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Plain radiograph and CT correlation in small and large bowel obstruction.

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ABSTRACT

The aims and objectives of this study were: To evaluate the efficacy of plain radiography and computed tomography (CT) imaging in diagnosing the presence, level, degree, and cause of intestinal obstruction, and the role of CT in detecting presence of complications. To identify the cause of intestinal obstruction. To correlate CT findings with plain radiograph findings , so that the modality of choice can be determined. A prospective study of 80 patients presented in outpatient/emergency department with features suggestive of intestinal obstruction. Plain radiograph and Contrast enhanced computed tomography of whole abdomen was done in all patients after preliminary investigations. Whenever indicated, patients were explored. Statistical analysis was performed to determine the efficacy of multidetector computed tomography (MDCT) in diagnosing intestinal obstruction and its complications.

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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). On plain supine and upright radiographs of the abdomen, the cardinal findings that suggest the diagnosis of small bowel obstruction are dilated bowel loops and the accumulation of air and fluid proximal to the point of obstruction . The etiology can sometimes be determined, but plain radiograph is less accurate than computed tomography (CT). Unlike plain radiography, CT allows imaging of the abdominal contents outside the lumen. Because of this advantage, the nature of the obstruction, especially when secondary to an extraluminal or intramural malignant process, can be established(2). Additional abdominal pathology, such as the presence of nodal or liver metastases, ascites, and solidorgan parenchymal abnormalities, can often be identified, thereby helping to define the cause of the obstruction.

Study design:

A correlative study with 80 patients was conducted to study the role of X-RAY and CT imaging in INTESTINAL OBSTRUCTION, out of 80 patients who were referred to our radiology department for intestinal obstruction, 44 patients were diagnosed of intestinal obstruction by Plain radiograph and CT findings .

SOURCE OF DATA

A prospective study was performed with 80 patients between October 2015 and September 2017 (period of 2 years) who were referred to our hospital with a provisional diagnosis of intestinal obstruction. Informed consent was taken from each patient and they were instructed to be on fasting for atleast 4 - 6 hours before the scan time. Each patient underwent X-RAY examination, followed by CT. The first line of radiological investigation has always been PLAIN RADIOGRAPH.

1) **INCLUSION CRITERIA**

- Patients with clinically suspected intestinal obstruction.
- Age group between 20 to 90 years.
- Patients willing to undergo this study.

2) **EXCLUSION CRITERIA**

- Any absolute contraindication for CT which are mainly associated with the use of iodine based contrast.
- Paediatric age group.
- Deranged renal function test
- Patients who refused CT examination.
- Pregnant women.

RESULTS

Age incidence

The most common age group suffering from intestinal obstruction in the present study was 61 – 70 years , accounting for (38 %).

Sex incidence

Out of 44 cases who have been diagnosed with intestinal obstruction and proven with intra-operative findings, 33 cases were male (75%) and 11 cases were females (25%) .

Causes of intestinal obstruction

Out of 80 patients with provisional diagnosis of intestinal obstruction, Plain radiograph and CT detected 44 patients with intestinal obstruction, in which adhesions were the most common cause (34 %) followed by malignancies (29%).

Incidence of small and large bowel obstruction

Small bowel obstruction proved to be more common than the large bowel obstruction accounting for 75 % and 25 % respectively.

Plain radiograph and CT correlation

Out of 44 diagnosed cases of intestinal obstruction, plain radiograph could detect only 22 cases (50%) and CT could detect all cases. Hence proving that CT is the more accurate and efficient in diagnosing intestinal obstruction.

The sensitivity of plain film radiography for revealing small bowel obstruction was 50 % and its specificity was 94 %. The probability that subjects with a positive Plain radiograph finding, truly have the disease is 91.67 % (Positive predictive value). The probability that subjects with a normal Plain radiograph truly don't have the disease is 60.71 % (Negative predictive value). The likelihood ration is 8.3.

The sensitivity of CT for revealing small bowel obstruction was 100 % and its specificity was 94.45 %. The probability that subjects with a positive CT finding, truly having the disease is 95.67 % (Positive predictive value). The probability that subjects with a normal CT not having the disease is 100 % (Negative predictive value). The likelihood ration is 18.

THE ABOVE RESULTS CLEARLY INDICATE THAT CT IS A BETTER DIAGNOSTIC TOOL IN DETECTING INTESTINAL OBSTRUCTION

DISCUSSION

A prospective study was performed with 80 patients who presented to department with provisional diagnosis of small and large bowel obstruction. The current study evaluated the correlation of Plain radiograph and CT in large and small bowel obstruction. Accuracy and effectiveness of both modalities in diagnosing small and large bowel obstruction were correlated and compared. This study comprised of patients between 20 to 90 years with mean age of 55 years.

In the present study all the 80 patients underwent Plain radiograph initially, followed by CT – abdomen and contrast enhanced CT (wherever necessary). The findings of both the modalities were correlated and compared with the final results which include histopathology and operative findings.

Plain radiograph findings like bowel loops dilatation and multiple air-fluid level were taken into considerations and correlated. The criteria for bowel loop dilatation was >3 cm for small intestines, >6 cm for colon (except caecum) and >9 cm for caecum. Presence of minimum three air fluid level was considered as positive. Dilated bowel loops were the most common finding Plain radiograph finding and was seen in 95 % of the patients whereas multiple air fluid levels was seen in only 54 % of the patients.

Correlative study also revealed that, out of all the patients with intestinal obstruction, small bowel obstruction was more common that is 75 % and large bowel obstruction is only 25 %.

Another correlative study was conducted to find the incidence of the type of hernia causing intestinal obstruction. Inguinal hernia was detected as the most common cause accounting to 55 % followed by incisional hernia which accounted for 33 %. Internal hernias accounted for only 11 %.

Out of all the cases of intestinal obstruction in the present study, only 2 % cases were detected with multiple sites of obstruction showing the diagnostic value, and accuracy of CT.

Age Incidence

Intestinal obstruction although occurs in all age groups, the age spectrum in our clinical study, with the spectrum age group of 20 years to 90 years. The study showed the peak incidence is in the age group 61 - 70 of 38 % which is comparable with the previous study groups Souvik Adhikari et al(3)., Cole GJ et al(4). group, which are almost similar to our clinical study of intestinal obstruction.

The mean age is our current study is 55 years where as Souvik Adhikari et al. shows mean age of 44 years, Jahangir Sarwar Khan(5) series shows mean age is 33 years.

These studies are compared with our current study.

AGE GROUP	Cole GJ	Souvik Adhikari	Harban Singh	Present Study
21 – 30	10%	11%	16%	09%
31 – 40	18%	15%	18%	13%
41 – 50	15%	24%	15%	13%
51 - 60	16%	13%	10%	15%
61 – 70	15%	20%	20%	38%
71 – 80	9%	2%	5%	04%
81 – 90	6 %	4%	4%	04%

Sex Incidence

In Souvik Adhikari et al.44 study male to female radio was 4:1. In Osuigwe ANet al. study male to female ratio was 2:1. In the present study male to female ratio is 2.5: 1.

Etiology incidence

In the present study, postoperative adhesion is the commonest cause of intestinal obstruction (34 %), which is comparable with the other study groups Playforth et al. with 54% and Arshad Malik et al. with 41%. Although the incidence of hernia is more in the developing countries , in this study group malignancy is the second common aetiology for obstruction. It may be because the awareness of public, the availability of investigative and surgical facilities like hernia repair which prevent obstruction.

Causes	Souvik Adhikari	Jahangir	Arshad M. Malik	Cole GJ	Brooks and Buttler	Playforth 1970	Present study
Adhesions	16 %	49%	41%	10%	23%	54%	34 %
Hernias	36%	34%	19%	35%	25%	23%	20 %
Malignancy	17%	3%	2%	9%	5%	9%	29 %
Infections	14%	1%	24%	3 %	-	-	04 %
Miscellaneous	9%	2%	10%	-	-	- 6%	11 %

Comparison of clinical features with other studies

In the present study, the clinical features of pain abdomen was 95 % , constipation was 72 % was which comparable with the other study group. Souvik Adhikari et al and Jahangir Sarwar Khan et al. Only 54 % of the patients in the present study group had distension of abdomen. It may be due to early approach and diagnosis in the present study.

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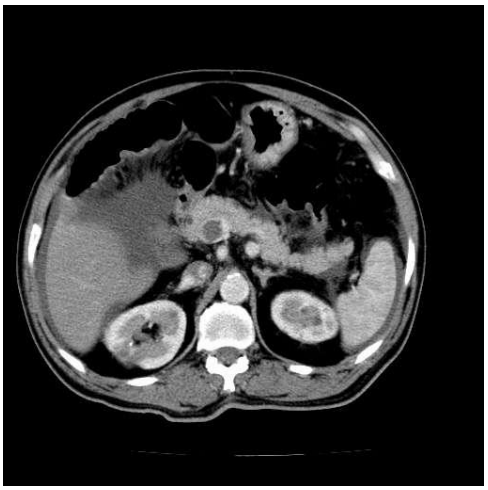
Study group	Pain abdomen	Vomiting	Distension	Constipation
Souvik Adhikari	72%	91%	93%	82%
Jahangir-Sarwar Khan	100%	92%	97 %	97 %
Present study	95%	63%	54%	72%

Case I

68-year-old man was hospitalized with chief complaints of pain abdomen, vomiting, decreased appetite and fever. During hospitalization, the patient complains of generalized abdominal pain was diffuse and continuous more pronounced after taking meal. Vomiting is projectile in nature and contains food particles. On physical examination, patient was conscious had stable vital signs and 38° C febrile.

Figure 1: Dilated Small bowel loops are on RT side and over the spine. – MALROTATION.



Axial CECT - Superior mesenteric artery and superior mesenteric vein axis are altered – MALROTATION.

CASE – II

Here is a 25 years old patient complaints of abdominal pain, constipation and weight loss.

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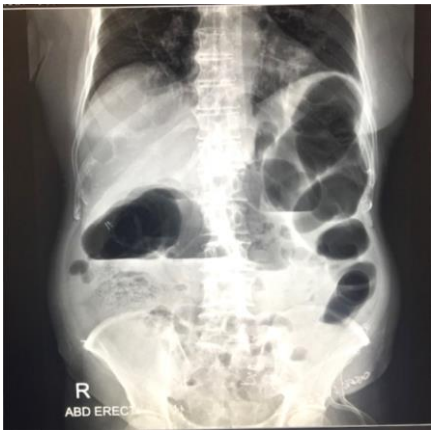

Plain radiograph – Abdomen erect shows grossly dilated bowel loops with multiple air fluid levels.

CECT – Abdomen shows a circumferential wall thickening in sigmoid colon and in the recto – sigmoid junction causing large bowel obstruction.

CONCLUSION

The occurrence of intestinal obstruction is more in small bowel. The incidence of intestinal obstruction is more common in males compared to females. Intestinal obstruction is more common in age group 61 – 70 years. Abdominal pain was the most common presentation (95%) by the patients suffering from intestinal obstruction. Adhesions were accounted as the major cause of intestinal obstruction (34 %).Malignancies are the second most common cause of intestinal obstruction and are the most common cause of large bowel obstruction. The sensitivity of plain film radiography for revealing small bowel obstruction was 50 % and its specificity was 94 %Plain X – ray Abdomen findings when correlated, proved that dilated bowel loops is the most common finding.

The sensitivity of CT for revealing small bowel obstruction was 100 % and its specificity was 94.45 %. Hence CT is the gold standard imaging modality in diagnosis intestinal obstruction.

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