



A STUDY OF DYNAMIC SMALL BOWEL OBSTRUCTION IN ADULTS

General Surgery

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ABSTRACT

Aims and Objective: This study assessed the clinical profile, aetiology, different ways of management and outcome of 92 cases of adults presenting with small bowel obstruction at tertiary care centre. **Study Design:** Prospective study **Place and Duration Of Study:** Department of general surgery, Indira Gandhi Government Medical College, Nagpur, Maharashtra, India between Oct 2014 to Nov 2016. **Materials and Methods:** Data was collected on patients admitted with small bowel obstruction and selection was done after they were confirmed on clinical, investigative or explorative findings. **Results:** Out of 114 cases, 92 cases (80.70%) were of small bowel obstruction, Male: Female ratio of 1: 1.04, abdominal pain being commonest symptom. Hyperperistaltic sounds was commonest sign. X-ray abdomen showed positive findings in 77.17%. Adhesion formation was the commonest cause of acute intestinal obstruction in adults in 52.17%. Resection and anastomosis was the most common procedure performed in 36 cases (50%) while adhesiolysis was done in 22 cases (30.55%) **Conclusion:** Patients with no associated co-morbidities and sepsis can undergo primary definitive procedures like resection and anastomosis, adhesiolysis and bassinis repair and anatomical repair. Post-operative mortality is more in old age, late presentation, Koch's abdomen, gangrenous or ischemic bowel, associated septicaemia and anastomotic leakage

KEYWORDS

abdominal tuberculosis, distension, obstruction, adhesions.

INTRODUCTION

Small bowel obstruction is common surgical emergency all over the world. It is defined as obstruction in forward propulsion of the content as obstruction in the intestine due to dynamic causes. It is predisposed by varying underlying anomalies which are difficult to define preoperatively. Though small bowel obstruction can be diagnosed easily, diagnosing underlying cause may be difficult except for external hernia. Bowel obstruction remains one of the most common intra-abdominal problems faced by general surgeons in their practice whether caused by hernia, neoplasm, adhesion or related to biochemical disturbances. Intestinal obstruction of either small or large bowel continues to be a major cause of morbidity and mortality.¹ It is also one of the significant causes of admission to emergency surgical departments.^{2,3} It accounts for approximately 15-20% of common acute surgical emergencies resulting into high morbidity and if timely aid is not provided then mortality sets in. The incidence of this condition has not changed though a different etiological pattern is present from place to place and time to time over the last century. The mode of presentation is same in all but certainly with varied causes. With time, better understanding of pathophysiology, improvement in radiological techniques of diagnosis, high degree of refinement in correction of fluid and electrolyte imbalance, introduction of antibiotics with effective bacteriological control, introduction of techniques in gastrointestinal decompression, new surgical principles as in bowel obstruction, introduction of on table lavage and resection and primary anastomosis, has replaced staged procedures and lessened the number of days in hospital stay which has helped in better management of patients. Improvement in field of anaesthesia has also contributed to lowering the morbidity and mortality. Thus, a multi modal approach has revolutionized our surgical methods. The dictum of never let the sun set or rise in bowel obstruction has made early surgical intervention for intestinal obstruction. This in turn has reduced the incidence of strangulation of bowel, which was major cause of mortality in already ill patient.

MATERIALS AND METHODS

This prospective study on dynamic small bowel obstruction in adults was carried out at Tertiary care centre from Oct 2014 to Nov 2016. Cases of small bowel obstruction selected after they were confirmed on clinical, investigative or explorative findings.

Inclusion Criteria

1. All cases of dynamic small bowel obstruction in adults that is above the age group of 18 years are included in this study
2. Patient with concomitant small and large bowel obstruction

Exclusion Criteria

1. Patient with isolated large bowel obstruction
2. Patient with adynamic small bowel obstruction

METHOD

Consent For Inclusion In Study Was Taken

All patients included in this study were evaluated by taking a proper history, thorough clinical and radiological examination. Most of the patients presented in an emergency situation with few patients in shock. Intravenous fluid replacement was started immediately. Shock was defined as a systolic blood pressure of less than 100 mm of Hg. After primary stabilisation of patient by IV fluids and inotropic supports, patients were stabilized first and then taken for radiological and haematological investigation as per need. Routine investigations like complete blood count, kidney function tests, blood group, HIV and HbsAg status were done in each and every patient. All patients underwent X-ray Chest PA and X-ray Abdomen Erect position. Ultrasonography of abdomen was done in all patients. CT of abdomen and pelvis was done whenever necessary in cases of partial small bowel obstruction. Diagnosis was thus done on the basis of history, clinical findings and radiological investigations and further confirmed intra-operatively. All patients prior to operation underwent a thorough anaesthetic evaluation and all high risk patients were informed accordingly. All patients were explored under general anaesthesia. In cases of obstructed hernia, spinal epidural anaesthesia was given if required.

Statistical Analysis

Statistical analysis done by medical statistician with calculation of incidences, median age and standard deviation.

Operative Procedure

Abdomen opened following standard principles. Midline vertical incision taken in all cases except patients with obstructed hernia in which inguino-scrotal incision was taken and laparotomy was done only if needed. In case of previously operated patients, midline or paramedian scar was excised and then abdomen was entered through virgin peritoneum. After entering the abdominal cavity, entire bowel was examined from D-J junction to I-C junction followed by appendix.

caecum and large bowel and rectum. Pathology was identified in the course and was treated accordingly. Multiple flimsy adhesions if present were separated. In previously operated patients, scar site was examined from within to look for any loop adhered to scar and if present was separated. In patients with adhesive obstruction causing bowel perforation, site and nature of obstruction was identified. Band or single adhesion was excised, multiple adhesions were separated. Then perforation was sutured in double layer after refashioning the edges or resection anastomosis was done depending on size of perforation. In all cases of resection and anastomosis, it was done in double layer with inner layer continuously with vicryl 2-0 or 3-0 R/B, outer layer with silk 2-0 or 3-0R/B intermittently. Bands and adhesions causing obstruction by kinking, angulation, volvulus, closed loops were found and separated. Correctable causes of obstruction like single loop adhesion, loop adhered to previous scar and band adhesion, if separable, were separated. Multiple dense inter-loop adhesions causing clumping of bowel and obstruction were divided with sharp dissection. Care was taken during adhesiolysis of not to open the bowel inadvertently. At the time the bowel had to keep outside the abdomen, it was kept in wet surgical mop or towel. Whenever required, in suspicious of bowel wall ischemia or mesenteric arterial supply compromise or intra-op evidence of unhealthy, non-peristaltic bowel segment, resection and anastomosis of bowel was performed. In case of stricture as a cause of obstruction, stricturoplasty or resection anastomosis was done. In cases, stricture was not passable and was not suspicious due to malignancy, resection anastomosis was the procedure performed. In cases of suspicious malignant or tubercular aetiology, biopsy from omentum, peritoneum, nodules if present over bowel wall and mesenteric lymph nodes, was taken and sent for histopathological examination. Abdominal fluid was sent for cytological examination, ADA level determination and pus sent for culture sensitivity. In cases of superior mesenteric arterial thrombosis, entire gangrenous segment of the bowel was resected and anastomosis was performed in all cases. In case with twisting of bowel around, causing ischemic changes, resection of bowel segment and anastomosis was performed. In obstructed hernia, inguino-scrotal incision was taken. Hernial contents were examined and after confirmation of viability, were reduced within abdominal cavity and Hernia repair was performed. In case of ischemic or gangrenous bowel, resection of segment with anastomosis followed by Hernia repair was performed. After completion of laparotomy, thorough abdominal wash was given with warm normal saline and metronidazole. After performing the operative procedure, abdominal drains were kept and abdomen was closed in layers. Post operatively patients were kept nil by mouth with regular hourly gastric aspiration and IV fluids were given with serum electrolytes monitoring. Patients were given broad spectrum antibiotics to cover gram negative and anaerobic organisms. Conservative management was continued till patients regain bowel activity in the form of appearance of bowel sounds and passing flatus and motions. After that gradually increasing spacing of gastric aspirations, Ryles tube was removed. Post-operatively wound was examined on 4th, 6th, 8th, day and depending on the condition of wound and nature of surgery, if local complication like wound infection was present, managed conservatively. Post-operatively patients were evaluated for complications in the form of infection, burst abdomen, fever, leak from anastomosis, septicemia and other co-morbidities like aspiration pneumonia or deep vein thrombosis. Patients were discharged after removal of stitches and when all associated complications associated with surgery were treated. Mortality was defined as death occurring during hospital stay or within a month of hospitalisation. All patients were followed up after discharge on 2 weeks, 1 month, 3 and 6 months and till the completion of this thesis and will be followed there after also if they have any problem. Complete data in the study is collected and analysed by principal investigator.

RESULTS

Age and Sex Wise Distribution:

Present study of small bowel obstruction was studied in adult patients above 18 years. Total 92 cases were present. Maximum cases were seen in 41-50 years i.e., 21 cases (22.8%). Least affected age groups were older age group, 61-70 years and 71-80 years with 7 cases (7.60%) and 3 cases (3.26%) respectively. Hence out of total 92 patients, 63 cases (68.47%) were <50 years and 29 cases (31.53%) were over 50 years. Oldest patient was of 77 years found during this study.

Table No.1: Age Wise Distribution

AGE IN YEARS	NO. OF PATIENTS	PERCENTAGE(%)
18-20	10	10.87%

21-30	18	19.57%
31-40	14	15.23%
41-50	21	22.82%
51-60	19	20.65%
61-70	07	7.60%
71-80	03	3.26%

Male and female predominance was seen equally with 47 female cases (51.09%) and 45 male cases (48.91%). Male: Female ratio is 1: 1.04

Table No.2: Gender Wise Distribution

GENDER	NO.OF PATIENT	PERCENTAGE
MALE	45	48.91
FEMALE	47	51.09

Time Of Presentation

The present study revealed that though small bowel obstruction is an acute condition, the time at which the patients reported in hospital was more than 48-72 hours. Maximum that is out of the total 92 cases, 44(47.82%) cases reported after 72 hours of onset of complaints and 37(40.22%) cases reported within 48-72 hours. 9 cases (9.79%) reported within 24-48 hours. Only 2(2.17%) cases reported in first 24 hours.

Symptomatology

The present study revealed that 84(91.30%) cases had a complaint of abdominal pain. 79(85.86%) patients had absolute constipation i.e., they had not passed stools and flatus. Abdominal distension(Image no. 01) was seen in 68(73.91%) patients. Nausea and vomiting were also one of the common symptoms observed in 66(71.73%) patients. Thus, abdominal pain was commonest symptom observed followed by constipation abdominal distension, nausea and vomiting, these four formed the major symptoms of this study. Out of total 92 patient 39(42.39%) patient had previous history of surgery. Out of 39 patient 31(79.48%) cases undergone emergency exploratory laparotomy and 8(20.52%) cases undergone elective surgical procedure. 21 cases i.e. (22.82%) had past history of tuberculosis, out of these 21 cases 15(71.42%) had completed treatment of abdominal Kochs developed adhesion later on. 4 patients had concomitant pulmonary Kochs and abdominal Kochs and 2 patients were newly diagnosed as a case of abdominal Kochs during evaluation as a case of subacute intestinal obstruction.



Image No. 01. Case Of Intestinal Obstruction With Abdominal Distension Signs

The present study of acute intestinal obstruction in adults revealed that around 45(48.91%) patients had pallor at the time of presentation. Tachycardia was present in 71(77.17%) patients. 16 (17.39%) were found to be hypotensive (BP<90mm of Hg Systolic) at the time of presentation. Tenderness was present in total 67 (72.82%) cases while distension(Image no. 01) was seen in 68(73.91%)cases. Other symptoms like guarding seen in 33(35.86%) cases and rigidity in 15 cases i.e. (16.30%) cases. Increased bowel sounds were seen in around 78(84.79%) cases. On per rectal examination 66 (71.85%) cases had empty PR on examination,

Investigations

a) Routine Investigations

It included complete hemogram. Kidney function tests, serum Electrolytes were done in all patients preoperatively. HIV and HbsAg were done in all patients pre-operatively. 3 patients were diagnosed to be HIV positive. No HbsAg positive patients were found. Anaemia i.e. haemoglobin<9 gm% requiring transfusion was seen in 27 (29.34%) patients. 06 patients out of 27 i.e. (22.22%) patients were having haemoglobin<7%. TLC and DLC were found raised in 32 (34.78%) patients. Kidney function test was found deranged in 08(8.69%)

patients. Electrolyte abnormalities were found in 28(30.43%) patients.

b) Radiological Investigations

1. X-Ray

X ray Chest PA view, X ray abdomen erect and USG was done in all 92(100%) patients. CT abdomen was done in 24(26.08%) patients who were presented with partial subacute small bowel obstruction diagnosed by ultrasonography and needed confirmation to decide further management. X ray chest PA view showed a COPD like changes in 8(8.69%) patients and 14 (15.21%) patients had lesion suggestive of healed pulmonary Koch's(Image no. 05). 15(16.30 %) patients had mild to moderate pleural collection on x-ray. X ray abdomen erect was done in all cases. The most common finding observed was distended small bowel loops with air fluid levels (Image no. 02) with absent colonic gas in 43(46.73%) patients. String of beads sign seen in 03(3.26%) patients suggestive of high grade obstruction. 16(17.39%) patients were having dilated small bowel loops with prominent valvulae conniventes (Image no. 03). X-rays of 3(3.26%) patients were normal. 9(9.78%) patients had dilated small bowel loops with effacement of valvulae conniventes suggestive of early complete or partial obstruction. Thus, X-ray abdomen erect was found useful in total 71(77.17%) cases.



Image No. 02. Xray Abdomen Erect With Air Fluid Level



Image No. 03. X-ray Of Intestinal Obstruction With Valvulae Conniventes



Image No. 04. X-ray Chest Of Pulmonary Tuberculosis

2. Ultrasonography

Ultrasonography was done in all cases. Most common finding was distended bowel loops, small or large with marked peristalsis in 62(67.39%) cases suggestive of intestinal obstruction from any cause. 12(13.04%) cases had distended loops with no peristaltic movements, more likely because of adynamic obstruction or vascular occlusion causing bowel ischemia. Herniation of bowel loops through abnormal abdominal defect with obstructive features was observed in 18(19.56%) patients.

3. Contrast Enhanced Computed Tomography Scan (CECT)

In selected cases of subacute intestinal obstruction, after x-ray and sonography, computed tomography scan with intravenous and / or oral contrast enhancement was done for confirmation of diagnosis. Those cases in which nature of obstruction could not be judged on x-ray or sonography were subjected for CECT scan. Also, in cases where cause of acute abdomen was in doubt to be either perforation or obstruction, CECT scan was done. 3 patients with requirement of CECT scan as per abovementioned details could not be subjected to that due to deranged creatinine levels. CECT scan was thus done in total 23(25%) cases. 9 (39.13%) out of 23 patients who undergone CECT during course of management found to have dilatation of proximal small bowel with multiple air fluid level(Image no. 05). 7(30.43%) cases out of 23 found to have dilated small bowels with extensive mesenteric lymphadenopathy with ascites. 3 cases (13.05%) found to extensive gangrenous small bowel suggestive of mesenteric ischaemia. 3 cases (13.05%) found to have dilated proximal small bowel with zone of transition at mid ileum and distally near to ileocecal junction. 1 case had normal finding on CECT abdomen.

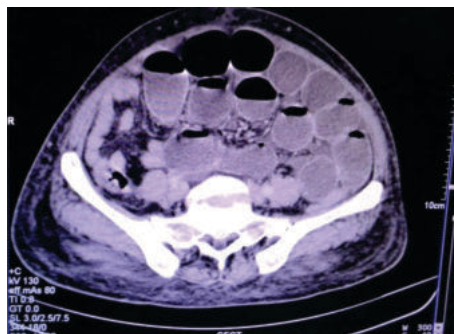


Image No. 05. CT Image In Case Of Intestinal Obstruction

Following co-morbid conditions were identified in certain patients. Total 36(39.13%) cases were found to have hypertension (BP= >140/90mm of Hg). 28(30.43%) cases were diagnosed cases of hypertension and 8(8.69%) showed raised blood pressure in casualty, 15(16.30%) were diagnosed for diabetes mellitus out of which 10(10.86%) were on regular OHA(Oral Hypoglycaemic Agents) treatment, 3(3.26%) were on injectable insulin preparation and 2(2.17%) were not taking any treatment. 8(8.69%) had bronchial asthma or COPD. 34(36.95%) patients were chronic smokers. 36(39.13%) were chronic tobacco chewers. 28(30.43%) patients were chronic alcoholic. 14(15.21%) patient were diagnosed cases of pulmonary tuberculosis out of which 11(11.95%) completed the Cat I AKT, 3(3.26%) were undergoing Cat IAKT.

Aetiology

Various factors were assessed for the cause of obstruction. The summary of factors noticed in our study is as follow:

- 1) Adhesions:** Total 51 patients with various types of adhesions causing bowel obstruction were identified. 39 out of 51(76.47%) were operated previously for various causes. 30 were explored on emergency basis while 09 had undergone elective abdominal operations previously. 5 patients with abdominal Koch's had developed adhesion during course of treatment leading to small bowel obstruction. 1 case of appendicular perforation, 3 cases of typhoid ileal perforation and 3 cases with pyoperitoneum due to infective aetiology had developed adhesions causing obstruction presently.
- 2) Hernia:** Obstructed hernia (Image no. 06) was second most common cause identified leading to obstructive symptoms in our study accounting for 18 cases(19.56%) cases. 12 cases had only obstructive features while 5 cases had strangulated hernia with tachycardia and hypotension with generalized tenderness, guarding and rigidity all over abdomen

- 3) **Tuberculosis:** Abdominal tuberculosis known as Koch's abdomen leading to intestinal obstruction was 3rd in the etiological factor list accounting for 16 cases (17.39 %) patients. 7 out of 16 patients had adhesion, 6 patients had stricture and 3 cases had adherent small bowel to each other within s/o cocoon abdomen (Image no. 07).
- 4) **Midgut Volvulus:** Midgut volvulus was seen in 1 (1.08%) patient leading to small bowel obstruction.
- 5) **Arterial Thrombosis:** Thrombosis of superior mesenteric artery, complete or partial leading to gangrene of a bowel segment supplied leading to obstruction was seen in 3 (3.26%) cases. All three cases got admitted to hospital in shock with feeble pulse with tachycardia and hypotension with generalized tenderness, rigidity and guarding all over abdomen. All three patients had raised leucocyte count and were found to be in sepsis.
- 6) **Stricture:** 3 patients out of 92 had h/o recurrent intestinal obstruction with previous history of admission to hospital with similar complaints suggestive of partial small bowel obstruction who undergone CECT abdomen and finding suggestive of small bowel stricture involving jejunum in 1 case 2 cases involving ileum with no previous history of pulmonary or abdominal Kochs. (Image no. 08)



Image No. 06. Case Of Obstructed Incisional Hernia

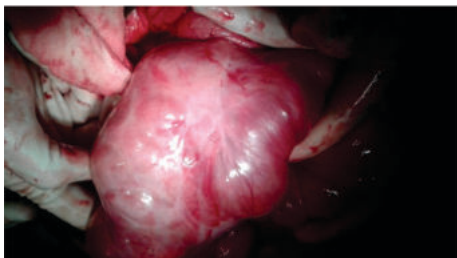


Image No. 07. Case Of Intestinal Obstruction With Abdominal Kochs (Cocoon Abdomen)



Image No. 08. Case Of Intestinal Obstruction With Stricture

Management

Out of total 92 patient admitted to hospital as a case small bowel obstruction in adults 72 patients (78.26%) were managed by doing surgical intervention and 20 patients were managed conservatively.

Nonoperative Management

Those patients admitted as a case of subacute intestinal obstruction in this study were kept nil by mouth. Ryles Tube insertion with Ryles tube aspiration done 4 hourly, Intravenous fluid given according to body weight requirement, 4 hourly abdominal girth taken and monitoring of abdominal girth done. Intravenous antibiotics given having broad spectrum coverage of gram negative, gram positive and anaerobic bacteria. Investigations like Complete blood count, serum electrolytes and serum creatinine done. Radiological investigations like Xray abdomen standing repeated after 24 hours, If patient symptoms doesn't

relieved during course of conservative management and no improvement in Xray found patient may subjected to CECT abdomen to rule out causes and to decide further line of management. If patients Ryles Tube aspiration decreases and patient passes flatus and motion having good bowel sound present in all quadrants patient put on oral sips and accordingly as patient attains normal bowel motility patient advised to take full orally. Most of the patients managed conservatively were previously operated and were suspected cases of abdominal Kochs.

Intra-op Findings

After stabilization and proper written informed consent which may require colostomy or ileostomy and explaining the risks of surgery and anaesthesia, patients were explored under general anaesthesia with or without epidural line. A standard midline laparotomy was done. The laparotomy revealed following intra operative features.

- a) **Adhesions:** Total 42 patients showed intra-op various types of adhesions. 31 out of 42 (73.80%) cases were operated previously either by midline incision for laparotomy or lower transverse incision in previous LSCS cases. 9 out of 31 (29.03%) patients had single loop or band adhesions. 2 out of 9 had ischemic ileal segment. Multiple dense adhesions were present in 18 out of 31 (58.06%) patients operated for various causes previously. 7 out of 18 had gangrenous small bowel loops. 3 (10%) cases had stricture formation in addition to multiple adhesions. 1 patient (3.44%) had small bowel volvulus with band adhesions causing bowel ischemia. Hence total 10 out of 31 patients had ischemic or gangrenous bowel. Four patients had dense adhesions with clumping of short bowel loops which on adhesiolysis revealed cheesy granules in between and associated thickened omentum. All 4 cases were diagnosed as abdominal tuberculosis later. 1 case of appendicular perforation, 3 cases of typhoid ileal perforation and 3 cases with pyoperitoneum due to infective aetiology had developed adhesions causing obstruction.
- b) **Hernia:** Total 18 cases had obstructed hernia. In 4 cases of left sided obstructed inguinal hernia omentum were the contents. 06 cases of right sided obstructed inguinal hernia had small bowel loops with thickened omental adhesions as obstructing cause. 4 cases of obstructed incisional hernia 4 cases of obstructed paraumbilical hernia had ileal and jejunal loop with dense omental adhesion as a content. Total 5 cases had strangulated hernia (Image no. 10) for which resection of small bowel segment with anastomosis done.
- c) **Strictures:** Apart from 3 cases of adhesion with strictures, total 5 patients had only stricture as a cause of obstruction. 4 had terminal ileal stricture with proximal dilatation out of which all were diagnosed to be of tubercular origin.
- d) **Volvulus:** 1 case had midgut volvulus with twisting of mesentery were managed by untwisting of mesentery.
- e) **Gangrene:** Apart from various causes with gangrenous or ischemic bowel as stated above, 3 other cases showed only gangrenous bowel loops without adhesions or peritonitis. 2 cases had gangrenous distal jejunum and ileum up to 40 cm proximal to IC junction suggestive of superior mesenteric artery thrombosis. 1 case had gangrenous terminal ileum, up to 20 cm proximal to IC junction. (Image no. 9)
- f) **Koch's Abdomen:** 3 cases on exploration showed omentum covering entire bowel loops with plastered abdomen. Bowel loops were found densely adherent to each other with clumping with extensive mesenteric lymphadenopathy with ascites found. In these cases, extensive peritoneal tubercles were found for which omental biopsy were taken for further pathological and microbiological examination. Peritoneal fluid was sent for adenosine deaminase examination and polymerase chain reaction analysis



Image No. 9. Case Of Intestinal Obstruction With Gangrenous Bowel



Image No. 10. Case Of Strangulated Inguinal Hernia

Management

Those patients admitted as a case of subacute intestinal obstruction in this study were kept nil by mouth. Ryles Tube insertion with Ryles tube aspiration done 4 hourly, Intravenous fluid given according to body weight requirement, 4 hourly abdominal girth taken and monitoring of abdominal girth done. Intravenous antibiotics given having broad spectrum coverage of gram negative, gram positive and anaerobic bacteria. Investigations like Complete blood count, serum electrolytes and serum creatinine done. Radiological investigations like Xray abdomen standing repeated after 24 hours, if patient symptoms doesn't relieved during course of conservative management and no improvement in Xray found patient may subjected to CECT abdomen to rule out causes and to decide further line of management. If patients Ryles Tube aspiration decreases and patient passes flatus and motion having good bowel sound present in all quadrants patient put on oral sips and accordingly as patient attains normal bowel motility patient advised to take full orally. Most of the patients managed conservatively were previously operated and were suspected cases of abdominal Kochs.

Operative Procedure

After identifying the cause of obstruction, intra-operative decisions were taken as per the cause of obstruction, condition of bowel loops, pre-operative condition of patient and other associated morbidity likely to affect prognosis of the patients. Procedures performed are as mentioned below:

a) Adhesiolysis

Out of 72 cases who requires surgical intervention during this study, in total 31(43.05%) cases adhesiolysis was done. Out of these 31 cases in 17 cases (23.61%) simple adhesiolysis was done. In 9 cases(12.50%) due to dense adhesion and ischaemic changes in bowel adhesiolysis along with resection anastomosis done. In 5 (6.94%) cases which were previously operated and initially managed conservatively electively laparoscopic adhesiolysis done. Out of these 5 cases 3 cases having recurrent subacute intestinal obstruction for which electively laparoscopic adhesiolysis done. Single loop/band adhesions: simple adhesiolysis with cutting of band relieved the obstruction. Multiple dense adhesions: Flimsy adhesions were separated easily followed by adhesiolysis of dense adhesions up to the level which relieves obstruction was done. Five Cases were managed conservatively initially but develop recurrent intestinal obstruction during follow-up for which laparoscopic adhesiolysis. In 3 cases of Koch's abdomen with cocoon formation, adhesiolysis was done. Appendicular perforation: Appendicectomy with adhesiolysis carried out.

Pyoperitoneum with adhesions: Adhesiolysis was the procedure performed.



Image No. 11. Separated Bowel Loops After Adhesiolysis

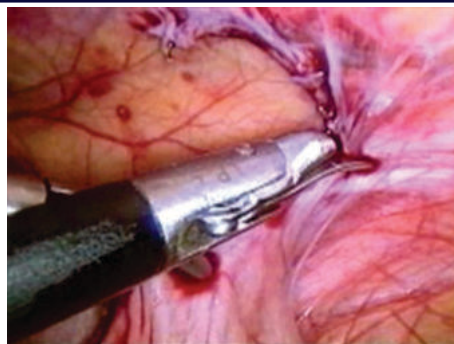


Image No. 12. Laparoscopic Images Of Adhesiolysis

b) Resection and Anastomosis

During this study out of 72 cases who requires surgical intervention 20 cases(27.78%) requires resection of bowel and anastomosis due to various causes. In cases of adhesions from any cause, 9 cases had ischemic small bowel loops in which resection of the involved segment followed by anastomosis was done. In cases with adhesion with stricture formation, adhesiolysis with resection of stricture with anastomosis was carried out. Out of 5 cases of strangulated hernia, in all 5 cases involving small bowel loops, resection of ischemic bowel followed by anastomosis was done. Hernia repair was done in all 5 cases. Superior mesenteric artery thrombosis causing gangrenous changes in bowel loops was found in 3 cases. 2 cases had gangrenous distal jejunum and ileum up to 40 cm proximal to IC junction. Complete resection of involved segment followed by jejunoileal anastomosis was carried out. 1 case had gangrenous terminal ileum, up to 20 cm proximal to IC junction for which resection of gangrenous ileal segment and ileo-ileal anastomosis done. In 2 cases of ileal stricture around 30 and 50 cm proximal to IC junction and 1 case of jejunal stricture resection of stricture segment and anastomosis done. In 1 case of abdominal Kochs with multiple adhesion with two terminal ileal strictures, adhesiolysis with right hemicolectomy with ileo-transverse anastomosis with proximal ileostomy done. In 2 cases suspicious of being Koch's abdomen, ileal stricture was found and stricturoplasty done. In 3 cases with multiple ileal perforations found after adhesiolysis, resection of involved segment with ileo-ileal anastomosis was done. In 1 case diversion Proximal loop ileostomy was also performed. In 7 cases(9.72%) of obstructed inguinal hernia, with omentum and healthy small bowel loop found as a content reposition of contents of sac along with that hernia repair done, in 5 cases(6.94%) of obstructed inguinal hernia with strangulated bowels resection anastomosis with hernia repair done. In 6 cases(8.34%) of obstructed incisional hernia with omentum and healthy ileal loop as a content anatomical hernia repair was done. In 1 case(1.39%) of midgut volvulus untwisting of bowel done and in 2 case (2.78%) along with resection anastomosis proximal loop ileostomy was done

All patients were assessed for post-operative complications. Total 28(38.88%) developed complications. 19(67.85%) out of 28 developed more than one complication. Rest 9(32.14%) developed only one complication. Total 21(29.16%) patients developed minor wound infection in the form of pus discharge. These wounds were taken care by local wound care in the form of daily dressings and as suture site having no discharge suture removed and patients were discharged. 08(11.12%) patients developed anastomotic leak out of which 3 patients expired before re-exploration, in rest 5 cases revision resection anastomosis done and patients were having good recovery and patients were later on discharge from hospital. 3 cases with leakage of anastomosis in SMA thrombosis, anastomotic site had developed gangrene in which re-exploration done and all 3 cases expired later 2 patients having anastomotic leakage, 1 with ileo-ileal anastomosis done in multiple adhesion with stricture and other with ileo-ileal anastomosis done in strangulated hernia in which revision anastomosis with proximal diversion ileostomy was created. Both these patients were having good recovery and were in regular follow up and ileostomy closure was done after 6 weeks. 4 cases(5.56%) patients developed burst abdomen out of which, 2 were re-sutured, 2 were managed conservatively, 1 out of these 2 cases re-sutured expired in postoperative period. 18(25.00%) patients developed septicaemia. Out of this, 11 already had pre-operative septicaemia. Out of 18 patient with septicaemia 2 patient expired during postoperative period. 1 patient put on ventilatory support postoperatively and expired during course of treatment due to ARDS.

Length Of Stay At Hospital

Overall hospital stays of patients excluding dead was >2weeks in 48 (58.54%) cases. 25(30.48%) discharged in 2nd week while 9 (10.98%) patients were fit for discharge in 1st week only, all of them were operated for obstructed hernia.

Mortality

Mortality was defined as death of a patient occurring during the hospital stay or within a month of hospitalization. Present study revealed death of 10(10.86%) patients. 08(11.12%) patients developed anastomotic leak out of which 3 patients expired before re-exploration. 3 cases with leakage of anastomosis in SMA thrombosis, anastomotic site had developed gangrene in which re-exploration done and all 3 cases expired later on during postoperative period. 4(5.56%) patients developed burst abdomen out of which, 2 were re-sutured, 2 were managed conservatively 1 of these expired in postoperative period. 18(25.00%) patients developed septicaemia. Out of this, 11 already had pre-operative septicaemia. Out of 18 patient with septicaemia 2 patient expired during postoperative period. 1 patient put on ventilatory support postoperatively and expired during course of treatment due to ARDS.

Follow Up

Patients were kept in ward for an average of 2 weeks. Sutures were removed after 14 days in normal healthy wounds. In infected patients they were removed late after local control of infection. The follow up was carried out at 2 weeks, 1 month, 3 and 6 months from the date of discharge. Out of total 82(89.14%) patients survived; 11(13.14%) patients were lost at the end of follow up of 1 month. Patients with diagnosed Koch's abdomen were started on AKT as per RNTCP schedule. The patients treated with diverting enterostomies in non-malignant obstructions were planned for stoma closure after confirming the patency with distal loopogram, at the end of 6 weeks. In 2 cases with proximal diversion loop ileostomy, closure was done after 6 weeks. Three cases during follow up develop recurrent intestinal obstruction, these cases with history of previous surgery were initially managed conservatively which later on requires surgical intervention and electively laparoscopic adhesiolysis was done.

DISCUSSION

This study of dynamic small bowel obstruction in adults comprises of total 92 cases of small bowel obstruction. In this study total 114 cases of intestinal obstruction were found out of which 92 cases i.e. (80.70%) were found to have small bowel obstruction and 22 cases i.e. (19.30%) have large bowel obstruction. The findings of present study are thus consistent with the studies conducted by Markogiannakis H et al⁴ with incidence of small bowel obstruction higher than large bowel obstruction among total cases of acute intestinal obstruction. Present study of small bowel obstruction was carried out in patients above 18 years of age and shows similar results in accordance with studies by Harban Singh et al¹, Souvik Hossein et al⁵ and Thampi, Thukka et al⁷ with 18-50 years as most common affected age group with incidence of around 60%. Male: Female ratio in present study is 1: 1.04. The findings of present study are thus consistent to studies by Naveen and Mukherjee⁶. Also in all studies except Markogiannakis H et al⁴ male sex is predominantly affected. Though in present study the incidence of male: female is nearly same, but worldwide male preponderance is seen. According to studies conducted by MC Entee G and Pender D et al⁹, Biarjet al¹⁰, Markogiannakis H et al⁴, Naveen, Mukherjee et al⁶, and Thampi, Thukka et al⁷ adhesions are found to be the most common cause of obstruction followed by obstructed hernias as 2nd most common cause which is also consistent with present study. According to M Ohene, Yeboah et al¹¹ obstructed hernias are most common cause followed by adhesion formation. The rise in the adhesions related obstructions in developing countries is attributed to increased number of abdomino-pelvic surgeries. In a study by Biarjet al¹⁰ incidence of adhesions is 53% with postoperative adhesions causing obstruction is 74.9% which is comparable to the finding in present study of 76.47%. In a study by M Ohene et al¹¹ 130 out of 176 cases (73.86%) had post-operative adhesions as a cause of obstruction which is similar to present study with 76.47% incidence. According to Markogiannakis H et al⁴ adhesions are more common in small bowel obstruction (64.8%). As per incidence in a study by Naveen, Mukherjee et al⁶ tuberculosis involves 14% cases. This finding in present study is comparable to present study as incidence of tuberculosis is 17.39%. The present study is comparable with Biarjet al¹⁰ and Markogiannakis H et al⁴. The present study revealed that 84(91.30%) cases had a complaint of abdominal pain. 79(85.86%) patients had constipation. Abdominal distension was seen in 68(73.91%) patients. Nausea and

vomiting were also one of the common symptoms observed in 66(71.73%) patients. Abdominal pain was commonest symptom observed followed by constipation, abdominal distension, nausea and vomiting, these four formed the major symptoms of this study. Findings of present study are consistent with studies by Naveen, Mukherjee et al⁶, Thampi, Thukka et al⁷ in terms of abdominal pain affecting most of the patients. Findings of abdominal distention and vomiting are consistent to the studies by Markogiannakis H et al⁴, Souvik, Hossein et al⁵ as one of the major signs and symptoms. Overall varied presentation of symptoms can be seen in different studies. The most common X-ray finding observed was distended small bowel loops with air fluid levels with absent colonic gas in 43(46.73%) patients. String of bead sign seen in 03 i.e., (3.26%) patients suggestive of high grade obstruction. X-ray abdomen erect was found useful in total 71(77.17%) cases. Most common finding was distended bowel loops, small or large with marked peristalsis in 68(73.92%) cases suggestive of intestinal obstruction from any cause. Those cases with partial small bowel obstruction in which nature of obstruction could not be judged on x-ray or sonography were subjected for CECT scan. results of present study in terms of Plain abdominal radiography is consistent to study of Musoke I and Kawooyan G et al¹³, Jang TB and Schindler D et al¹⁴ and Daneshmands and Hedley CG et al¹². In this present study ultrasonography abdomen is sensitive investigation in establishing the diagnosis in 93.48% cases and this study is consistent to the study conducted by Musoke I and Kawooyan G et al¹³, Jang TB and Schindler D et al¹⁴. Also, Daneshmands and Hedley CG et al¹², Lassandro F¹⁷ reported that CECT abdomen is the most sensitive in diagnosing bowel obstruction and also malignant obstructions, site of obstruction and ischemia of bowel loops are better appreciated on CECT scan of abdomen, these findings are consistent with the present study. Thus, it can be seen that X-ray abdomen standing, USG abdomen and as and when CT abdomen done in case of partial subacute small bowel obstruction are valuable investigation modalities in diagnosis of small bowel obstruction. Out of total 92 cases of small bowel obstruction 72 cases i.e. (78.26%) were managed by doing surgical intervention whereas 20 cases i.e. (21.74%) were managed conservatively. Hence findings of present study of small bowel obstruction regarding operative or conservative management is consistent to findings of study conducted by Markogiannakis H et al⁴ and Souvik, Hossein et al⁵. The findings of present study regarding operative and conservative management have vast difference and disparity comparing the study conducted by Donald Menzies et al¹⁶ and Osama M.H. Khalil en et al¹⁵ because in their study they included only cases of postoperative adhesive small bowel obstruction. So in their studies it can be seen that obstruction occurring due to postoperative adhesion can be managed conservatively without operative management in large majority of cases. In study by Osama M.H. Khalil en et al¹⁵ cases of postoperative adhesive small bowel obstruction were managed either laparoscopically or conservatively, as this was the comparative study between laparoscopic or conservative management of cases of postoperative adhesive small bowel obstruction. As done in studies by M Ohene and Yeboah et al¹¹, Souvik, Hossein et al⁵, Thampi, Thukka et al⁷, Naveen and Mukherjee et al⁶ resection with anastomosis for ischemic bowel, hernia repair for obstructed hernia and untwisting of bowel for volvulus are the standard procedures performed in present study. Due to varied causes of obstruction in different studies type of operative procedure done varies, though present study is comparable with Naveen and Mukherjee et al⁶. Septicaemia and wound infection were the major complication developed in study by Souvik, Hossein et al⁵ and finding are comparable to our study. Naveen, Mukherjee et al⁶ showed wound infection as most common complication, finding comparable to our study. Overall complication of this present study is comparable to the findings of Naveen, Mukherjee et al⁶ with overall complication of 35%. The higher rate is explained by existing pre-operative septicaemia, associated comorbidities and late presentation (>48 hours later) of maximum number of patients. As many cases presented late, rate of complication causing postoperative morbidity are more in this present study. Present study findings of 10.86% overall mortality are comparable to studies by Thampi, Thukka et al⁷ and Souvik, Hossein et al⁵ and M Ohene, yeboah et al¹¹. The present study is comparable to Naveen, Mukherjee et al⁶. Present study is also comparable in terms of anastomotic leakage as a cause of mortality with study by M Ohene and Yeboah et al¹¹. Present study shows that late presentation (>48-72 hours), pre-operative and post-operative septicaemia, gangrenous and ischemic bowel, and anastomotic leakage are one of the major factors leading to mortality in small bowel obstruction. Also, as our institute is a tertiary referral centre most of the cases which could not be managed at primary or secondary level are

referred and hence have delayed presentation which affects mortality. Also, most of them are from poor socio-economic status with high prevalence of malnutrition and associated comorbidities leads to higher mortality.

CONCLUSION

Based on the present study of small bowel obstruction, it can be concluded that small bowel obstruction is more common than large bowel obstruction and is nearly equal in occurrence among both males and females. The most common symptoms include abdominal pain, constipation, and distension, while common signs are increased bowel sounds, tachycardia, and tenderness. Adhesion formation is the most common cause of small bowel obstruction in adults, with post-operative adhesion formation and Koch's abdomen being the leading causes among the adhesions. X-ray, ultrasound, and CT scans of the abdomen are valuable diagnostic tools, along with supportive investigations like haematological and biochemical tests. Treatment options for patients without associated co-morbidities and sepsis include resection and anastomosis, adhesiolysis, and anatomical repair. Post-operative complications are common, particularly due to late presentation, associated co-morbidities, unprepared bowel, and bacterial contamination. Minor wound infections are prevalent, but septicaemia can be life-threatening and affects post-operative prognosis. Post-operative mortality is higher in older age, late presentation, Koch's abdomen, gangrenous or ischemic bowel, associated septicaemia, and anastomotic leakage. Overall, early diagnosis, appropriate management, and careful monitoring of potential complications are crucial for better outcomes in small bowel obstruction cases.

Competing Interests- Authors have declared that no competing interests exist

Consent- Obtained from all subjects with maintained confidentiality.

Ethical Approval - As per Institutional Ethical committee, Indira Gandhi government medical college Nagpur.

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