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Relationship Between History/Physical Examination and Radiological Findings with Surgical Findings to Determine the Level of Obstruction

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Author`s Contribution

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ABSTRACT

Objective: To assess the correlation between the clinical findings and radiological findings with surgical findings in patients with intestinal obstruction and the subsequent determination of the level and severity of the obstruction.

Methods: This prospective observational study was done at the general surgery department of JPMC Karachi, during 12-month from January 2022 to December 2022. Adults aged 15 years and above, clinically and radiologically suggestive of intestinal obstruction and underwent surgical intervention were included. Clinical data was collected through thorough physical examinations and detailed medical history reviews. Parameters such as abdominal pain, distension, bowel sounds, and other relevant symptoms were documented. Radiological investigations were analyzed for evidence of obstruction and its location. Patients who undergone surgical intervention, their operative findings were correlated with clinical and radiological findings. Data analysis was done by using SPSS version 26.

Results: Overall, 44 patients were studied with mean age of 38.59 ± 7.77 years, 56.8% were male and 42.3% female. Common clinical findings included inability to pass gas or stool (97.7%), constipation (95.5%), dehydration (93.2%), and tachycardia (93.2%). Radiologically, air-fluid levels with valvulae connivences were most frequent (52.3%). Intra-operatively, omental bands (22.7%) were the most common finding. There was a significant association between clinical symptoms, such as tenderness and anorexia, with specific intraoperative findings (p=0.004). Radiological findings, particularly air-fluid levels, were strongly associated with surgical diagnoses (p=0.001), highlighting their importance in guiding treatment.

Conclusion: Clinical assessments and abdominal X-rays in diagnosing intestinal obstruction, applicable in only a few instances. It emphasizes the superior diagnostic capability of abdominal CT scans, may enhance the surgeon's understanding of the underlying pathology.

Key words: Intestinal obstruction, clinical features, radiology, operative findings

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Introduction

Intestinal obstruction stands as a critical surgical condition necessitating prompt diagnosis and intervention to prevent complications and improve patient outcomes. Its etiology varies not only between nations but also within different regions of a single country.[2] Since the turn of the century, adhesive obstruction has been reported as the most common cause of intestinal obstruction in Western nations, while obstructed hernias continue to be the leading cause in underdeveloped nations.[2,3] It also imposes significant financial strain due to prolonged hospitalization. In instances of ileus with delayed treatment, patients may progress to sepsis, which

represents a critical factor contributing to mortality and morbidity, particularly among the elderly population.[4,5]

Globally, the occurrence and treatment outcomes of intestinal obstruction also differ across nations, influenced by factors such as ethnic composition, age demographics, dietary patterns, urban or rural residence, geographic region, community living standards, symptoms at presentation, duration of hospitalization, existing medical conditions, length of surgical procedures, illness duration, peritonitis presence, and healthcare service accessibility.[6-8] It constitutes roughly 15% of acute abdominal pain cases seen in emergency departments. Potential complications encompass bowel ischemia and perforation.[9] While advancements in diagnostic capabilities have reduced associated morbidity and mortality, diagnosing intestinal obstruction still poses significant surgical challenges.[9]

Typically, patients present with symptoms like nausea, vomiting, intermittent abdominal pain, and cessation of bowel movements and gas passage.[1] However, the intensity of these symptoms may vary depending on the urgency and location of the obstruction. Classic indicators such as distension of the abdomen, resonant sound upon tapping, and increased bowel sounds are often observed.[1] Ultrasound examination of the abdomen serves as an initial assessment for patients experiencing abdominal pain and swelling, boasting high sensitivity for detecting severe obstructions, with rates reaching approximately 85%.[10] When clinical examination and radiographic findings fail to provide a definitive diagnosis, ultrasound is often utilized as a supplementary diagnostic tool.[10] Computed tomography (CT) typically stands out as the preferred and precise diagnostic imaging method for suspected bowel obstructions in most cases.[11]

Other frequently employed imaging techniques encompass plain radiography and contrast imaging. Conversely, ultrasonography and magnetic resonance imaging are less frequently utilized for this purpose.[11] A recent study underscores the pivotal role of imaging in the contemporary assessment and treatment of suspected intestinal obstruction. CT emerges as the preferred imaging method for most patients due to its accessibility, diagnostic precision, and ability to offer comprehensive insights into the underlying cause of obstruction and potential complications.[11] Early recognition of obstruction, prompt diagnosis, proactive preoperative interventions, enhance the patient outcomes. However, in rural regions of low-income countries where advanced imaging resources are often lacking, prioritizing a comprehensive clinical assessment becomes imperative during the initial phases.[12] This approach allows for initial patient assessment, enabling swift referrals to tertiary healthcare facilities for timely intervention aimed at reducing morbidity and mortality. Consequently, this study aims to establish a correlation between clinical findings, radiological assessments, and operative observations in cases of intestinal obstruction. By doing so, it seeks to validate the reliability of clinical features both with and without radiological findings.

Methodology

A prospective observational study was done at the general surgery department of JPMC Karachi. The study was conducted over a 12-month period from January 2022 to December 2023. Adults aged 15 years and above, clinically and radiologically suggestive of intestinal obstruction and underwent surgical intervention were included. All the unwilling patients, pregnant women and patients with cognitive impairment or language barriers were excluded. Informed consent was taken from each case. Patients were assured that participation is voluntary and that refusal to participate not affect their medical care in any way. Clinical data was collected through physical examinations and detailed medical history reviews.

Parameters such as abdominal pain, distension, bowel sounds, and other relevant symptoms were documented. Radiological investigations, including abdominal X-rays and computed tomography (CT) scans, were analyzed for evidence of obstruction, its location, and severity. Patients who underwent surgical intervention, their operative records and findings were documented. Surgical findings of the obstruction identified were correlated with clinical and radiological findings. Data analysis was done by using SPSS version 26.

Results

Overall, 44 patients were studied with mean age of 38.59 ± 7.77 years, 56.8% were male and 42.3% female. The most common clinical findings were inability to pass gas or stool (97.7%), constipation (95.5%), dehydration (93.2%), and tachycardia (93.2%). Frequent symptoms included vomiting/nausea (90.9%), weight loss (50.0%), and hyperactive/absent bowel sounds (56.8%). Radiologically, the most common finding was air-fluid levels with valvulae conniventes (52.3%), with other findings like haustration, dilated cecum, and featureless loops observed in fewer cases. (Table I)

Table I: Clinical and radiological findings of the patients. (n=44)

Variables		N	%
Clinical presentation/ physical examination	Constipation	42	95.5
	Inability to pass gas or stool	43	97.7
	Vomiting/nausea	40	90.9
	Tenderness	15	34.1
	Anorexia	16	36.4
	Weight loss	22	50.0
	Dehydration	41	93.2
	Hyperactive or absent bowel sounds	25	56.8
	Tachycardia	41	93.2
	Tenesmus (straining during bowel movements)	6	13.6
Radiological findings	Valvulae conniventes	2	04.5%
	Haustration, air in cecum	2	04.5%
	Air fluid levels, Haustration, dilated cecum	2	04.5%
	Air fluid levels, valvulae conniventes	23	52.3%
	Air fluid levels, valvulae conniventes, ilium loop	4	09.1%
	Air fluid levels, Haustration	4	09.1%
	Air fluid levels, valvulae conniventes, featureless loop	6	13.6%
	Air fluid levels, valvulae conniventes, ground appearance	1	02.3%

According to intraoperative findings, most common finding was an omental band (22.7%), followed by pus with perforation (6.8%). Adhesions, masses, strictures, and intussusception each accounted for smaller portions, with frequencies ranging from 2.3% to 4.5%. Other less frequent findings included foreign bodies, appendicitis, and hernias. Overall, the data highlights the diverse intraoperative causes of intestinal obstruction, with omental bands being the most prevalent as shown in (Table II)

On the association between clinical findings and intraoperative findings the most common clinical symptoms, such as constipation (95.5%), inability to pass gas or stool (97.7%), and vomiting/nausea (90.9%), were present across various intraoperative diagnoses. Notably, tenderness and anorexia were significantly associated with multiple findings, including omental bands and strictures (p=0.004). Hyperactive or absent bowel sounds and weight loss showed a weaker association with some findings, such as adhesions and masses (p=0.010 and p=0.055, respectively). Other symptoms, like constipation and inability to pass stool, showed no significant association (p=0.387 and p=1.00) as shown in (Table III)

Table II: Intraoperative findings of the patients with intestinal obstruction. (n=44)

Intraoperative findings	N	%
Adhesion at ilium and appendicitis	1	2.3
Adhesions at junction of ilium	2	4.5
Adhesions band	2	4.5
Appendicitis	1	2.3
Appendicular lump and iatrogenic cecal perforation	2	4.5
Constricting mass at level of mid rectum	2	4.5
Foreign body	1	2.3
Hard mass at jejunum	1	2.3
Intraluminal bolus	2	4.5
Intussusception	2	4.5
Intussusception and mass in descending colon	2	4.5
Mass at descending colon	1	2.3
Mass at recto sigmoid	2	4.5
Mass at rectum	1	2.3
Multiple nodules and stricture	2	4.5
Multiple strictures	2	4.5
Omental band	10	22.7
Paraumbilical hernia irreversible	1	2.3
Puss and bowel adhesions	1	2.3
Puss with perforation	3	6.8
Stricture	1	2.3
Stricture at distal ilium	1	2.3
Thicken gut and fibrotic mass at cecum	1	2.3
Total	44	100.0

According to the association between radiological and intraoperative findings the omental bands were associated with a wide range of radiological patterns, including air-fluid levels with valvulae conniventes and featureless loops (p=0.001). Additionally, intussusception was linked to air-fluid levels with valvulae conniventes and ilium loop. Other findings, such as adhesions, strictures, and masses, were associated with less common radiological features. Overall, the statistical significance of the associations (p=0.001) highlights the relevance of radiological findings in guiding operative diagnoses. (Table IV)

Furthermore, there was a statistically significant association was found between radiological and surgical levels (p=0.001), highlighting the relevance of radiological findings in predicting surgical locations. (Table V)

Table III: Association between clinical findings and operative findings. (n=44)

OPERATIVE FINDINGS	Clinical presentation/physical examination															
	Constipation		IGS		Tenderness		Vomiting /nausea		Anorexia		Weight loss		Abdominal distension		Hyperactive or ABS	
Adhesion at ilium and appendicitis	1	0	1	0	0	1	1	0	0	1	0	1	1	0	0	1
Adhesions at junction of ilium	2	0	2	0	0	2	2	0	0	2	0	2	2	0	2	0
Adhesions band	2	0	2	0	0	2	2	0	0	2	0	2	2	0	0	2
Appendicitis	0	1	1	0	1	0	1	0	0	1	0	1	1	0	0	1
Appendicular lump and iatrogenic cecal perforation	2	0	2	0	2	0	2	0	2	0	2	0	2	0	0	2
Constricting mass at level of mid rectum	2	0	2	0	0	2	2	0	2	0	2	0	2	0	2	0
Foreign body	1	0	1	0	0	1	1	0	0	1	0	1	1	0	1	0
Hard mass at jejunum	1	0	1	0	0	1	1	0	0	1	1	0	1	0	0	1
Intraluminal bolus	2	0	2	0	0	2	2	0	0	2	0	2	2	0	2	0
Intussusception	2	0	2	0	0	2	2	0	0	2	0	2	2	0	2	0
Intussusception and mass in descending colon	2	0	2	0	0	2	0	2	2	0	2	0	2	0	2	0
Mass at descending colon	1	0	1	0	0	1	0	1	1	0	1	0	1	0	1	0
Mass at recto sigmoid	2	0	2	0	0	2	2	0	2	0	2	0	2	0	0	2
Mass at rectum	1	0	1	0	0	1	1	0	1	0	1	0	1	0	1	0
Multiple nodules and stricture	2	0	2	0	2	0	2	0	0	2	2	0	2	0	2	0
Multiple strictures	2	0	2	0	2	0	2	0	0	2	2	0	2	0	0	2
Omental band	9	1	9	1	2	8	9	1	0	10	0	10	10	0	9	1
Paraumbilical hernia irreversible	1	0	1	0	0	1	1	0	0	1	0	1	1	0	0	1
Puss and bowel adhesions	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1
Puss with perforation	3	0	3	0	2	1	3	0	3	0	3	0	3	0	0	3
Strictures	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1
Stricture at distal ilium	1	0	1	0	1	0	1	0	0	1	1	0	1	0	1	0
Thicken gut and fibrotic mass at cecum	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1
Total	42	02	43	1	15	29	40	4	16	28	22	22	44	0	25	19
p-value	0.387		1.00		0.004		0.060		0.004		0.055		1.00		0.010	

Table IV: Association between radiological findings and operative findings. (n=44)

OPERATIVE FINDINGS	RADIOLOGICAL FINDINGS									p-value
	VC	Haustration, air in cecum	AFL, Haustration, dilated cecum	AFL, VC	AFL, VC, ilium loop	AFL, Haustration	AFL, VC, FL	AFL, VC, ground appear	Total	
Adhesion at ilium and appendicitis	0	0	0	0	0	0	1	0	1	0.001
Adhesions at junction of ilium	0	0	0	2	0	0	0	0	2	
Adhesions band	0	0	0	2	0	0	0	0	2	
Appendicitis	0	0	0	1	0	0	0	0	1	
Appendicular lump and iatrogenic cecal perforation	0	0	0	0	2	0	0	0	2	
Constricting mass at level of mid rectum	0	2	0	0	0	0	0	0	2	
Foreign body	0	0	0	1	0	0	0	0	1	
Hard mass at jejunum	0	0	0	1	0	0	0	0	1	
Intraluminal bolus	0	0	0	2	0	0	0	0	2	
Intussusception	0	0	0	2	0	0	0	0	2	
Intussusception and mass in descending colon	0	0	2	0	0	0	0	0	2	
Mass at descending colon	0	0	0	0	0	1	0	0	1	
Mass at recto sigmoid	0	0	0	0	0	2	0	0	2	
Mass at rectum	0	0	0	0	0	1	0	0	1	
Multiple nodules and stricture	0	0	0	2	0	0	0	0	2	
Multiple strictures	0	0	0	2	0	0	0	0	2	
Omental band	2	0	0	4	2	0	2	0	10	
Paraumbilical hernia irreversible	0	0	0	1	0	0	0	0	1	
Puss and bowel adhesions	0	0	0	1	0	0	0	0	1	
Puss with perforation	0	0	0	1	0	0	2	0	3	
Strictures	0	0	0	1	0	0	0	0	1	
Stricture at distal ilium	0	0	0	0	0	0	1	0	1	
Thicken gut and fibrotic mass at cecum	0	0	0	0	0	0	0	1	1	
Total	2	2	2	23	4	4	6	1	44	

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Table V: Association of radiological level with surgical level. (n=44)

Radiological level	Surgical level						Total	p-value
	Small bowl	Large bowl	Jejunum	Ileum	Rectum	Anal canal		
Small bowl	12	0	1	5	0	0	18	0.001
	27.3%	0.0%	2.3%	11.4%	0.0%	0.0%	40.9%	
Large bowl	0	3	0	0	2	0	5	
	0.0%	6.8%	0.0%	0.0%	4.5%	0.0%	11.4%	
Descending colon	0	1	0	0	0	0	1	
	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	2.3%	
Jejunum	1	0	0	2	0	0	3	
	2.3%	0.0%	0.0%	4.5%	0.0%	0.0%	6.8%	
Ileum	8	0	0	6	0	0	14	
	18.2%	0.0%	0.0%	13.6%	0.0%	0.0%	31.8%	
Rectum	0	2	0	0	0	0	2	
	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	4.5%	
Anal canal	0	0	0	0	0	1	1	
	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	2.3%	
Total	21	6	1	13	2	1	44	
	47.7%	13.6%	2.3%	29.5%	4.5%	2.3%	100.0%	

Discussion

Intestinal obstruction is a disorder in which the usual movement of digestive materials through the intestines is disrupted, resulting in a variety of symptoms and possible problems. This obstruction can occur in either the small or large intestine (colon) and may be caused by a variety of underlying conditions. Clinical diagnosis, together with radiological diagnosis, is critical in establishing the level of intestinal obstruction and guiding later surgical procedures. This study has been done to evaluate the association between the clinical findings and radiological findings with surgical findings in patients with intestinal obstruction and the subsequent determination of the level and severity of the obstruction, on 44 patients with an overall mean age of 38.59 ± 7.77 years and slightly male predominance 56.8%. In the comparison of this study Jena SS et al[2] shoed a higher mean age of the patients 50.1 years compared to this study, while consistently like this study they found males in majority 57.7% compared to female 42.3%. In the study by Sharif et al[13] also reported that the 59.2% were males and 40.8% were females. According to another study by Jang Y et al[14] also reported that the median age of the patients was 57 years, male predominance 63.6%. Male predominance was observed in all studies, may due to additional risk factors such as smoking and alcohol consumption compared to women, while variation in the mean age of patients between our study and others could be attributed to differences in sample size and selection criteria.

In this study the most common clinical findings were inability to pass gas or stool (97.7%), constipation (95.5%), dehydration (93.2%), and tachycardia (93.2%). Other frequent symptoms included vomiting/nausea (90.9%), weight loss (50.0%), and hyperactive/absent bowel sounds (56.8%). Radiologically, the most common finding was air-fluid levels with valvulae conniventes (52.3%), with other findings like haustration, dilated cecum, and featureless loops observed in fewer cases. In aligns to this study Gogineni JC et al[15] reported that the among 50mcases distension was present in 90%, scars were in 24% of cases, no patients had visible peristalsis, and 12% had visible hernias, on the palpation, abdominal tenderness was in 96% of patients, guarding in 72%, and rigidity in 12%, decreased bowel sounds were in 26%, and absent bowel sounds were in 38% of the cases and radiologically they found multiple air-fluid levels in the small bowel were observed in 80% of cases, while multiple air-fluid levels in the large bowel were seen in 18%.[15] In aligns to this study Vaishnani BV et al[16] also reported that the all of the patients had abdominal pain and tenderness, with 80% experiencing vomiting and 58% reporting constipation, a lump was noted in only 6% of the patients, while rebound tenderness was observed in 18%, guarding in 38%, rigidity in 28%, and distension in 48%. CT scan results revealed free air in 2% of patients, a transition point in 42%, complete obstruction in 28%, a closed loop in 2%, free fluid in 78%, and partial obstruction in 72%.[16] Consistently Islam MR et al[17] also reported that the Abdominal tenderness was in all cases and abdominal pain was the most prevalent symptom 91.3%, followed by vomiting (72.8%), abdominal distension (69.9%), absolute constipation (12.6%), and relative constipation (63.1%).

In this study most common operative finding was an omental band (22.7%), followed by pus with perforation (6.8%). Adhesions, masses, strictures, and intussusception each accounted for smaller portions, with frequencies ranging from 2.3% to 4.5%. Other less

frequent findings included foreign bodies, appendicitis, and hernias. Comparatively Lad V et al[18] reported that the most frequent cause of intestinal obstruction was postoperative adhesions in 44% of cases, followed by Koch's abdomen 30%, malignancy 12% case, while obstructed hernia was 10%, intussusception occurred in 6% cases, and gut malrotation was identified in 1 case. In the study by Zia LA et al[13] reported that the ileus secondary to volvulus was 19.2%, tumor 12.8%, sepsis was 31.2%, Hernias 11.2%, ileus due to ileal gangrene 7.2%, 6.8% fecal impaction, ileal strictures 6.8%, and adhesions were in 3.6% of the cases.

In this study on the association between clinical findings and intraoperative findings the most common clinical symptoms, such as constipation (95.5%), inability to pass gas or stool (97.7%), and vomiting/nausea (90.9%), were present across various intraoperative diagnoses. Notably, tenderness and anorexia were significantly associated with multiple findings, including omental bands and strictures (p=0.004). Hyperactive or absent bowel sounds and weight loss showed a weaker association with some findings, such as adhesions and masses (p=0.010 and p=0.055, respectively). Other symptoms, like constipation and inability to pass stool, showed no significant association (p=0.387 and p=1.00).

In this study on the association between radiological and intraoperative findings the omental bands were associated with a wide range of radiological patterns, including air-fluid levels with valvulae conniventes and featureless loops (p=0.001). Additionally, intussusception was linked to air-fluid levels with valvulae conniventes and ilium loop. Other findings, such as adhesions, strictures, and masses, were associated with less common radiological features. Overall, the statistical significance of the associations (p=0.001) highlights the relevance of radiological findings in guiding operative diagnoses. Furthermore there was a statistically significant association was found between radiological and surgical levels (p=0.001), highlighting the relevance of radiological findings in predicting surgical locations. In aligns this study Madhwapathy NS et al[19] reported that among 84% of patients, the intraoperative findings matched the radiological findings, while in 20% of cases, there was no correlation between these findings. Conssitnely Pundeer S et al[10] also found adhesions and bands found as cause of intestinal obstruction intraoperatively. The most frequent observation on plain abdominal X-rays was dilated gut loops (82%). Ultrasound (USG) of the abdomen had limited diagnostic utility in intestinal obstruction cases, with small bowel obstruction being the most common finding (62%). However, in their study, CT scans of the abdomen provided more detailed information; aiding surgeons in better understanding the underlying pathology.[10] In an other study by Ali MZ et al[20] also demonstrated that the X-rays are more diagnostically useful in cases of hollow viscus perforation and intestinal obstruction, while ultrasonography has a diagnostic rate of 64.3%. Ultrasonography accurately identified acute appendicitis in 74.2% of cases, hollow viscus perforation in 50%, and intestinal obstruction in 60% of patients. When compared to intraoperative findings, clinical accuracy reached 95%. Arora B et al[21] also observed that there was a 89.6% clinical accuracy was, which exceeded radiological accuracy, demonstrating that medical opinion is extremely more accurate for detecting acute abdomen. Furthemore Singh S et al[22] plain X-rays and ultrasonography are valuable tools for diagnosing acute abdominal emergencies. They are cost-effective, non-invasive, fast, reliable, and highly accurate in identifying the exact cause and source of pain in patients with acute abdomen.[22] Nevertheless, considering the significant limitations of the study, such as very limited sample size and possible discrepancies in selecting participants and data collection, the results should be regarded with carefully. The results of the study, while suggestive, do not provide conclusive evidence about the such relationships. Further large investigations with varied patient populations are needed to validate these findings and give more convincing proof. Future subsequent studies could potentially enhance diagnostic and therapeutic techniques, enhancing overall management of intestinal obstruction

Conclusion

Study revealed a significant correlation between clinical, radiological, and surgical findings in patients with intestinal obstruction, aiding in the determination of the level of obstruction. Clinically, inability to pass gas or stool, constipation, dehydration, and vomiting/nausea were the most common symptoms, with tenderness and anorexia significantly linked to omental bands and strictures. Radiologically, air-fluid levels with valvulae conniventes were the most common findings, correlating with intraoperative diagnoses like omental bands and intussusception. However, due to several limitations and the small sample size, the findings cannot be considered conclusive. Therefore, further large-scale studies are recommended to validate the results.

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