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ORIGINAL RESEARCH

Etiology and Management of Post-operative Adhesive Intestinal Obstruction- A cross sectional study

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Abstract

Background: Abdominal adhesions are bands of scar tissue (fibrous or fibrofatty), most often occurring as a complication of previous abdominal surgery. Post operative adhesions represents an unresolved and leading causes of intestinal obstruction. With the advent and development in the field of Laparoscopic surgery and enhanced rehabilitation after surgery have led to decrease in surgical morbidity. This study was conducted to evaluate patients with suspected adhesive intestinal obstruction and assess the role of imaging and outcome of different management approaches as well as the complications related to them.

Methods: Following approval by the Institutional Ethics Committee, Rohilkhand Medical College and Hospital, Bareilly; 88 patients were selected for the study and patient characteristics, previous surgical history, intraoperative findings and post-operative complications were recorded

Results: The post-surgical adhesions were more common (65%) in patients with history of single surgery in past. Majority of the patients (62.13%) underwent surgery for bowel pathology. (22.27%) patients were treated conservatively, (53.40%) patients underwent open adhesiolysis and (23.86%) of the patients were managed Laparoscopically. The average hospital stay ranged from (7-18 days). The post operative complications were more in Open adhesiolysis compared with the Laparoscopic approach.

Conclusion: Although there are several retrospective series, and meta-analyses comparing open approach to laparoscopy, there are no prospective, randomized studies. This study concludes that though laparotomy is associated with increased chances of further adhesion formation and recurrent small bowel obstruction therefore conversion to open surgeries when required must be done and should not be considered as failure.

Keywords: Adhesive small bowel obstruction, Open Adhesiolysis, Laparoscopic Adhesiolysis

Introduction

Adhesive intestinal obstruction is one of the leading causes of surgical emergencies that require immediate intervention.[1] The abdominal adhesions are vascularized and innervated connective tissue bands formed between the peritoneum, the intestinal loops and abdominal wall. These adhesions are a significant source of impaired organ functioning, bowel obstruction, decreased fertility, difficult re-operation and possibly chronic pain.[2]

In developed countries adhesions accounts for approximately 65% to 75% of cases of small bowel obstruction. Post-operative adhesions developing between small bowel loops are referred to as enteroenteric or interloop adhesions. Adhesions between the bowel and peritoneal surfaces (usually anterior peritoneum) are referred to as enteroparietal adhesions and those between bowel and visceral organs are referred to as enterovisceral adhesions. Patients with enteroparietal type adhesion often present with chronic pain, while enteroenteric adhesions may be responsible for obstructive symptoms.[3]

There are certain surgical procedures such as appendectomies, cholecystectomies, colorectal surgery and pelvic surgery, that tend to be particularly associated with formation of adhesions.[4] The studies have shown incidence of adhesions following abdominal and pelvic surgery in ranges of 55-94% with an average of 80-85% of all patients undergoing these surgical procedures. These adhesions are likely a result of injury from incision, electrocoagulation, trauma, sutures, foreign body damaging the parietal and visceral peritoneum resulting in aberrant peritoneal healing and scars.[5] Recognition of the various types of adhesions can impact clinical and surgical management.

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The increased prevalence of imaging with multidetector CT technology offering higher resolution and isotropic imaging with multiplanar reconstructions has resulted in better visualization of adhesions. The anterior peritoneum is a common location for enteroparietal adhesions, leading to distortion of bowel loops and visceral organ surfaces with tethering of these structures, which can indicate underlying adhesions.[6]

The management of small bowel obstruction has recently been reviewed. The initial management of adhesive intestinal obstruction is conservatively done with fluid and electrolytes. Adhesiolysis is undertaken either laparoscopically or by laparotomy when clinically indicated.[7]

Better understanding of pathophysiology of peritoneal fibrinolytic activity and adhesiogenesis has led to development of various antiadhesion agents. Their roles are in activating fibrinolysis, hampering coagulation, diminishing the inflammatory response, inhibiting collagen synthesis, or creating a barrier between adjacent wound surfaces. Many researchers have sought to develop effective anti-adhesion barriers by mitigating the disadvantages of existing anti-adhesion barriers and maximizing their advantages by controlling the degradation behaviours of the barriers.[8] The use of various adhesion barriers as adjuvants for peritoneal administration has been extensively studied however the data to support their uses is insufficient.

The lack of evidence despite substantial work in development of various agents in recent years and ongoing debate about the management modalities in our scenario, the current study was thus undertaken to assess and manage patients with post- operative adhesive intestinal obstruction.

Material and Methods

This was a cross sectional study conducted from 1st November 2020 to 31st October 2021 in Department of General Surgery, Rohilkhand Medical College and Hospital, Bareilly. A total of 88 patients who visited the outpatient department and emergency of Rohilkhand Medical College with previous history of abdominal and pelvic surgery and clinical findings of intestinal obstruction were included in the study. The patients after complete radiological examination and laboratory investigation were managed using the algorithm. The patients which improved on conservative management were continued on the same. The patients which after initial conservative management were not resolved were considered for operative intervention either Open adhesiolysis or Laparoscopic adhesiolysis.

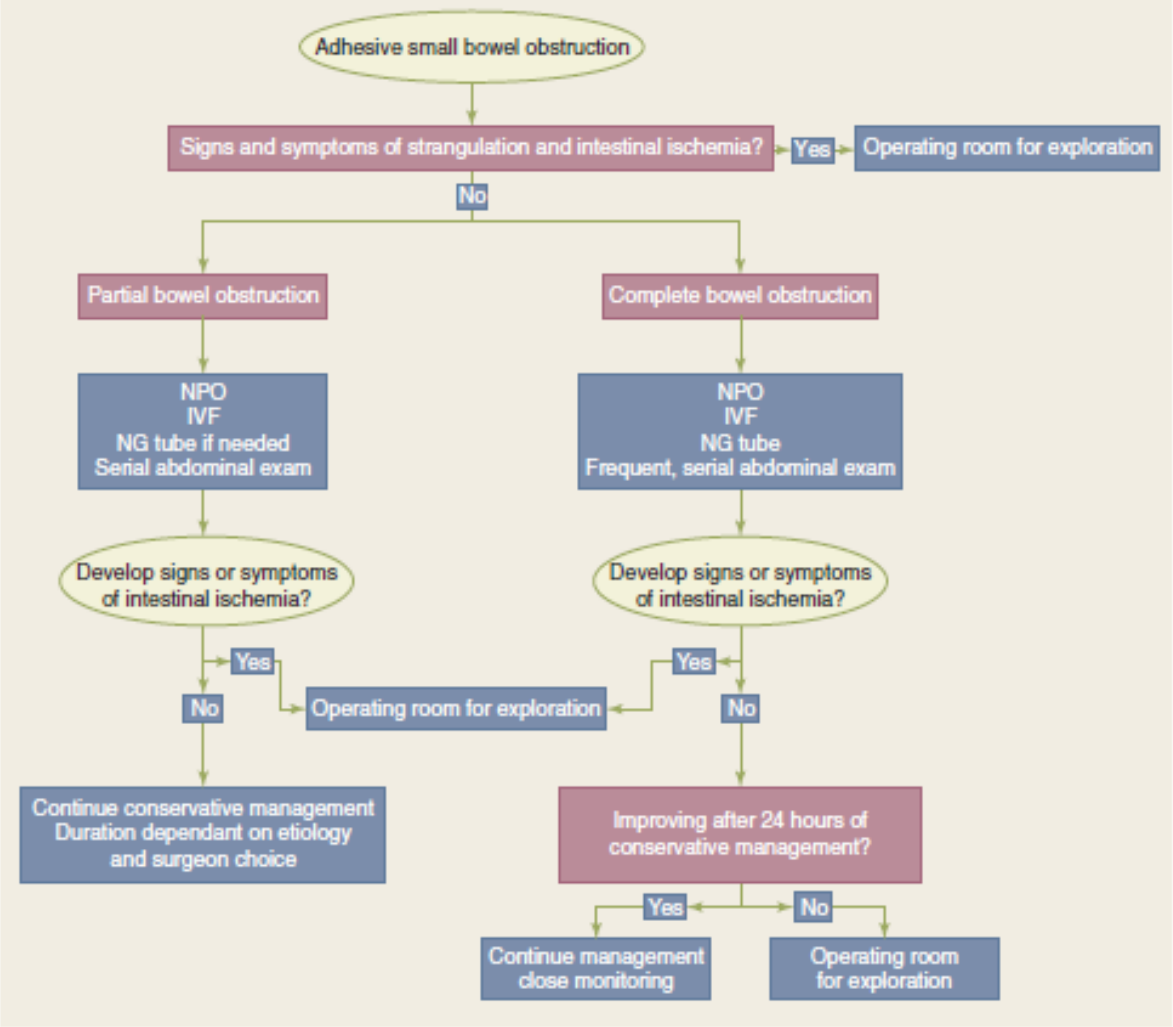

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Figure 1[9]: Algorithim for management of adhesive intestinal obstruction

Inclusion Criteria

1. Patients between the age of 18 and 65 presenting with features suggestive of intestinal obstruction with previous history of abdominopelvic surgery
2. ASA Class 1 and Class 2

Exclusion Criteria

1. Fresh cases of intestinal obstruction with previous history of gynaecological surgery.
2. Patients with previous history of abdominal malignancy, history of radiation treatment for abdominal malignancy.
3. ASA Class 3 and Class 4

Results

The study population consisted of members ranging from 15 years upto 65 years of age. Amongst this study population it was observed that majority of patients, 21 off 88 (25%) belonged between the ages of 21-30 years presented with post operative adhesions and patient while patients between the ages of 31-40 were the second most common (20 of 88) group. Patients between the ages of 51-60 had less incidence of post operative adhesions.

Table 1: Age wise distribution

Age Group	N	%
15-20	10	11.36
21-30	22	25
31-40	20	22.7
41-50	17	19.31
51-60	8	9.09
61-65	11	12.5
TOTAL	88	100
MEDIAN+STD. DEV.	38.047±14.417	

Amongst the study population, 44.3% (39 off 88) were females and 55.68 % (49 off 88) were males. The ratio of total male with total female patient was 1.25:1. In the present study pain abdomen was the most common complain present in 100% of the patient which was followed with abdominal distension in 44.31% cases and vomiting in 28.40% patients.

Table 2: Number of previous surgery

Number	Frequency	%	Mean	SD	P-value
1	58	65.9	0.44	0.57	**0.019****
>2	30	34.09			
TOTAL	88	100			

Majority of patients 65.9% had previous history of single surgery whereas 34.09 % patient had history of 2 or more surgeries in the past in the present study.

Table 3: Nature of previous surgery

Type	Frequency	Mean	SD	t-value
Open		44.479	7.323	5.081
• **Elective**	47			
• **Emergency**	22			
• **Elective + Emergency**	17			
Laparoscopic				
• **Diagnostic Lap**	1			
• **Diagnostic + Emergency**	1			
Total	88			

In the present study it was observed that 47 out of 88 patient previously underwent an open elective surgery whereas 22 out of 88 patients underwent open emergency surgery in the past and 17 out of 88 patients had undergone both open elective and emergency surgery in the past, whereas 3 out of 88 patient underwent Elective and Emergency diagnostic laparoscopy previously.

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Table 4: Scar of previous surgery

Approach	Frequency	%	Mean	S.D	p-value
MIDLINE					
1. UPPER	18	20.45			
2. LOWER	6	6.81			
3. COMPLETE	44	50			
RIGHT SUBCOSTAL	4	4.54			
PARAMEDIAN	1	1.13			
GRIDIRON	3	3.40	0.41	0.71	**0.001****
LAPAROSCOPIC PORT	8	9.09			
TOTAL	88	100			

A total of 68 patient had previously been operated via midline open approach, 4 patients had history of open cholecystectomy via right subcostal approach, 3 out of 88 patients were previously operated for appendix via gridiron incision and 8 out of 88 patients underwent Laparoscopic surgery.

Table 5: Previous surgeries

Type	Frequency	%
OPEN		
• ABDOMINAL LUMPS*	9	10.22
• PYOPERITONEUM	10	11.36
• HOLLOW VISCOUS PERFORATION	8	9.09
• SAIO	8	9.09
• STRICTURE	4	4.54
• ABDOMINAL TRAUMA	3	3.40
• ABDOMINAL KOCHS	4	4.54
• HEPATOBILIARY*	8	9.09
• DIVERSION STOMA	2	2.27
• APPENDIX	3	3.40
• STOMA CLOSURE	4	4.54
• VENTRAL HERNIA		
1. INCISIONAL	7	7.95
2. PARAUMBILICAL	4	4.54
• LARGE BOWEL	3	3.40
LAPAROSCOPIC		
• APPENDECTOMY	3	3.40
• ABDOMINAL KOCHS	3	3.40
• SAIO	3	3.40
• OTHERS	1	1.13
TOTAL	88	100

Table 6: Abdominal lumps*

Intra- Abdomin (9)	Frequency	Percentage
Mesenteric Cyst	3	33.33%
Desmoid tumor	2	22.22%
Enteric duplication cyst	1	11.11%
Retroperitoneal teratoma	1	11.11%
DJ lymphoma	1	11.11%
Encapsulating Peritoneal Sclerosis	1	11.11%
TOTAL	9	100%

In the present study it was observed that Open Exploration for Pyoperitoneum in the past was the most common surgical procedure (11.36%) followed by Intra-abdominal lump (10.22%) which included mesenteric cyst (3), Desmoid tumor (2), DJ Lymphoma (1), Enteric duplication cyst (1), Retroperitoneal teratoma (1), Encapsulating peritoneal sclerosis (1), Hollow viscous perforation(9.09%) and Subacute Intestinal Obstruction (9.09%), Hepatobiliary surgery (9.09%)* which included Choledochojejunostomy(1) and Choledochoduodenostomy (1), Ventral hernia repair (12.49%), Benign Stricture (3.40%), Abdominal KOCH, Stoma closure (4.54%) resulting in post operative adhesions. 11.33 % patients underwent Laparoscopic surgery previously for Appendix (3.40%), Abdominal tuberculosis (3.40%), and Sub- Acute Intestinal Obstruction (3.40%)

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In this study we also observed that 18.88% of patient presented within the duration 6 months of previous surgery. However maximum number of patients (26.1 3%) presented within a period of 6 months to 1 year post surgery and only 1.13% patient presented after 10 years and was found to have intraabdominal adhesion.

Table 7: Imaging and Radiological Findings

Radiological Findings	Frequency	Percentage
ERECT ABDOMEN XRAY (88)		
○ Multiple air fluid levels		
▪ >3 air fluid levels	76	86.36%
▪ Step ladder pattern	48	54.54%
○ Dilated bowel loops	52	59.09%
○ Others	10	11.36%
USG whole abdomen (88)		
• Free fluid	88	100%
• Aperistaltic bowel loops	80	90.90%
• Dilated bowel loops >2.5 cm	68	77.27%
• Others	20	22.72%
CT whole abdomen (68)		
• Focal clustering	34	50%
• Angulation of bowel loops	8	11.76%
• Asymmetric thickness	48	70.58%
• Vascular crowding	52	76.47%
• Loss of fat planes	60	88.23%

In our study on 88 patients Erect abdominal X-Ray and USG whole abdomen was done in 88 patients and GI contrast study was used in 7.95% patients while CT scan of the abdomen was done in 77.27% of the patients. In our study we had observed following findings in our radiological investigations.

In patients who had Erect abdominal X-ray we observed that 86.36 % patients had multiple air fluids levels (>3), 54.54% had step ladder pattern and 59.09% patients had dilated loops of bowel while in 10% percent of the patients we also observed fecal loaded bowel loops and calcificifations.

In the abdominal ultrasound of 88 patients it was observed that 100% of patients had presence of free fluid in the peritoneal cavity, 90.90% patients had aperistaltic bowel loops and 77.27% patients had dilated loops of bowel >2.5 cm while in 20% of the patients had other incidental findings.

68 out of 88 patients who underwent CT scan of the abdomen we observed the following findings of focal clustering of bowel loops in 50% of the patients, 70.58% patients had asymmetric thickening of the bowel wall, 76.47% had vascular crowding in proximity to bowel loops and 88.23% patients had loss of fat planes between the adjacent visceral organs.

Table 8: Management of the study population

	Frequency	%
CONSERVATIVE	20	22.72
OPEN SURGERY		
• **ELECTIVE**	3	3.40
• **EMERGENCY**	44	50
LAPAROSCOPIC	21	23.86
TOTAL	88	100

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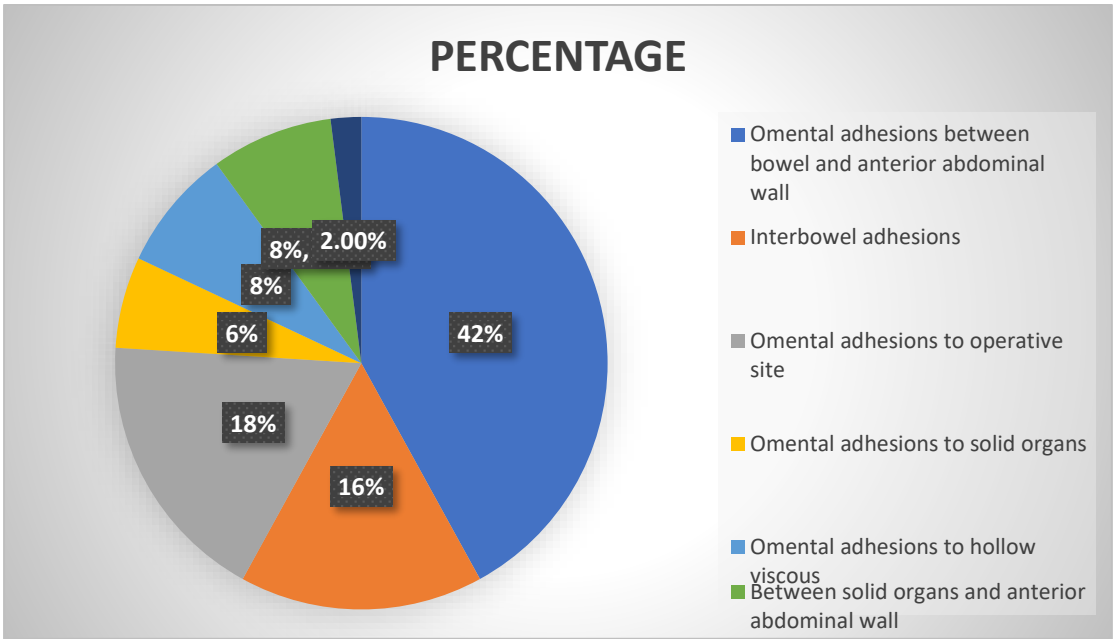

Figure 1: Type of adhesions

Table 9: Duration of hospital stay

No of days	Frequency	%	Mean	t-value	Mean Difference	S.D
<7	24	27.27	7	26.028	2.5143	0.86381
7-12	31	35.22	2.4			
13-18	24	27.27	20.6			
>18	9	10.221	7			
TOTAL	88	100	100.0			

Table 10: Comparison of complications in open vs laparoscopic adhesiolysis

	OPEN (47)	LAPAROSCOPIC (21)
INTRAOPERATIVE • MESENTERIC INJURY • SEROSAL TEAR • BOWEL PERFORATION SOLID ORGAN/VASCULAR INJURY	 6(12.76%) 13(27.67%) 3(6.38%) 2(4.2%	 3 (14.2%) 1(4.76%) 0 1(4.76%)
POST OPERATIVE 1. EARLY VENOUS THROMBOEMBOLISM • CATHETER RELATED • PNEUMONIA/EFFUSION • WOUND INFECTION • SEPSIS ENTEROCUTANEOUS FISTULA 2. LATE INCISIONAL HERNIA	 0 5 (10.6%) 6(12.76% 34(72.34%) 3(6.38%) 2(4.25%) 4(8.5%)	 0 0 0 0 0 0

In open adhesiolysis serosal tear was the most common intraoperative complication in 27.67% (13 out of 47 patients), iatrogenic injury was noted in 12.76% (6 out of 47 patients), bowel perforation was seen in 6.38% (3 out of 47 patients) for which primary repair was done. Postoperatively Wound infection was the most common complication in open surgery with 72.34% (34 out of 47 patients), Pneumonia/effusion was seen in 12.76% (6 out of 47 patients), catheter related infections were seen in 10.6% (5 out of 47 patients), Incisional hernia was seen as a late postoperative complication in 8.5% (4 out of 47 patients), enterocutaneous fistula developed in 4.5% (2 out of 47) and sepsis was seen in 6.38% (3 out of 47 patients). In laparoscopic adhesiolysis, Iatrogenic injury to mesentery and vessel was most common complication with laparoscopy 14.2% (3 out of 21 patients), serosal tear was seen in 4.76% (1 out of 21 patients), solid organ/ vascular injury was seen in was seen in 4.76% (1 out of 21 patients)

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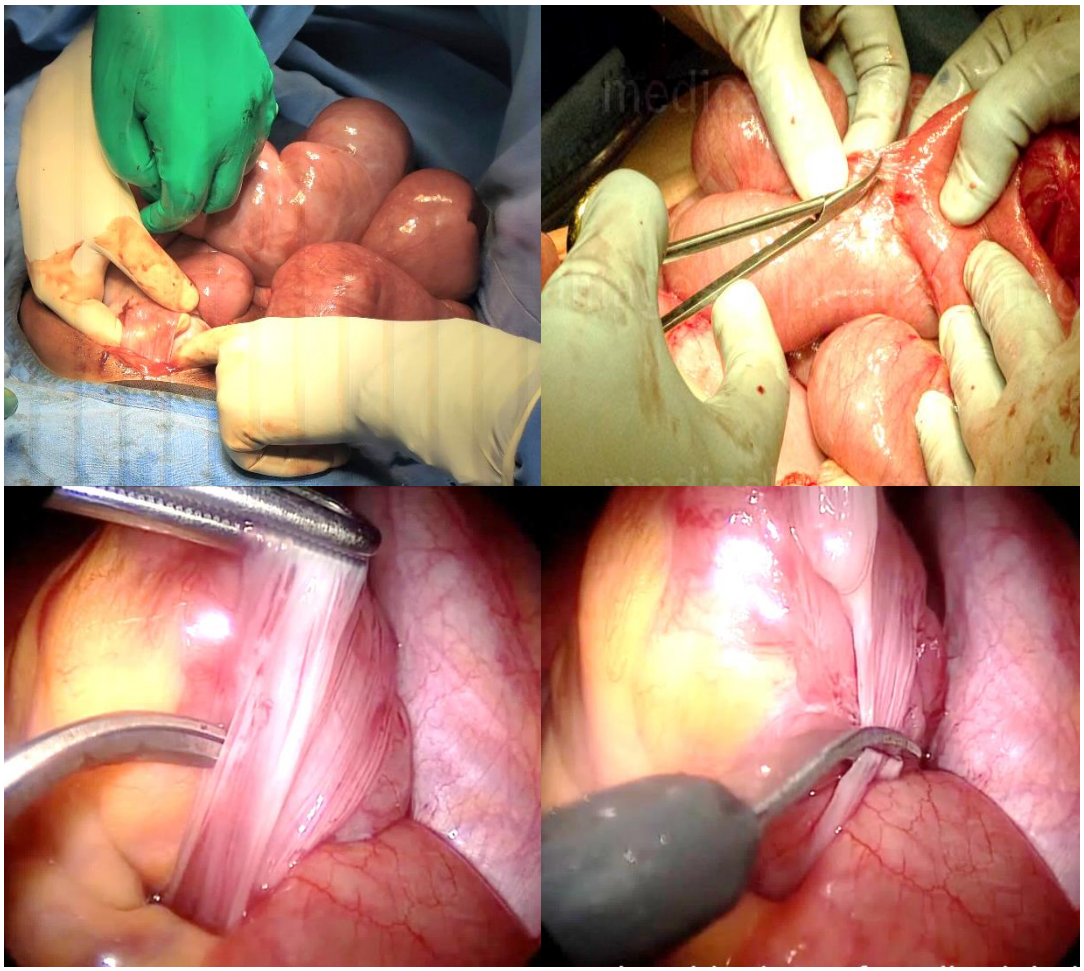

Figure: A. Fibrous interbowel adhesions B. open adhesiolysis C. Laparoscopic Adhesiolysis D.

Discussion

In this study we found that maximum incidence of adhesive intestinal obstruction occurred in 4th decade (31-40 years) of which males contributed to almost 55.68% of total cases. The ratio between the male and female patients was 1.25:1. Similar findings were also observed in the studies conducted by Peter Sykes et al[10] (65.38%), S lliyas et al (71.73%). Adhikari et al[11]. In their study observe the mean age of incidnec to be 55.5 years.

In study conducted by RT Kuremu et al[12] on 93 patients, it was observed that median age range was 30-39 years and male to female ratio was 1.6:1

Pain in abdomen was the commonest complain present in 100% of patients followed by distension72.71% of the patients and vomiting was seen in 42.03% in our study group. In the study conducted by RT Kuremu et al[12] 85% patient presented with pain, 75% presented with bilious vomiting and 50% patients presented with abdominal distension.

Mitra et al[14] in their study on post operative adhesions in 40 patients observed that the predominant presenting complain was abdominal pain in 100% of patients followed by vomiting (60%) and abdominal distension(37.5%)

S Bethsy Priscell et al(2017)[15]; in their study on 100 patients observed that in 26% of the patients adhesions was the cause of obstruction which was the 2nd most common and 94% patients presented with pain abdomen, 69% presented with vomiting and 58% presented with constipation and 52% patients had abdominal distension. Similar findings were also noted in the studies conducted by Khan et al[96] and Adhikari et al.[11]

In the present study out of 88 patients majority of patients (77%) has midline scar mark from previous surgery followed by laparoscopic scar (10%) which were comparable with the study done by Sisodia V et al[16] where they observed 63.33% (19 out of 30) patients had midline scar from previous surgery followed by Gridiron type which contributed 10% and 1 patient with Pfannenstiel incision scar mark. With respect to abdominal scar the p value was found to be insignificant as patients with all types of surgery had equal chances of developing scar

In this study while interpreting the nature and type of previous surgery it was observed that out of 88 subjects 48(54.54%) subjects had elective nature of previous surgery followed by 23(26.13%) subjects who underwent emergency surgery previously and 17(19.31%) subjects had emergency as well as elective surgery

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Mitra et al[14] in their study reported that 67.5% of patient previously underwent emergency surgery and 22.5% patient had previous history of elective surgery in the past

Sisodia V et al[16] int their study observed a statistically significant difference($p<0.5$) between the patients who previously underwent emergency surgery had higher incidence of adhesions as compared to those who underwent elective surgery in the past. However the incidence was lower in patients who underwent both elective and emergency surgery in the past.

Similar findings were observed in the Bologna Guidelines where the incidence of adhesions was estimated to be as high as 94-95% after emergency laparotomy. The findings in our study were comparable with studies conducted by S.lliyas (71.73%) and Tanphiphat(63.32%)

In the present study 26.13 % patient presented within 1 year of surgery with intestinal obstruction, 23.86 presented after 2 years of surgery and 18.88% presented within 6 months of surgery. Mitra et al[14] in their study observed that 30% of patients presented after 5 years of previous surgery, while 22.5% presented within 6 months.

It was observed that there was no co-relation between the time since last surgery and onset of signs and symptoms of obstruction, which had a wide range of 6 months to.10 years. James Shalkow et al. reported that the onset of symptoms ranged between 2 days to 10 years.

In the present study it was observed that on Erect abdominal X-Ray 86.36 % patients had multiple air fluids levels(>3), 54.54% had step ladder pattern and 59.09% patients had dilated loops of bowel while in 10% percent of the patients we also observed fecal loaded bowel loops and calcificifations. In the study conducted by S. Bethsy Priscella et al[15] multiple air fluid levels were seen in 81% patients and in 52% patients dilated bowel loops were seen.

In the study conducted by Mitra et al[14], majority of patients (60%) of post operative adhesive intestinal obstruction had multiple air fluid level in their erect abdominal X-ray, 27.5% had their X-ray within normal limits, 10% had dilated bowel loops and 2.5% had single air fluid level. Majority of patients (55%) in the USG had mild dilatation of bowel loops, 10% had grossly dilated bowel loops, 10% had normal calibre with sluggish peristalsis while 17.5% had a normal ultrasound and 5% had only probe tenderness

Most of the patients in the current study were previously operated for small bowel pathology followed by ventral hernia repair (12.49%) and Hepatobiliary surgeries (9.09%) via open approach. However, the patient who underwent laparoscopic surgery previously constituted only 11.33%. Similar findings were observed in the studies conducted by Mitra et al[14] where 48.48% patients were operated for perforation peritonitis followed by appendectomy (18.18%), 6% underwent laparotomy for abdominal trauma in small bowel obstruction accounted for 21.09%.

Sisodia V et al[16] in their study observed that the patients undergoing GI surgery had greater incidence of adhesions than that of patients with previous history of Hepatobiliary surgery and found the difference to be statistically insignificant ($P>0.05$)

In the presented study 22.72% of the patients were managed conservatively by keeping them nil per oral and using nasogastric tube wile maintaining adequate hydration. 53.40% of patient were managed with open adhesiolysis and 22.86 % were managed with Laparoscopic adhesiolysis.

In 47.72 % of patients Grade I i.e, flimsy adhesions were noted between and omentum and the anterior abdominal wall and between the bowel loops and abdominal wall intraoperatively, 36.36% had Grade II i.e, fibrous bands between the bowel loops and mesentery mostly. 11.36% had Grade III adhesions.

Mitra et al[14] in their study observed that 88% of the patients had a single adhesion causing obstruction during the laparoscopy. 37.5% had grade II adhesions which were lysed using the scissors. Only a few patient had multiple grades of adhesion and use of cautery was minimised to reduce the chances of bowel injury.

Intraoperatively in our study during the open adhesiolysis 27.67 % patients had serosal tear, 6.38% had perforation which was primarily repaired intraoperatively and only 4.2% had solid organ and vascular injury whereas only 18.96% of patient had iatrogenic injury during laparoscopic adhesiolysis and 4.76% had solid organ and vascular injury.

In the present study mean duration of hospital stay was between 4 day and up to 24 days with an average of 7-12 days. In the study conducted by T. Hackenberg et al[17] the postoperative stay was on an average 6 days in laparoscopic group and 10 days in patients who underwent open adhesiolysis.

The average period for keeping patients nil by mouth and with nasogastric tube was compared and it was found to be significantly less in patients who had underwent laparoscopic adhesiolysis.

Post operatively 72.34% of the patient undergoing open adhesiolysis developed surgical site infection, 10.6% developed catheter related infections, 12.76% developed effusion and atelactasis, while 6.38% patient landed into early sepsis which prolonged the hospital stay and cost. 4.25 % patient developed enterocutaneous fistula which were managed conservatively and were followed up later. 8.5% patient presented with incisional hernia. Souvik et al[18] in their study reported SSI in almost 16% patients followed by septicemia in 8% cases and respiratory infections in 4% and an overall mortality rate of 7.35%.

Conclusion

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The incidence of iatrogenic bowel injury was less in open adhesiolysis as compared to laparoscopic approach whereas the patient undergoing laparoscopic adhesiolysis had less postoperative complications and short duration of hospital stay.

The most common post operative complications following open adhesiolysis was surgical site infection. Intraoperatively proper surgical techniques and measures were taken to reduce the risk of of injury to peritoneal surface to prevent the recurrence of adhesions.

Though laparotomy is associated with increased chances of further adhesion formation and recurrent small bowel obstruction therefore conversion to open surgeries when required must be done and should not be considered as failure.

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