen (94%) followed by constipation (76%), Minimum 14% patients had presented with obstipation.

In CT imaging, maximum 36% presented with dilated bowel loops followed by constriction/bands-18%, sub-acute intestinal obstruction-16%, 10% as intussusception cases. In present study, 60% patients were treated by surgery. 40% patients were treated by conservative management.

Donckier V et al conducted a study on 54 patients with suspected adhesive small bowel obstruction had CT at admission. ¹³ CT demonstrated signs of strangulation or volvulus in 19 patients, including three with signs of peritoneal irritation. Within this group, urgent laparotomy was performed in 17 patients and confirmed the CT diagnosis in thirty-seven patients (2/3rd of total patients) without clinical or CT signs of complications had initial conservative treatment; among them, seven of 12 with a distal obstruction determined by CT required a delayed operation for persisting obstruction, compared with two of 25 patients with a proximal obstruction (P < 0.01). ¹⁶

Majority of patients (86.67%) CT findings matched with perop/ intraoperative findings whereas in 13.33% patients, CT findings did not match with intraoperative findings.

Saini DK et al performed a single centre prospective follow up study. 14 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%). MDCT is sensitive and specific in determining the presence of bowel obstruction and should

be recommended for patients with suspected bowel obstruction because it affects outcome in these patients.

Accurate CT findings were helpful in guiding patient management (Operative versus Conservative). In our study, CT had the sensitivity of 86.67%, Specificity75%, PPV 81.87%, NPV 65.21%.

Similar results were obtained by Mallo RD et al who conducted a systemic review.¹⁵ 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). A MEDLINE search (1966-2004) identified 15 studies dealing with the CT diagnosis of ischemia and complete obstruction in SBO. Ischemia was defined by operative findings, and complete obstruction was defined by enteroclysis or operative findings. Aggregated sensitivity, specificity, and positive and negative predictive values (PPV and NPV) were calculated. Eleven of 15 studies reported on the CT diagnosis of ischemia in SBO based on 743 patients.

The aggregated performance characteristics of CT for ischemia in SBO were sensitivity of 83% (range, 63-100%), specificity of 92% (range, 61-100%), PPV of 79% (range, 69-100%), and NPV of 93% (range, 33.3-100%). 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. These results are in line with our study results.

CONCLUSION

Any surgeon involved in evaluating patients with bowel distention 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.

During the last two decades, the classical philosophy of "never let the sun set or rise on bowel obstruction" has been succeeded by a new management based especially on the cause and the severity of the obstruction. It most often allows a correct choice between medical therapy and surgery using laparotomy or laparoscopy. This changing attitude is still in progress and is mainly related to the high accuracy of computed tomography.

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.

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institutional ethics committee

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