Discussion
DISCUSSION

The study included 20 patients of different Non-Acute Intestinal pathologies who were registered between August 2002 to August 2003 in the Department of Surgery, MLB Medical College, Jhansi.

The age of these 20 patients ranged from 13-60 years and most of the non-acute intestinal pathologies occurred in 10-25 years range (55%).

Of all the non-acute intestinal pathologies, include in the study, Recurrent Appendicitis was the commonest (40%), followed by SAIO (30%) due to bands and adhesions, Appendicular lump (15%), Ileocaecal tuberculosis (10%) and Rectal prolapse (5%).

All the cases were subjected to therapeutic laparoscopic interventions, with the aim to compare and analyse the results with other contemporary studies and to assess their outcome in terms of -

1) Feasibility
2) Alternative feasibility of assisted laparoscopic intervention
3) Operative time
4) Length of hospital stay
5) Complications

Laparoscopic Adhesiolysis for SAIO

Adhesions may be defined as abnormal attachments between tissues and organs. The development of acquired adhesions is a generalized phenomenon in response to trauma to the peritoneum, the surface of which is extremely delicate, as its cells are very loosely interconnected. The trauma may be inflammatory or surgical, and may include, exposure to infection or to intestinal contents, ischemia, irritation from foreign materials such as sutures, guage particles, or glove dusting powder. Adhesion formation generally requires coaptation of two traumatised mesothelial surfaces, or of one surface and the omentum.

Intestinal obstruction is the most severe consequence of adhesions 30-41% of patient who require abdominal reoperation have adhesion related intestinal obstruction (74). For small bowel obstruction, the proportion rises to 65-75%(74).
Clinical consequences of adhesions are not confined to the gut, adhesions are a leading cause of secondary infertility in women 20% (76) and can cause substantial abdominal and pelvic pain. In addition to this morbidity and workload, post-surgical adhesions waste surgical time and operating theatre resources and increase the difficulty and risk of surgical re-entry.

Laparoscopic adhesiolysis is the oldest laparoscopic procedure used in digestive surgery. It is a safe and effective management option for patients with prior abdominal surgery with chronic abdominal pain or recurrent bowel obstruction not attributed to other intra-abdominal pathology. Enthusiasm for elective adhesiolysis is often limited by the concern about subsequent scar tissue formation following major laparotomy. Many studies suggest a lower incidence of scar tissue formation following laparoscopic procedures. Therefore, it is possible that laparoscopic adhesiolysis would result in immediate resolution of symptoms attributed to intra-abdominal adhesions, with less likelihood of subsequent recurrence of adhesions and symptoms.

Emergency adhesiolysis is a difficult procedure, as shown by the high conversion rate in the literature (35.9%). The emergency context brings together several factors that are unfavourable for laparoscopy (74):

- A reduced work area because of the distension of the small bowel
- An increased risk of perforation of the distended fragile bowel with the Veress needle or trocar, during the dissection, or even while manipulating the bowel loops
- A greater risk of incomplete adhesiolysis
- Difficulty in assessing the small bowel, especially its color
- The risk of releasing bacteria while manipulating stagnant intestinal fluid, and
- The possibility of a prolonged procedure

For these reasons, it is preferred to perform laparoscopy shortly after resolution of the acute obstruction. The same disorder can then be treated under much more favourable conditions, with an adequate work area and a relatively normal (neither distended nor fragile) small bowel.
Generally, complications associated with the creation of a pneumoperitoneum and the insertion of the first trocar during laparoscopic surgery are infrequent, with a reported incidence ranging from 0.008% to 1.53% (77). The risk of visceral injury during these maneuvers is substantially greater in patients who have previously undergone laparotomic surgery, owing to possible presence of abdominal wall adhesions. Visceral injury, more over, though less dramatic than vascular damage, is associated with late morbidity and mortality related to the fact that it is often identified only when clinically frank sepsis has become apparent.

To reduce the incidences of these complications, several authors (78, 79) have proposed procedures involving the performance of a minilaparotomy for the introduction of the first trocar and the creation of the pneumoperitoneum.

The location of the ports used in the laparoscopic adhesiolysis of small bowel is highly variable.

The inadvertent intestinal injury (missed enterotomy) is the Achilles heel of laparoscopic surgery of the small bowel (75).

In the present study, 6 patients presented with features suggestive of Sub Acute Intestinal Obstruction who were subjected to therapeutic laparoscopic intervention. Among 6 patients, only one had an omental band as the cause while rest five had adhesions of the small bowel.

For all the cases, patient was placed supine on the table in our study as in other studies by Schenk et al (11) and Ellis H et al (12) Three ports were used – first supraumbilical 10 mm port, second 10 mm in left iliac fossa and 3rd port 5mm in suprapubic midline.

Our study recorded the mean operative time (in minutes) for laparoscopic adhesiolysis as 23 min which was comparable to open approach – 25 minutes by the same surgical team. Studies by Schenk et al (11) and Ellis H et al (12) reported the mean operative time as 37 minutes and 42 minutes respectively.

Average duration of hospital stay was 4 days for laparoscopic adhesiolysis in our study as against 7 days in the study by Schenk et al (11). There were no significant complications in the intra operative or post operative period while Ellis et al reported 1 case of missed enterotomy out of 21 cases.
In conclusion, laparoscopic adhesiolysis for chronic abdominal pain, recurrent bowel obstruction, or both, is safe and effective and results in minimal peri-operative morbidity.

**Laparoscopic Assisted Right Hemicolecctiony**

Laparoscopic surgery has had a major impact on colorectal surgery. Laparoscopic colorectal surgery is feasible, efficacious, safe and of benefit to the patient. In case of laparoscopically assisted procedures, most benefits of minimally invasive surgery are retained, and some of the disadvantages such as lengthy operating time and increased equipment costs are lessened. This technique is simpler and thus more readily accessible to a larger proportion of colorectal surgeons. In case of totally laparoscopic procedures, intracorporeal resection and anastomosis using presently available equipments is complex, lengthy and requires particular aptitude and training. Performing resection and anastomosis extracorporeally also minimizes the risk of peritoneal faecal contamination. It is important to emphasise that conversion rate is not synonymous with failure; rather it should be recognised as the application of a sound surgical judgement.

The question is no longer about the feasibility but rather about the advisability of laparoscopic colectomy. Dire consequences may result from resection. Injuries to the small bowel and ureters exist (63). Anastomotic leak, post operative bowel obstruction and port site herniation have been noted (64, 65). Conversely, reports of port site implants after laparoscopic procedures in patients with intraabdominal malignancies are the source of increasing concern and the most important factor that precludes wide use of laparoscopy in the treatment of malignant diseases.

This phenomenon of port-site metastasis, in cases of laparoscopic procedures for colorectal cancers is particularly concerning for four reasons. First, not all recurrences have been at the port through which the specimen was retrieved. Second, the number of reported cases undoubtedly represents only the
'tip of the iceberg' Third, the phenomenon is not exclusive to advanced lesions. Fourth, the problem does not seem to be unique to laparoscopic colectomy. Even diagnostic laparoscopy has been associated with port site metastasis in the literature. Cook and Detin found an 11% port site recurrence rate in a series of 46 patients who underwent laparoscopy for different malignancies (66).

Pathogenesis of port site metastasis can be explained in different ways. Development of port site metastasis requires the presence of viable cancer cells at the trocar site. This situation is very likely to occur when a malignant tumor is removed through a narrow incision of the abdominal wall. Such direct implantation of tumor cells has been confirmed by literature review (67). It has been suggested that growth of cancer cells at port sites is augmented by insufflating gas into peritoneal cavity because of turbulence. In an experimental study in rats using colon cancer suspensions, Bouvy et al. (68) recorded the absence of tumor deposits at trocar sites when gasless laparoscopy was used while tumor growth was found at trocar sites after CO2 insufflation. Another hypothesis is that CO2 has a stimulating effect on tumor growth. Jacobi et al. (69) assessed the in vitro growth of colon adenocarcinoma exposing the tumor cells to either CO2 or helium. Tumor growth was significantly less when helium was insufflated. Another concern about gas insufflation during laparoscopy for cancer is leakage of gas through and around the trocars. This leakage might result in an accumulation of tumor cells at the trocar site which has been described as the 'Chimney-effect' by Kazemier et al. (70).

Local application of cytotoxic or anti-adherence agents at trocar sites after a laparoscopic procedure is a possible way to prevent port-site metastasis. Jacobi et al. (69) studied peritoneal tumor growth after application of either heparin, taurolidine or a combination of the two. Tumor growth was least when a combination of heparin with taurolidine was used. Protective measures that have been suggested included careful surgical procedure, followed by placement of the
specimen in a bag before extraction through a protected wound site, and tumoricidal washouts of the abdominal cavity (71).

Laparoscopically assisted colon resection is technically feasible for both benign and malignant disease. In the present study, there were only 2 patients who presented with features of ileo-caecal tuberculosis and were subjected to laparoscopic assisted right hemicolecctionmey successfully. We did not attempt this procedure for any malignant disease.

In our study both the patients were positioned supine on the table with 15° tilt on left side for right hemicolecctionmey while modified lithotomy position was utilized by Geis WP et al (72) as against supine position in the study by Lezoche et al (45).

We utilised 5 ports were utilized, first umbilical 10mm port, second - suprapubic 5mm third - Epigastric 10 mm port and fourth left hypochondrium 5 mm port and 10 mm port in left iliac fossa which is comparable to port sites utilized by Geis et al (72).

In our study, with the help of harmonic scalpel, all the mobilization of caecum, ascending colon hepatic flexure was done and intracorporeal mesenteric vessel occlusion was performed with the use of harmonic scalpel. Later, the mobilized segment was delivered out through the incision proposed and extracorporeal resection and anastomosis was done. While in the studies by E Lezoche et al (45) and CA Anderson et al (72), after the mobilization of the required segment, intracorporeal ligation of the mesenteric vascular pedicle was obtained using endoscopic linear stapling device, and later the segment was delivered out for definite resection and anastomosis. However vessel ligation can be done with intracorporeal knotting.

The site of incision for specimen retrieval in our study was a 2-3” incision placed transversely, midway between right subcostal margin and anterior superior iliac spine which was similar to the study by Geis et al (72) while in the study by CA Anderson et al (73) it was just right to the umbilicus.
Present study done for right hemicolecotomy for Ileocaecal tuberculosis recorded a mean operative time (in minutes) as 72 min as against 45 min for open procedure (by the same surgical team). As there was no study found to have done work on the same topic so comparison was done with laparoscopic assisted right hemicolecotomy for colon carcinoma in the study by CA Anderson et al (73). Latter study reported the time as 166 min ± 40 min (73). While the time reported in a case of totally laparoscopic right hemicolecotomy for colon carcinoma in the study by E Lezoche et al (45) was 192 min.

Present study did not require any conversions as comparable to studies by CA Anderson et al (73) and E Lezoche et al (45).

Our study had no significant complications in the post operative period. CA Anderson et al (73) reported no port site metastasis while in the study by E Lezoche et al (45) - 19% patients experienced prolonged ileus and underwent reoperation and 27% patients developed a metastasis at the site of right subcostal port 6 months after undergoing palliative laparoscopic right hemicolecotomy.

Average duration of hospital stay in our study was 8 days which is comparable to studies for laparoscopic assisted and totally laparoscopic right hemicolecotomy for colon cancer as 8.3 days (73) and 9.2 days (45) respectively.

Summarising, on the basis of studies, a number of advantages have been shown when comparing laparoscopy to laparotomy for colorectal surgery including, in the former instance, less trauma to immune system, less adhesions formation, improved cosmesis, less depressed pulmonary function, and less post operative pain. Subjective improvements for the patients include an earlier return to a normal diet, a shorter hospital stay, and a more rapid return to a partial and full activity and employment for laparoscopy procedure patients than for laparotomy patients.

However, the applications of the laparoscope for the cure of the colorectal malignancy should be approached with cautions, and critical enthusiasm. We must
fulfill the most important part of the Hippocratic Oath "Primum non nocere - first, do no harm "

**Laparoscopic Appendectomy**

In the 1970s Laparoscopy was used as a diagnostic tool in patients with suspected appendicitis. Laparoscopic appendectomy was first described in 1983 and now has become the treatment of choice in appendicitis. There are perceived advantages in performing laparoscopic appendectomy (LA) in patients with suspected appendicitis. These include improved cosmesis, thorough examination of the peritoneal cavity with lavage and suction of infected peritoneal fluid, improved diagnostic accuracy (particularly in young fertile women), reduced exposure to patient's blood and secretions, resulting in a reduction in abdominal and pelvic adhesions. Recent published studies comparing open and LA suggest that LA may offer advantages over the open technique by reducing postoperative pain, morbidity, inpatient hospital stay and a possible earlier return to work (41-44, 52) and more important causing lesser long term morbidity in mainly two groups of patients i.e. young fertile females and patients with suspected appendicitis.

Appendectomy is one of the most common surgical procedures. However, the reported rate of appendectomy of normal appendices, using the open procedure, varies from 10-30% (53). The rate may be as high as 40-50% in females of reproductive age (54). An improvement on the unfavourable rate with the open procedure can be achieved by laparoscopy (55). But the converse is also true and there are reports of an actual increase in the number of normal appendectomies during diagnostic laparoscopy.

Laparoscopy improved diagnostic accuracy (56) for appendicitis. It allows the surgeon to examine the abdominal and pelvic cavity in detail particularly advantageous in cases of uncertain diagnosis and in young women of reproductive age. The laparoscopic technique also allows effective management of any other
pathology, particularly that prevalent in young women (57), without the wound extension needed in the conventional approach.

Prospective randomized trials have not shown an advantage of laparoscopic over open appendectomy for the treatment of male patients with suspected appendicitis. Laparoscopy has been recommended in men in selected cases where the diagnosis is uncertain, or the patient is obese (58). Obese patients generally require larger incisions for standard exposure with open technique, therefore the laparoscopic technique has obvious advantage in this group.

The extent of inflammation of the appendix can also play a role. Laparoscopic management of perforated appendicitis or appendicular lump may be superior to the open approach (60). In these cases, blunt dissection of the adherent omentum and bowel loops can be achieved under direct vision. Suction and irrigation of the peritoneal cavity and pelvis can be performed, and drains can be inserted through one of the port sites. This, when compared to open intervention, has obvious advantage of a decreased incision morbidity.

In the present study, 11 patients presented with features suggestive of Recurrent Appendicitis or Appendicular lump (55% of total patients included in this study).

Out of 11 cases, laparoscopic appendectomy was done successfully in 7 cases while in 2 cases laparoscopic assistance was required (due to dense adhesions).

In all the cases, patient was positioned supine on the table as in the studies of JTT Tate et al (42), O Tucker et al (43) while in the series by JA Mompean et al (41) - the position was supine with 15° turned to the left and in the study by Attwood et al (44) it was trendelenberg position with 15° turned to left.

In our study, 3 ports were used – a supraumbilical one of 10 mm for the laparoscope, one of 10 mm in the left iliac fossa and third of 5 mm in midline suprapubic region as in the case of Attwood et al (44), JTT Tate et al (42),
Mompean et al (41) where 3 ports were used but the third 5mm port was placed below the right costal margin in the mid clavicular line

Present study recorded a mean operative time (in minutes) for LA as 20 min for open method which was much less as compared to their studies

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Although, in the current study, no conversion was required in any case subjected to laparoscopic technique, assistance was needed in 2 cases (due to dense adhesions) comparable to the study by Kum et al (52) – 0%, as against 5% in Mompean et al (41), 6% in Attwood et al (44), 8% in Tate et al (42) and 2% in Tucker et al (43)

The present study showed the average duration of hospital stay (HS) as 2 days which was comparable to studies by Tucker et al (43) – 2 3 days, Attwood et al (44) – 2 5 days as against 3 2 days in study by Kum et al (52), 3 7 days in Tate et al (42) and 4 8 days in the study by Mompean et al (41)

The present report recorded no significant complications (like wound infections, hematoma, intraabdominal abscess) in the post operative period as comparable to studies by Attwood et al (44) and Kum et al (52) while the percentage of complications in other studies were as 3%, 5 % and 8% in Tucker et al (43), Mompean et al (41) and Tate et al (42) respectively

In summary, when comparing laparoscopic and open appendectomy, there were similarities in anaesthetic times, postoperative mobility and analgesic requirements but laparoscopic technique has an upper hand in certain patients with a suspected diagnosis of appendicitis (61), particularly in young fertile female (57), obese male patients (59) and patients with perforative appendicitis or appendicular lump (60) It is an important diagnostic tool particularly in young women with suspected appendicitis,as other pathologies of pelvic organs like salpingitis/oophoritis mimicking appendicitis can be easily ruled out
Laparoscopic Rectopexy

The advent of laparoscopic surgery has changed the technical, but not conceptual, approach to many abdominal operations including for rectal prolapse. Patients who must undergo transabdominal operations for the treatment of rectal prolapse are the ideal candidates for the application of laparoscopic surgery. Elderly patients who previously were deemed unfit for abdominal surgery may be candidates for laparoscopic abdominal procedures such as rectopexy and anterior resection. Operations for rectal prolapse that are approached laparoscopically include anterior resection, proctopexy, and abdominal perineal resection. Perineal rectosigmoidectomies can also be performed with laparoscopic assistance.

Rectopexy is the most frequently performed laparoscopic operation for the control of rectal prolapse. All the steps of the equivalent open operation are mobilization of the rectum to the pelvic floor with preservation of the presacral nerve, division of the lateral sacral ligaments and posterior rectopexy, can satisfactorily be accomplished laparoscopically. Intraoperative complications have been limited to minor bleeding, which can be easily addressed by converting to an open procedure if necessary. The incidence of deep venous thrombosis may increase especially in patients in a Lloyd-Davies position with flexed legs. The position of the patients during surgery, the high intraabdominal pressure and the length of the procedure may all contribute to the development of this complication. The Lloyd-Davies position, although helpful, is not strictly necessary for laparoscopic rectopexy and patients are now placed supine for pelvic laparoscopic procedures as is our practice and especially in those that do not involve endoanal manipulation. There are no published data on the incidence of post operative DVT in patients undergoing laparoscopic colorectal surgery.

In our study, only one patient of rectal prolapse was subjected to laparoscopic mesh rectopexy.

Patient was positioned supine on the table with head down tilt in our study as compared to Lloyd-Davies position in the study by Ballantyne et al (32).

Regarding the number of ports used for rectopexy, we placed 4 ports – a 10mm supraumbilical for camera, 10 mm port in the right iliac fossa, 10 mm port in epigastrum and 5 mm port in the left hypochondrium as opposed to five ports.
used in the study by Ballantyne et al (32) – where all the ports were placed in the infraumbilical region.

Our study recorded the mean operative time (in minutes) for laparoscopic rectopexy as 80 min as compared to 40 minutes in open approach. The time taken in our study in the laparoscopic procedure was remarkably less as compared to average of 3.6 hrs recorded by A. Cuschieri et al (47) and 198 minutes by Solomon et al, 1996 and 150 minutes in the study by Kellokumpu et al (48).

Average duration of hospital stay after the laparoscopic rectopexy in our study was 5½ days as compared to 5 days in the study of Kellokumpu et al (48), 4 days by Cuschieri et al (47) and 6½ days in the study by Solomon et al, 1996.

Our patient had no significant intra-operative or post-operative complications as against the study of Cuschieri et al (47) where one of the five patients was readmitted after 3 days of discharge with a left ileofemoral thrombosis while Solomon et al, 1996 report 1 patient with port site hernia and another was converted to open among total of 21 patients.

The laparoscopic rectopexy is therefore a safe and effective option for the treatment of rectal prolapse. It is less invasive than an open rectopexy procedure with decreased post operative disability.