Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

Comparison of Imagiology with Operative Findings in a Case of Intestinal Obstruction

B Sharadha

Assistant Professor, Department of General Surgery, Osmania Medical College/Osmania General Hospital, Hyderabad, Telangana, India

Abstract

Introduction: The diagnosis of intestinal obstruction is a team work of radiologist and clinician. Acute abdominal conditions require precise radiological diagnosis to achieve excellent results to reduce morbidity and mortality.

Aims and Objectives: This study aims to study the various radiographical, ultrasonographic, and contrast-enhanced computerized tomography (CECT) findings associated with intestinal obstruction and to study the various causes of intestinal obstruction.

Methodology: A prospective study of 50 patients admitted to the Mahatma Gandhi Memorial (MGM) Hospital, Warangal, during the period of November 2017–September 2019 with the diagnosis of intestinal obstruction.

Results: A clinical study of 50 cases of intestinal obstruction was done at Osmania hospital at Hyderabad during November 2017–September 2019. Intestinal obstruction whether in small bowel or large bowel occurs nearly in equal ratio in both sexes.

Conclusion: Intestinal obstruction remains still a common and important surgical emergency. Obstruction due to adhesions increasing in incidence due to increased abdominal and pelvic surgeries. X-ray erect abdomen and ultrasonography abdomen are able to diagnose intestinal obstruction, but CECT has more sensitivity and specificity in diagnosing the intestinal obstruction. It also helps in the management of the intestinal obstruction.

Key words: Adhesions, Bands, Computerized tomography scan, Hernia, Intussusception, Large intestine, Malignancy, Resection and anastomosis, Small intestine, Stricture, Tuberculosis of intestine gangrenous bowel, Ultrasonography, Volvulus

INTRODUCTION

Intestinal obstruction is a common surgical emergency all over the world. It is defined as obstruction in forward propulsion of the contents of the intestine either due to dynamic, adynamic, or pseudo-obstruction. It is predisposed by varying underlying anomalies and diseases which are difficult to define preoperatively. Although intestinal obstruction can be diagnosed easily, the underlying cause except post-operative adhesions and external hernias is difficult to be diagnosed preoperatively. Early diagnosis of obstruction, pre-operative preparation, skillful operative management, proper technique during surgery, and intensive post-operative treatment carries a grateful result. The diagnosis and management of the patient with intestinal obstruction is one of the more challenging emergencies that a general surgeon can come across. Although the mortality due to acute intestinal obstruction is decreasing with better understanding of pathophysiology, improvement in diagnostic techniques, fluid and electrolyte correction, much potent antimicrobials, and surgical management, still mortality ranges from 3% for simple obstruction to as much as 30% when there is a vascular compromise or perforation of the obstructed bowel.

Access this article online

www.ijss-sn.com

Month of Submission : 10-2019
Month of Peer Review : 11-2019
Month of Acceptance : 12-2019
Month of Publishing : 12-2019

Aims and Objectives

The aims of the study were as follows:

1. To study the various causes of intestinal obstruction.
2. To study the various radiographical, ultrasonographic, and contrast-enhanced computerized tomography (CECT) findings associated with intestinal obstruction.

Corresponding Author: Dr. B Sharadha, Department of General Surgery, Osmania Medical College/Osmania General Hospital, Hyderabad, Telangana, India.

3. To analyze the efficacy of CECT in predicting the etiology of intestinal obstruction and its correlation with intraoperative findings.

METHODOLOGY

A prospective study of 50 patients admitted to the Mahatma Gandhi Memorial (MGM) Hospital, Warangal, during the period of November 2017–September 2019 with the diagnosis of intestinal obstruction. Investigations and operative findings were collected from inpatients where interpreted 50 patients who presented to us with intestinal obstruction were admitted to the hospital in the above-mentioned period and were subjected to plain X-ray of abdomen, ultrasonography (USG), and CECT of abdomen.

All patients included in the study were examined thoroughly and history, physical examination, and investigation findings were recorded as per pro forma. After a history taking and physical examination, all patients underwent plain X-ray abdomen, USG, and CECT abdomen. Plain X-ray abdomen anteroposterior view with horizontal beam in upright position was taken. This film included both domes of diaphragm and pelvis up to the symphysis pubis. Confirmation of the imagiology was done by intraoperative findings. Finally, effort was made to study the sensitivity of plain X-ray, ultrasonographic, and CECT abdomen findings to final diagnosis: Efficacies were analyzed.

RESULTS

A clinical study of 50 cases of intestinal obstruction was done at Osmania hospital at Hyderabad during November 2017–September 2019, Warangal, studied as follows [Tables 1-12]:

Table 1: The age and sex distribution of the cases

Age group	Male	Female	Total	Percentage
11–20	2	4	6	12
21–30	5	2	7	14
31–40	5	4	9	18
41–50	6	4	10	20
51–60	4	6	10	20
61–70	5	3	8	16
Total	27	23	50	100

Table 2: Presenting symptoms and signs

S. No.	Clinical features	Number of cases	Percentage
1.	Pain abdomen	50	100
2.	Vomiting	43	86
3.	Distension of abdomen	50	100
4.	Constipation	30	60
5.	Dehydration	30	60
6.	Fever	7	14
7.	Tenderness over the abdomen	40	80
8.	Guarding	20	40
9.	Palpable mass	13	26
10.	Increased bowel sounds	44	88
11.	Absent bowel sounds	6	12

CECT: Contrast-enhanced computerized tomography

Table 3: Sensitivity and specificity of CECT in diagnosing adhesions in intestinal obstruction

Statistic	CECT in intestinal obstruction (%)
Sensitivity	95
Specificity	96.67
Positive predictive value	95
Negative predictive value	96.67

CECT: Contrast-enhanced computerized tomography

Table 4: Sensitivity and specificity of CECT in diagnosing hernia in intestinal obstruction

Statistic	CECT in intestinal obstruction (%)
Sensitivity	87.5
Specificity	95.2
Positive predictive value	77.78
Negative predictive value	97.50

CECT: Contrast-enhanced computerized tomography

DISCUSSION

Intestinal obstruction continues to be a frequent emergency, which surgeons have to face 1–4% of emergency operations. Richard *et al.* analyzed 1000 consecutive abdominal surgeries in 1976 and reported an incidence of 2.5%.[1] In 1973, reported an incidence of 3.2%.[2] In our hospital, 1574 cases of total abdominal surgeries were done in November 2017–September 2019, of which 50 cases were intestinal obstruction comprising about 3%. The involvement of small bowel in obstruction is much more common than that of large bowel.[3] The delay in the treatment will lead to high mortality. Since the advancement in understanding the anatomy/physiology, fluid and electrolyte management along with modern antibiotics, and intensive care unit, the mortality has been decreasing consistently.[4] The associated medical problems (such as respiratory cardiac or metabolic diseases) and advanced age carry a considerable contribution in adding the mortality.

Age Incidence

Although intestinal obstruction occurs in all age groups, here the youngest patient was 14 years and oldest patient was 70 years. In this study, 20% belongs to 50–60 years age group and 58% belongs to 30–60 years age group. Studies by Gill and Eggleston[5] have 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. Their studies almost correlate with the present study. However, studies reported by Singh *et al.*[6] and Ramachandran[7] say that the maximum number of cases occur in the age group of 21–40 years, of these the etiological factors were obstructed hernia. The explanation which I would like to give in presently the etiological shift is toward adhesions and then hernia, which are decreasing from the earlier 20th century most common cause of intestinal obstruction due to awareness as people are seeking treatment early for hernia.

Table 5: Sensitivity and specificity of CECT in diagnosing TB stricture in intestinal obstruction

Statistic	CECT in intestinal obstruction (%)
Sensitivity	80
Specificity	95.56
Positive predictive value	66.67
Negative predictive value	97.73

CECT: Contrast-enhanced computerized tomography, TB: Tuberculosis

Table 6: Sensitivity and specificity of CECT in diagnosing volvulus in intestinal obstruction

Statistic	CECT in intestinal obstruction (%)
Sensitivity	66.7
Specificity	97.8
Positive predictive value	66.7
Negative predictive value	97.8

CECT: Contrast-enhanced computerized tomography

Table 7: Sensitivity and specificity of CECT in diagnosing malignancy/mass in intestinal obstruction

Statistic	CECT in intestinal obstruction (%)
Sensitivity	85.7
Specificity	97.7
Positive predictive value	85.8
Negative predictive value	97.7

CECT: Contrast-enhanced computerized tomography

Table 8: Age-wise incidence of intestinal obstruction in different studies

Age group	Singh *et al.*	Playforth	Cole	Gill	Present study (%)
11–20	10%	4	10	12	12
21–30	16	5	10	12	14
31–40	18	13	18	13	18
41–50	15	18	16	13	20
51–60	10	14	15	16	20
>60	20	40	16	13	16

Sex Incidence

In the present study, there are 27 males and 23 females. Males and females are nearly in equal ratio. Among the previous studies, Budharaja *et al.*[9] and Singh *et al.*[6] reported 4:1 and Sufian and Matsumoto[3] found equal incidence.

Etiology

The etiology of intestinal obstruction varies from one country to other and from one part of the country to another party. The comparative study of the previous report is as follows:

The most common etiological factor in the present study is adhesion which included post-operative, inflammatory, and congenital bands. Post-operative adhesion occurs in 93% of cases of previous abdominal surgery, of every third patient will be having one of the other clinical signs and symptoms related to adhesion. Among 93% of the post-operative adhesions, 5% of the cases can develop acute intestinal obstructions, most of them will be within the 1st year (39–60%).

In the present series, 42% of the cases of obstruction are due to adhesion and bands. Among adhesion and bands, 61.9% are due to post-operative adhesion, 23.8% are due to inflammatory adhesions, and 15.3% are due to congenital 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. In the inflammatory causes, 42% followed acute appendicitis, 14.5% diverticulitis, and others resulted from pelvic infection, Crohn's disease, and cholecystitis.

Table 9: Comparison of causes of intestinal obstruction in different studies

Cause	Present study (%)	Gill and Eggleston (%)[5]	Cole (%)	Playforth (%)	Ramachandran (%)[7]	Brooks and Buttler (%)	Biarj *et al.* (%)[8]
Adhesion	42	15	15	10	23	23	53
Hernia	20	27	27	35	13.6	25	26
Intussusception	-	12	12	12	7.4	18	-
TB	14	3.5	3.5	3	8.6	-	-
Malignancy	16	3.4	3.4	4	9.3	5	-
Volvulus	8	3.4	25	4	26.6	1	3
Mesenteric vascular thrombosis	-						26

TB: Tuberculosis

Table 10: Comparison of hernia causing intestinal obstruction in different

S. No.	Studies	Percentage
1.	Gill and Eggleston[5]	15
2.	Cole	15
3.	Playforth	10
4.	Ramachandran[7]	23
5.	Brooks and Buttler	23
6.	Biarj *et al*.[8]	53
7.	Present study	20

Table 11: Comparison of intestinal TB causing intestinal obstruction in different studies

TB in percentage		
Harbans *et al*.[6]	1972	17.2
Ramachandran[7]	1982	8.6
Present study	2017–19	14

TB: Tuberculosis

Table 12: Comparison of malignancy causing intestinal obstruction in different studies

Studies	Number of cases	Malignancy (%)
Harbans *et al*.[6]	53	15
Kostner *et al*.	300	53
Present study	50	16

On review of the earlier Indian studies, 10% of intestinal obstructions were related to adhesion and more recent studies in 1982 report 23%. The rise in the incidence of adhesions related obstructions is attributed to increased number of abdominopelvic surgeries. In the Western studies, the adhesion-related obstruction ranges from 40% to 60%. Developing countries like Virginia also reported 40% of the obstructions related to adhesions.

Hernia

In the present series, 10 cases of obstruction are related to hernia (20%) of cases. Among the obstructed hernias, 7 cases are due to obstructed inguinal hernia and the remaining 3 cases are due to obstructed incisional hernia. The comparative analysis of incidence of various studies reported the incidence from 13% to 35%. However, hernia-related obstructions were higher in the early 20th century, but due to early surgical treatment for hernia, the incidence is decreasing.

Tuberculosis

Tuberculosis is one of the common health problems in developing countries. In the present series, tuberculosis found to be a causative factor in 7 cases (14%) in the form of iliocecal tuberculosis with stricture and adhesions.

Our present study corresponds well with the other Indian studies by Harbans *et al*. However, disparity with Western literature is due to the increase in number of tuberculosis patients in the rural population.

Malignancy

Harbans *et al*. reported an incidence of 15% of bowel obstruction. In the present study, 8 cases (16%) presented with acute intestinal obstruction, five cases due to large bowel malignancy and three due to small intestinal malignancy. In large bowel malignancy, two at the descending colon, 2 at the transverse colon, in that 1 due to carcinoma of the stomach infiltrating transverse colon. In small intestine malignancy, 1 at the jejunum and 1 at the ileum due to carcinoid tumor, and the other 1 case is due to ovarian malignancy with intraperitoneal metastasis causing ileal obstruction.

The incidence of large bowel obstruction is higher in Western countries due to various factors, which includes increased aged population, consumption of high animal fat, and lack of fiber diet.

This present study correlates with Harbans *et al*. mentioned above.

Carcinoid Tumors Causing Small Intestine Obstruction

In our study, we found two interesting cause of intestinal obstructions, i.e., carcinoid tumors in jejunum and ileum, one case each.

Lubarsch first described carcinoid tumors in 1888. Oberndorfer used the term "karzinoide" to describe it in 1907. Carcinoid neoplasms are neuroendocrine tumors from enterochromaffin cells present as benign to malignant.

Carcinoid tumors involving the small intestine should, however, be regarded as malignant. They are most commonly found in the ileum, 73% of malignant carcinoids are found at this site, 4% in the jejunum. Small bowel carcinoid tumors usually present with intestinal obstruction, in 40% of cases, metastasis is found at laparotomy. About 4% of patients with small bowel carcinoid tumors develop carcinoid syndrome characterized by flushing, intestinal hypermotility, and bronchospasm.

Volvulus

Sigmoid volvulus is the common cause of large bowel obstruction. In our study, we had two cases of sigmoid volvulus and two cases of small bowel volvulus. Total percentage of volvulus in our study is 8%. Small bowel volvulus is a rare but life-threatening surgical emergency. The etiology may be primary where cause is not known and secondary due to adhesions and bands; Iwuagwu *et al*.,

1999, reported an incidence of 3.5–6.2%. Our study had 4% of small bowel volvulus. This corresponds to the study done by Iwuagwu *et al.*

Operations

All the cases of our study were subjected to surgery. The most common operation performed was resection of ileal segment and end-to-end ileoileal primary anastomosis 34%, release of adhesions and bands 30%. Hernia repair in 20%, hemicolectomy in 8% cases, reduction and untwisting of volvulus in 4%, resection of jejunal segment and end-to-end jejunoileal primary anastomosis 2%, and tube cecostomy in 2% of cases.

CONCLUSION

- Intestinal obstruction remains still an important surgical emergency
- Late presentation of the patient with complications possesses a challenging problem to the surgeons for management
- Patients with a clinical picture of obstruction of the bowel demand vigorous correction of fluid and electrolyte, which can be severe, and life threatening
- Post-operative adhesions are the common cause to produce intestinal obstruction as abdominal and pelvic surgeries are on rise
- X-rays are the first investigation to be done and USG abdomen and pelvis helps in differentiating between adyamic and dynamic obstruction. However, most of the due to gas shadow findings cannot be elicited correctly
- CECT helps in diagnosing the etiology better and gives good results for the management of intestinal obstruction
- Clinical, radiological, and operative findings put together can bring about the best and accurate diagnosis of intestinal obstruction
- Mechanical obstruction is not associated with any specific biochemical marker, which can help the surgeon for differentiate simple obstructions from ischemia or a closed-loop obstruction with impending bowel infarction. Diagnosis of strangulation is still a challenge
- Majority of the patients intestinal obstruction needs surgical relief of obstruction
- Early operation is mandatory to avoid the development of peritonitis and systemic sepsis associated with multisystem organ failure.

SUMMARY

A clinical study of 50 cases of intestinal obstruction was done at Osmania hospital at Hyderabad during November 2017–September 2019.

- Intestinal obstruction whether in small bowel or large bowel occurs nearly in equal ratio in both sexes
- Intestinal obstruction is more common in the age group of 30–60. Large bowel obstruction is more common in patients above 40 years than in younger group
- Small bowel obstruction is more common than large bowel obstruction
- Pain abdomen, vomiting, distension, and constipation are the four cardinal features of intestinal obstruction, present in most of the cases
- Plain X-ray abdomen taken in erect posture is the first most important investigation required for the patients
- Most common etiological factor for intestinal obstruction is adhesions due to post-operative and inflammatory causes.

The advancement in imagiology lead, especially CT scan and with contrast led to increase in accuracy in diagnosing the etiology of intestinal obstruction, has improved a lot; hernia is the second most common cause of intestinal obstruction. Intestinal tuberculosis with stricture is next common cause of intestinal obstruction.

- Malignant obstruction is far more common in large bowel than in small bowel. In large bowel, malignant obstruction is more common on the left side than the right side
- Volvulus is next common cause of intestinal obstruction. Sigmoid volvulus is the most common in large bowel obstruction
- Intravenous fluids and electrolytes, gastrointestinal aspiration, antibiotics, and then appropriate surgery are still the mainstay of the treatment.

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How to cite this article: Sharadha B. Comparison of Imagiology with Operative Findings in a Case of Intestinal Obstruction. Int J Sci Stud 2019;7(9):92-96.

Source of Support: Nil, **Conflicts of Interest:** None declared.