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Original Research Article

Evaluation of Bowel Damage and its Repair in Pelvic Operations

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Abstract:

Background: Bowel injury is a serious but infrequent complication of pelvic surgery, associated with significant morbidity and mortality. Awareness of risk factors, mechanisms, and management strategies is essential for optimizing outcomes.

Aim: To assess the prevalence, risk factors, treatment, and results of intestinal damage sustained following pelvic operations.

Methodology: A prospective observational study was conducted on 60 patients undergoing gynecological, colorectal, urological, and general pelvic surgeries at Netaji Subhas Medical College and Hospital and ESIC Medical College and Hospital, Bihta, Patna, Bihar, India. Data on demographic profile, type of surgery, mechanism of bowel injury, management modality, and postoperative outcomes were collected and analyzed using descriptive statistics and Chi-square/Fisher's tests.

Results: Most patients were females (63.3%) aged 31–40 years (30%). Most had no comorbidities (53.3%). Primary repair was the most common management (48.3%), followed by resection with anastomosis (30%) and stoma formation (21.7%). Postoperative complications included surgical site infection (23.3%), sepsis (13.3%), anastomotic leaks (10%), and fistula formation (8.3%). Mean hospital stay was 13.4 ± 4.2 days; reoperation was required in 15%, with 5% mortality.

Conclusion: Bowel injury during pelvic surgery can be effectively managed with timely recognition and intervention. Early detection, appropriate surgical management, and careful postoperative monitoring are critical to minimizing morbidity and improving patient outcomes.

Keywords: Pelvic surgery, bowel injury, postoperative complications, primary repair, resection, stoma.

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Introduction

Pelvic surgeries can be used to treat various processes of the body including gynecological, colorectal, urological and oncological. Pelvic surgeries of any specialty imply working in close position to the vital organs of the abdominal cavity, such as a bowel. The proximity of the structures of the pelvic organs presents the possibility of accidental bowel injury developing during a surgical dissection. Bowel injury is one of the most severe complications albeit rare as compared to other complications due to possible infection, peritonitis, sepsis, prolonged length of stay, and morbidity [1]. Consequently, appreciation and comprehension of bowel injury in pelvic surgery is valuable among surgeons, trainees, and medical staff that work together regarding perioperative management.

Bowel injury depends on the type of surgery and surgical procedure. Laparoscopy and robotic surgery are minimally invasive techniques that enhance precision and visual field, and in some cases, these methods may decrease the risk of accidental trauma. They however have other challenges like worse tactile feedback and adhesion detection [2]. The open procedures could offer superior tactile qualities but contain the danger of excessive dissection and exposure. Adhesions and distortion of normal anatomy due to previous surgeries, pelvic infections, endometriosis, and radiation therapy provide more chance of bowel damage.

Small bowels, sigmoid colon and rectum are the bowel segments that are prone to being affected during pelvic surgery. Bowel injury can occur due to sharp dissection, electrosurgery, staplers or traction to mobilize the tissue. There will be injuries which will be noticeable to the surgeon during the surgery and then there are injuries which cannot be realized

until hours or days after the operation. Late presentations are particularly alarming due to the possibility of the emergence of complications like the development of abscess, leaks as well as systemic infection. Early diagnosis and quick response are therefore very critical to avoid worsening [3].

Bowel injuries are transformed into treatment by the location, the extent of injury, and the time of their discovery. Minor injuries, which are identified during the intraoperative period, can be repaired mostly during the operation. Astomosis will be necessary in case of resection or major injury or devascularization. When the patient is in an unstable or emergent condition and has a lot of fecal contamination, the fecal stream can be diverted by establishing a temporary stoma that will provide the best healing conditions [4]. Postoperative care will include antibiotics and nutrition, as well as observation of infection, and, in some cases, imaging to evaluate healing.

Bowel injury prevention starts with proper preoperative preparation. The surgeon will desire to see past imaging to determine whether there are potential adhesions or an abnormal anatomy and will have need of the right tools and methods. Handling of tissues in a gentle manner, proper use of energy equipment, and intraoperative observation of the tissue planes have also been found to prevent the risk of injury. Availability of trained surgical team members and training in advanced (particularly minimally invasive) surgical modalities also factor in important variable [5].

Even with the better tools and methods of carrying out surgery, bowel injury has stayed as a significant clinical concern. Studies and training will still be very important in enhancing patient outcomes, identification of vulnerable patients and enhancement of preventive methods. Enhancement of surgeons and team awareness may become the key to early recognition and the subsequent successful treatment of bowel trauma [6].

Moreover, the concept of continuing education and practice in simulation has been progressively regarded as an effective tool to reduce the amount of harm to the colon during pelvic surgery. Experimental training and simulation training are given to the surgeons to identify the altered anatomy and work with adhesions, and train safe dissection in a controlled setting. Decision-making during complicated cases involving the pelvis can also be enhanced by interdisciplinary collaboration between gynecologic, colorectal and general surgeons. Due to the constant development of surgical methods, continuous education and the acquisition of new skills will be required as the sole protective measures to ensure the safety of the patient and the enhancement of the results of post-operative care [7].

To sum up, bowel injury during pelvic surgery is a rare, yet severe and avoidable complication! As has been mentioned above, the comprehensive knowledge of the anatomy of the pelvis, risk factors, injury pathophysiology, and management methods will aid in the decrease of further morbidity and mortality of bowel injuries in surgery, as well as the skill of surgery.

Methodology

Study Design This study will be a prospective observational study conducted to evaluate bowel injury occurring during pelvic surgeries and to analyze the various modalities used in their management.

Study Area: The study will be carried out in Department of General Surgery and Obstetrics and Gynaecology, Netaji Subhas Medical College and Hospital and ESIC, Medical College and Hospital, Bihta, Patna, Bihar, India for one year.

Study Participants

Inclusion Criteria

- Patients undergoing pelvic surgeries (gynecological, colorectal, urological, and general surgical pelvic procedures).
- Patients who develop intraoperative or postoperative bowel injury confirmed by clinical findings, imaging, or intraoperative detection.
- Patients who provide informed consent.

Exclusion Criteria

- Patients with pre-existing bowel perforation prior to surgery.
- Patients who decline to participate in the study.
- Patients who are lost to follow-up or whose records are incomplete.

Sample Size: This research will involve 60 patients who meet the inclusion criteria.

Procedure: All patients undergoing pelvic surgeries during the study period will be observed for the occurrence of bowel injury. Once a bowel injury is identified, details will be recorded including type of surgery, mechanism of injury (sharp, thermal, or traction), anatomical segment of bowel involved, time of recognition (intraoperative or postoperative), clinical presentation, and diagnostic modalities used. The management approach, whether primary repair, resection and anastomosis, or creation of a stoma, will be documented along with intraoperative findings. Postoperative outcomes including complications, duration of hospital stay, need for reoperation, and mortality, if any, will also be observed. Each patient will be followed until discharge and, where applicable, during follow-up visits for assessment of long-term outcomes.

Statistical Analysis: Data will be imported into Microsoft Excel, and SPSS version 27 will be used for

analysis. For quantitative data, descriptive statistics like mean, percentage, and standard deviation will be employed. Depending on the situation, the Chi-square test or Fisher's exact test will be used to assess categorical variables. Statistical significance will be established when the p-value is less than 0.05.

Result

Table 1 shows the highest percentage was the individuals who were aged 31-40 years (30 percent), 41-50 years (25 percent) and above 50 years (20 percent). The proportion of the participants who were between 21 and 30 years was 20, and the smallest proportion was the participants under the age of 20 (5). Gender was also an issue with most of the respondents being female (63.30) and male (36.70) respectively. Concerning co-morbid conditions, more than half of the study population (53.30) also described no co-morbidities. The most prevalent amongst the ones who had existing health conditions was hypertension (23.30%), then diabetes mellitus (16.70%), and chronic obstructive pulmonary disease (COPD) as it was found in 6.70% of the participants.

Table 1: Demographic profile of study participants (n = 60)

Variables	Categories	Number (n)	Percentage (%)
Age group (years)	<20	3	5%
	21–30	12	20%
	31–40	18	30%
	41–50	15	25%
	>50	12	20%
Gender	Male	22	36.70%
	Female	38	63.30%
Co-morbidities	Diabetes Mellitus	10	16.70%
	Hypertension	14	23.30%
	COPD	4	6.70%
	None	32	53.30%

Table 2 illustrates the postoperative data of the 60 patients indicates that almost half of them had no complications, and 27 patients (45) had an uneventful recovery. Surgical site infections were the most common among participants with some problems, occurring in 14 patients (23.3%). Eight patients (13.3%) were diagnosed with sepsis and 6 patients (10%), with anastomotic leaks. The least common complication was fistula formation that was witnessed in 5 patients (8.3%). Overall, surgical site infection and sepsis were the most prominent postoperative issues even though a considerable number of them had no such occurrences.

Table 2: Postoperative complications (n=60)

Complication	Number (n)	Percentage (%)
Surgical site infection	14	23.30%
Anastomotic leak	6	10%
Sepsis	8	13.30%
Fistula formation	5	8.30%
None	27	45%

Table 3 shows the distribution of modalities of management of 60 patients. Primary repair of the bowel was the most used technique where it was done on 29 patients representing 48.3 percent of the cases. The most common modality was that of resection with anastomosis, which was done on 18 patients or 30 percent of the study population. Stoma, ileostomy and colostomy were the most used techniques and were applied in 13 patients (21.7% of the cases). These data suggest that almost half of the patients were treated by means of primary repair and more complicated surgical procedures, including resection or stoma creation, were not of frequent use.

Table 3: Management modalities (n=60)

Management approach	Number (n)	Percentage (%)
Primary repair of bowel	29	48.30%
Resection + anastomosis	18	30%
Creation of stoma (ileostomy/colostomy)	13	21.70%

Table 4 shows the result measures of a sample of 60 patients. Mean length of stay was 13.4 days and the standard deviation was 4.2 days, which means that there was a variation in terms of the length of stay. One out of every nine patients (15%) had to have re-operated, and this indicates that a small fraction of cases suffered complications that required further surgical intervention. One out of 3 patients experienced mortality while this was 5 percent of the study population. Complications in terms of follow-up such as adhesions and fistula formation were reported in 7 patients making up 11.7% of the cohort. Overall, these findings will give an idea of the post-operative process and the rate of complications among the patients under investigation.

Table 4: Outcome measures (n=60)	
Outcome variable	**Mean ± SD / Number (%)**
Mean duration of hospital stay (days)	13.4 ± 4.2
Need for Re-operation	9 (15%)
Mortality	3 (5%)
Follow-up complications (e.g., adhesions, fistula)	7 (11.7%)

Discussion

The demographic description of the research sample revealed that more respondents belonged to the age group of 31 to 40 years (constituting 30 percent), then came the age group of 41 to 50 (25 percent) and the group of over 50 years (20 percent). Instead, the least number of respondents were under 20 years (5%). Ivatury et al., 1991 [8] have observed that most of the subjects were middle-aged adults and this may also influence age-related comorbidities and postoperative outcomes.

The gender distribution was not equal as there were more females (63.3) than males (36.7). This is perhaps an indication of the current demographic trends of the patient population or seeking health services. The significance of gender distribution knowledge is associated with the possibility of gender distribution influencing disease manifestation, the reaction on surgical intervention, and postoperative healing. Heaton et al., (1993) [9] established more bloating, straining, lumpier stool and feeling of incomplete evacuation following hysterectomy and heightened urgency and incomplete evacuation following cholecystectomy.

With respect to comorbidity, most of the participants did not have any health conditions (53.3%). Hypertension was the most common among people with comorbid conditions (23.3%), with diabetes mellitus (16.7%) and COPD (6.7%). These comorbidities have been determined risk factors of postoperative complications and emphasize the importance of preoperative measurement and optimization. Chapron et al., (1999) [10] were able to report that 32% of 62 gastrointestinal injury reported to the French Society of Gynecological Endoscopy took place during the access: 11% with the Veress needle, and 21% with the trocar.

Post-operative outcomes were nearly by half (45) in the absence of complications. Surgical site infection (23.3), sepsis (13.3), anastomotic leaks (10%), and fistula (8.3) were the most prevalent complications. The clinical implications of these findings are infection prevention and close follow-up of those who have risk factors of infection (e.g. diabetes, hypertension) to ensure that morbidity is kept to a minimum. Fakhry et al., (2003) [11] discovered that 13.0% of patients with a perforated small intestinal injury had no abnormalities on their preoperative CT scan in their Eastern Association for the Surgery of Trauma multi-institutional research.

The management techniques applied showed that primary repair of the bowel was the most common technique used 48.3, resection with anastomosis was 30 and stoma formation was 21.7. This spread shows that the decision was to apply the less complex procedures whenever possible only to apply more complex surgery in complicated situations. It's likely that the surgical techniques used may have affected both the need for surgical re-examination and surgical complications. Jang et al., (2016) [12] found no difference in overall mortality rates between 14 patients who had hemodynamic instability from a pelvic fracture treated with preperitoneal pelvic packing and 16 similar patients who were unable to undergo preperitoneal pelvic packing (37.5 vs. 35.7).

On the outcome measures, the mean hospital stay was 13.4 days with a standard deviation of 4.2 and 15% of the patients needed to be re-operated. The mortality rate was low at 5%. Follow up complications were experienced among 11.7 percent of patients. The findings imply that most patients had a positive rate of recovery but there were some patients with severe postoperative issues thus indicating the need to be more vigilant when providing postoperative care and follow up to achieve optimal patient outcomes.

Conclusion

Surgical injury of the bowel during pelvic surgery is a critical complication, which can be successfully controlled in case of precise and timely intervention. The middle-aged adults with most of them being women characterized most patients in this study since most gynecological procedures are more common. Even though a slightly higher percentage of

patients did not receive any comorbidities, patients with hypertension, diabetes, or COPD were at higher risk in the postoperative period. The most common types of management were primary repair, anastomosis and stoma construction, indicating that less complex interventions should be preferred when possible. The average hospital stay was 13.4 days, 15% needed reoperation and 5% mortality rate. It is essential to recognize complications early, provide prompt surgical intervention and close postoperative observations in reducing complications and additional studies are required to reinforce evidence-based practices in this direction.

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