

## ORIGINAL RESEARCH

# Role Of Laparoscopy In Evaluation And Management Of Hollow Viscus Perforation

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### ABSTRACT

**Aim:** To evaluate the role of laparoscopy in evaluation and management of hollow viscus perforation. **Material and Methods:** The present prospective study, which took place between August 2020 and September 2022 in the department of surgery at Chhatrapati Shivaji Subharti Hospital. Study participants included all patients who were offered surgical repair for a suspected perforation of the abdominal viscus and were admitted through the surgery outpatient department, the emergency room, or were transferred from other departments. Diagnostic laparoscopy was performed under general anaesthesia with intubation and controlled ventilation. For the subsequent conduct of the procedure, the choice of energy source or a combination (MEC or BEC or Harmonic) was used as per the choice of the operating surgeon. First-port findings were recorded, and subsequent disease management was decided accordingly. **Results:** Most common clinical feature was tenderness (90.7%) followed by vomiting (33.3%) and nausea (33.3%). Most common clinical diagnosis was Appendicitis with perforation reported in 68.3% of the subjects. Conversion to open was revealed in 11.11% of the subjects. Clinical diagnosis and intraoperative findings were matched fully and partially in 87.1% of the subjects. Radiological diagnosis and intraoperative findings were found to match in 64.9% and partly match in 18.5% of the subjects. The histopathological diagnosis and intraoperative findings were found to match in 70.4% of the subjects. **Conclusion:** Diagnostic laparoscopy followed by laparoscopic therapeutic intervention whenever feasible or mini laparotomy following diagnostic laparoscopy should be the standard approach for hollow viscus perforation. The diagnostic accuracy can be increased by using modern diagnostic tools especially laparoscopy.

**Keywords:** Laparoscopy, Hollow Viscus Perforation, Diagnosis

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### INTRODUCTION

Most emergency surgical admissions and laparotomies are due to the perforation of a hollow viscus caused by various etiologies<sup>1,2</sup>. Several sets of recommendations and approaches to patient treatment have been proposed to improve these patients' prognosis and quality of life with minimum loss of life. Laparoscopy is one technique that is constantly improving and helping medical professionals achieve the requirements of these standards. Laparoscopy have benefitted in abdominal trauma and other surgical emergencies in diagnosis as well as in therapeutics. Diagnostic Laparoscopy is performed to detect, diagnose or rule out organ and visceral damage and if feasible, managing the disease using the least invasive technique. Thus, laparoscopy has a potential to become a viable treatment alternative for selected patients with hollow viscus perforation with more advancement and development and experiences<sup>3</sup>.

Perforation of a hollow viscus is a life-threatening situation. Following perforation there is spillage of hollow viscus contents into the peritoneal cavity, triggering a cascade of adverse events that can ultimately lead to death, including hypovolemia, circulatory collapse, septic shock and organ failure<sup>4</sup>. Even though there have been great strides in the field of duodenal perforation repair via the use of laparoscopy and other techniques, the study population still do explorative laparotomy with omental patch. Wound infection was the most prevalent problem after surgery. Causes of death included cardiac arrest and septicaemia<sup>4,5</sup>. The death rate is 30%, and the fatality rate of those with diffuse peritonitis is up to 70%, despite advancements in surgical and medical therapies<sup>6</sup>.

There is a greater risk of postoperative problems, such as fluid collection, leakage, surgical site infection, and other systemic infections, in individuals who have emergency abdominal procedures. Iatrogenic

perforation during colonoscopy has a low fatality risk in contrast to perforations caused by malignancy and infection. Patients with intestinal perforation have been the subject of a number of research aimed at identifying prognostic variables related to morbidity and death<sup>7</sup>.

Less discomfort, shorter hospital stays, quicker rehabilitation, and lower morbidity are reasons laparoscopy has become more popular among surgeons in recent years<sup>8</sup>. In situations with suspected viscous perforation or peritonitis, diagnostic laparoscopy can reveal an underlying pathology. After identification of pathology, it may be treated and corrected with a laparoscopy. In case of need for conversion, a laparoscopy-assisted conversion allows for greater surgical precision and a smaller laparotomy incision. Laparoscopy is no longer considered an absolute contraindication for the treatment of peritonitic abdomen, as stated by the recommendations of the European Association for Endoscopic Surgery (EAES)<sup>9</sup>.

Peritonitis remains lethal despite improvements in diagnosis, surgery, antibiotic treatment, critical care support, and more profound knowledge of its aetiology. Despite some similarities, the spectrum of aetiology in tropical countries and their western counterparts continues to diverge with peritonitis secondary to hollow viscus perforation being common in our country. As a result of the encouraging results of other studies, we decided to undertake this prospective research to examine the role of Laparoscopy in evaluation and management of hollow viscus perforation.

#### AIM AND OBJECTIVES

1. To study the various clinical presentations of abdominal viscus perforation.
2. To evaluate the role of Laparoscopy as a diagnostic tool in abdominal viscus perforation.
3. To evaluate the role of Laparoscopy as a therapeutic tool in abdominal viscus perforation.
4. To assess Laparoscopy as a discipline to avoid large midline incisions.
5. To develop an objective assessment tool to decide – When to go for diagnostic or /and therapeutic Laparoscopy or direct laparotomy, if possible.

#### MATERIAL AND METHODS

The present prospective study took place between August 2020 and September 2022 in the department of surgery at Chhatrapati Shivaji Subharti Hospital. Study participants included all patients who were offered surgical repair for a suspected perforation of the abdominal viscus and were admitted through the surgery outpatient department, the emergency room, or were transferred from other departments. The research was conducted following a protocol that was approved by the Institutional Review Board for Ethical Clearance at Chhatrapati Shivaji Subharti Hospital/Subharti Medical College/SVS University

and was in line with the World Medical Association's Code of Ethics as outlined in the 1975 Declaration of Helsinki and its 2000 revisions. Before the start of the study, we had all patients or their representatives sign a written consent form.

#### INCLUSION CRITERIA

- Patients >10 years of age.
- Patients with suspected clinical diagnosis or/and radiological evidence of perforation.
- No medical or surgical contraindication to general anaesthesia and laparoscopic surgery.

#### EXCLUSION CRITERIA

- Pregnant females in the third trimester.
- Age below ten years
- Hemodynamically unstable patient (Systolic Blood pressure < 80 mmHg)
- Uncorrected coagulopathy.
- The patient is not fit for general anaesthesia.
- Patient not giving consent.

#### CASE SELECTION

The information was gathered through a standardized interviewer-administered questionnaire that had been pilot tested and refined before being used in the research. Data about the patient's background (such as age, race/ethnicity, income level, medical history, and current drugs and supplements) were recorded.

#### INVESTIGATIONS

- Liver function test (S. Bilirubin, SGOT, SGPT, S. Alkaline phosphatase), viral markers
- (HCV, HBsAg, HIV1 & 2) and standard haematological tests (Hb, TLC, DLC, RBS).
- Urea, creatinine, sodium, calcium and potassium as well as a test of kidney function.
- Abdominal USG with X-ray Upright (wherever indicated)
- CECT Whole Abdomen (wherever indicated)
- MRI Whole abdomen (wherever indicated)
- Another suitable imaging study, if required.
- Specific blood investigations in the pre/post-op period, if required.
- ECG
- Pre-anaesthetic check-up

#### Patients were planned for diagnostic laparoscopy and the following protocol was followed:

1. Nil by mouth for 6 hours, or Gastric decompression will be done by putting a Ryle's tube followed by aspiration of contents, if any.
2. Part preparation from nipple to mid-thigh.
3. Injection of Ceftriaxone 1gm IV or suitable antibiotic 1 hour before surgery.
4. Shift to the operation theatre after fulfilling preoperative requirements.

**OPERATIVE WORKUP**

1. Anaesthesia: Diagnostic laparoscopy was performed under general anaesthesia with intubation and controlled ventilation.
2. Creation of pneumoperitoneum: The following cleaning and draping under all aseptic precautions, the first patient was in a horizontal position, place a 1.5cm incision, deepen it up to the peritoneal cavity, suck out peritoneal fluid, collect it for culture and then all patients were put in Trendelenburg's position and pneumoperitoneum was created either by using Veress needle with secure method or by the open method by using Trocar sheath only under direct vision or suitably modified. Suppose the required modified position may be used. All standard precautions were taken to avoid access injury. Carbon dioxide insufflation was then done using automatic insufflators set at 1 litre/minute. Then the insufflation rate was increased so that maximum pressure of 12mmHg-14mmHg was obtained.
3. In case of a distended abdomen = open method trocar sheath insertion under vision after fluid suction was used.
4. A secure method was used in the non-distended abdomen veress needle.
5. Appropriate standard diagnostic laparoscopic ports will be inserted with proper modifications whenever indicated.
6. For the subsequent conduct of the procedure, the choice of energy source or a combination (MEC or BEC or Harmonic) was used as per the choice of the operating surgeon.
7. First-port findings were recorded, and subsequent disease management was decided accordingly.
8. Subsequent ports were created if required.

9. Endosuturing/endoknotting was used whenever required.

**POSTOPERATIVE MANAGEMENT**

For all patients, antibiotic coverage, analgesia, intravenous iv fluids, and proton pump inhibitors were given for the first 48 hours as per the decisions of the consultant in charge.

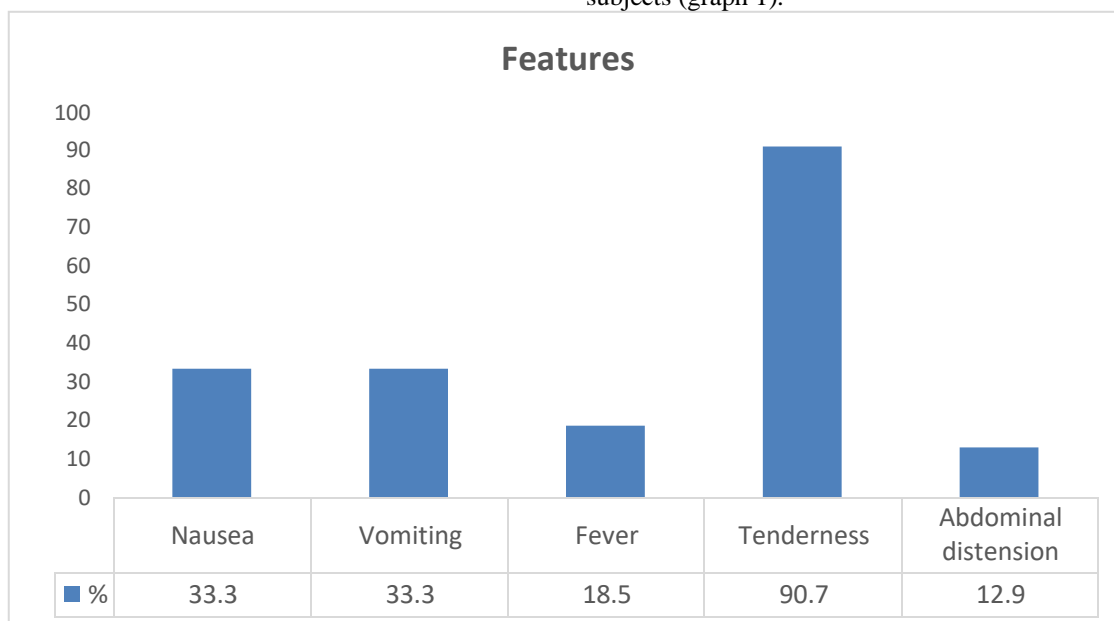
**OUTCOME MEASURES**

- Operative time.
- Intraoperative blood loss.
- Conversion to open laparotomy required or not.
- Concomitant haemorrhage.
- Hemodynamic instability during Laparoscopic intervention (Interventional Team factor)
- The severity of pain was recorded as right shoulder tip pain, left shoulder tip pain or generalized abdominal pain at 24 and 48hours.
- Complications like tachycardia, localized/generalized abdominal tenderness, shock, fever, tachypnea, abdominal distention.
- Post-operative bleeding (abdominal drain).

Data was collected and subjected to statistical analysis.

**RESULTS**

Out of 54 subjects, 35 were males (64.8%) and 19 were females (35.2%). Hence there was preponderance of male in our study. Maximum subjects were from the age group of 21-30 years (48.1%) followed by 31- 40 years (20.4%). Minimum subjects were from the age group of >50 years (9.3%). Most common clinical feature was tenderness (90.7%) followed by vomiting (33.3%) and nausea (33.3%). Abdominal distension was found in 12.9% of the subjects (graph 1).



**Graph 1: Pre operative clinical features among the study subjects.**

Most common clinical diagnosis was Appendicitis with perforation reported in 68.3% of the subjects followed by perforation peritonitis (22.2%) as shown in table 1.

**Table 1: Clinical diagnosis**

Diagnosis	N	%
Perforation Peritonitis	12	22.2
Urinary Bladder Perforation	1	1.9
Post Appendectomy Fecal Fistula	1	1.9
Appendicitis with Perforation	37	68.3
Uterine perforation	1	1.9
Ischeorectal Abscess With Rectocutaneous Fistula	1	1.9
Post Ovarian Cystectomy Feceal Fistula	1	1.9
Total	54	100.0

Conversion to open was revealed in 11.11% of the subjects. GIT was the most common system involved among 94.3% of the subjects. All of the patients were operated under GA. Appendicular perforation was the most common first port finding, reported in 72.1% of the subjects. Minimal and moderate blood loss was reported among 98.1% and 1.9% of the subjects respectively as per the definition in our methods (table 2).

**Table 2: Intraoperative findings among the study subjects**

Variables	N	%
Diagnostic	54	100
Diagnostic + Therapeutic	48	88.89
Conversion to open	6	11.11
Organ System Involved		
1. Female Genital System	1	1.9
2. Gastrointestinal Tract	51	94.3
3. Hepatobiliary System	1	1.9
4. Urinary Tract System	1	1.9
First Port Finding		
Multiple Ileal Perforation	2	3.5
Traumatic Urinary Bladder Perforation	1	1.9
Ileal Perforation	6	11.1
Fecal Fistula At Ileo Caecal Junction	1	1.9
Appendicular Perforation	39	72.1
Liver Abcess With Sealed Gb Perforation	1	1.9
Uterine Perforation With Traumatic Utero-Intestinal Prolapse	1	1.9
Adhesion Of Intestine With Abdominal Wall At Umbilicus, Sigmoid Colon Fistula Adherent With Abdominal Wall Forming Mucocutaneous Fistula	1	1.9
Duodenal Perforation	1	1.9
Mid Jejunal Mesentery Tear With Distal Jejunal Bowel Avulsion (Anterior Aspect)	1	1.9
Blood Loss		
Minimal	53	98.1
Moderate	1	1.9

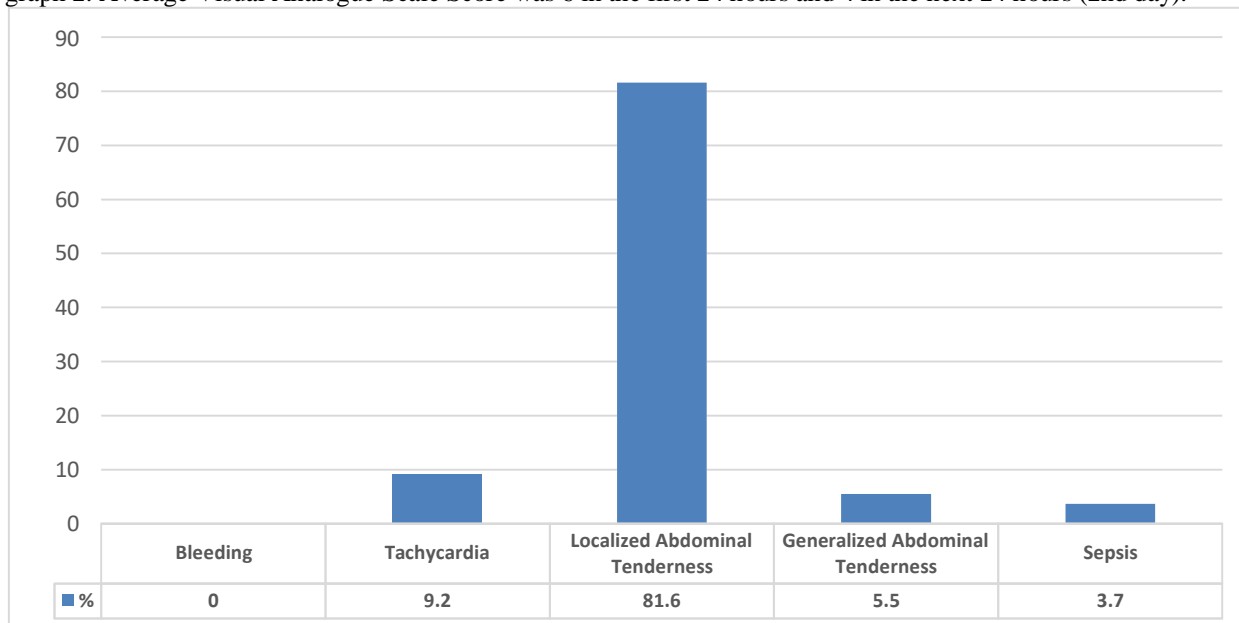
Mean operative time required for the surgery among the study subjects was 132.49±23.84 minutes. Mean days of stay in hospital among the study subjects was 6.33±2.91 days. Clinical diagnosis and intraoperative findings were matched fully and partially in 87.1% of the subjects. Radiological diagnosis and intraoperative findings were found to match in 64.9% and partly match in 18.5% of the subjects. The histopathological diagnosis and intraoperative findings were found to match in 70.4% of the subjects. Hence there was a good correlation between the intraoperative diagnosis with pathological diagnosis.

**Table 3: Correlation of clinical diagnosis, radiological diagnosis, pathological diagnosis and intraoperative findings**

Variables	Clinical		Radiological		Pathological	
	N	%	N	%	N	%
No	0	0	7	12.9	1	1.9
Partly	7	12.9	10	18.5	38	70.4

Yes	47	87.1	35	64.9	38	70.4
Not Applicable (cases without imaging)	-	-	2	3.7	-	-
Not Applicable (histopathology not done)	-	-	-	-	15	27.7

Out of 54 subjects, 53 (96.3%) were treated and discharged while there was two mortality, owing to ongoing disease process and its complications, unrelated to the operative procedure (3.7%). No post-operative bleeding was found in any of the subjects. Tachycardia, localized abdominal tenderness, generalized abdominal tenderness and sepsis was reported among 9.2%, 81.6%, 5.5% and 3.7% of the subjects respectively as shown in graph 2. Average Visual Analogue Scale Score was 6 in the first 24 hours and 4 in the next 24 hours (2nd day).



**Graph 2: Post-operative complications among the study subjects**

**DISCUSSION**

Peritonitis due to hollow viscus perforation from due to various causes is quite common cause of surgical emergency and surgical intervention but it has received very less attention in the recent medical literature than any other abdominal pathologies. Because of the high mortality risk associated with multiple organ dysfunction syndrome, prompt diagnosis and treatment of hollow viscus perforation is essential. Therefore, it is essential to make a prompt diagnosis and implement a final treatment plan for this group of patients<sup>10</sup>.

Diagnostic Laparoscopy's importance in assessing intra-abdominal pathology has grown with the development of less invasive surgical techniques. Extensive review of the literature reveal only few reports on hollow viscus perforation being managed laparoscopically.

Each participant in our research reported experiencing abdominal pain. Similar finding was seen by Kesarwani et al<sup>11</sup> study and Morsy et al<sup>12</sup>.

When there is doubt about the diagnosis, laparoscopy is helpful for settling the matter once and for all. When performed for reasons other than those needing surgery, it may prevent therapeutic laparotomies from being performed unnecessarily or find an illness that does not require surgery for optimal care. In some circumstances, laparoscopy may serve as a great therapeutic and additional diagnostic tool in the

treatment of acute abdominal sickness, and as such, it has a potential to become an established part of the standard of care for this kind of illness. In 14.8 percent of cases intraoperative findings were partly comparable with the clinical diagnosis, and in 85.2 percent of cases, we found a complete agreement between our clinical diagnosis and intraoperative findings. Radiology of 68.5% of patients were completely correlated to intraoperative findings and in 13% of patients radiology and intraoperative findings was incompletely correlated. In 70.4% of cases, the intraoperative results corroborated the histological diagnosis. Therefore, the intraoperative diagnosis agreed well with the postoperative pathology report. Our study also provided an increased diagnostic accuracy as compared to clinicoradiological assessment.

Kauffman GL<sup>13</sup> found that the definitive diagnosis was made in 90% of patients after laparoscopy. Garbarino and Shimi<sup>14</sup> noticed the elevation of diagnostic accuracy of routine diagnostic laparoscopy in acute appendicitis to more than 95%. Mirabella et al<sup>15</sup> claimed that clinical diagnosis along with plain radiography has a sensitivity of 50–70% for the confirmation of pneumoperitoneum in cases of perforated peptic ulcer.

According to Babannavar et al<sup>16</sup>, USG is the preferred initial modality in the investigation of right upper quadrant pain. It is more sensitive than CT in the

diagnosis of acute cholecystitis. Moreover, Agresta and colleagues<sup>17</sup> recommended laparoscopy for the treatment of established acute cholecystitis, not for a diagnosis. This indicates a clear practical advantage and demonstrates laparoscopy as an aid to reaching a diagnosis. 88.89% cases underwent a therapeutic procedure laparoscopically, avoided a large scar and resulted in a good clinical outcome with early discharge from the hospital.

After initial laparoscopic diagnosis, Conversion to open was required in 6 patients that forms 11.11% which is in near equivalent to conversion rate 12.3% seen in study done by Ahmed et al<sup>18</sup> on 138 patients. This may be because of our learning curve and involvement of multi unit workload and their variable threshold for open conversion. Although in all the cases we were able to make a diagnosis by laparoscopy and only for therapeutic purposes did we need to convert the procedure to an open approach. Campanile et al<sup>19</sup>, the likelihood of a successful conversion increases from 9.5% if surgery is conducted after 2 days of symptom onset to 16.1% if surgery is performed within 4 days. Kucuk<sup>20</sup> reported that just 1.3 percent of their 75 laparoscopic appendectomy patients required a further, more invasive open procedure. After Laparoscopic appendectomy (LA), Agresta et al<sup>17</sup> found a conversion rate of 3.6% for all surgeries and 4.6% for severe appendicitis. Further research to isolate the factors affecting conversion to open can help in developing accurate conversion criteria.

The most common clinical diagnosis was Appendicitis with perforation reported in 68.3% of the subjects and perforation peritonitis (22.2 %) in our study. Similar results were found by Ranjeet Ravan Kadam et al<sup>21</sup> who found that appendicitis was the most prevalent clinical diagnosis, with perforation recorded in 68.3% of the individuals and perforation peritonitis in 22.2%. Specifically, acute appendicitis was the most prevalent cause of non-traumatic acute abdomen in their research (39.33%), which is consistent with the findings of studies by Ohene-yeboah M et al<sup>22</sup>. According to research by Jain et al<sup>23</sup> perforative peritonitis (39.7%) was the leading cause, followed by acute appendicitis (37.7%) and intestinal obstruction (14.2%).

Mean operative time was 49.35 (range 30-70) minutes. 2 cases (5.1%) required conversion to open surgery. There was no operative or post operative mortality. One patient was operated for duodenal ulcer. Age of patient was 32 years. In this patient suture closure with omentoplasty was performed. Operative time recorded was 85 minutes. Hospital stay was 7 days. The average operative time recorded was 72.5 (range, 40-95) minutes which is similar (range 45- 92 mins) to the study conducted by Sinha et al<sup>24</sup>.

The mean operative time required for the surgery among all study subjects was 55.25±16.28minutes. There was no evidence of postoperative bleeding in

any of the individuals. 9.2% of participants experienced tachycardia; 81.6% of respondents expressed localized abdominal soreness; 5.5% of subjects reported diffuse abdominal tenderness; 3.7% of subjects reported sepsis. These findings support laparoscopic surgery's recognized role in the surgical therapy of some instances of hollow viscus perforation.

This research assessed the intervention's clinical feasibility, safety, and effectiveness. With this sample size, it will be too early to formulate an objective assessment tool for management of hollow viscus perforation patient with laparoscopy. However, we have observed few parameters responsible for good and bad outcome.

## CONCLUSION

Diagnostic laparoscopy followed by laparoscopic therapeutic intervention whenever feasible or mini laparotomy following diagnostic laparoscopy should be the standard approach for hollow viscus perforation. The preoperative diagnostic accuracy can be increased by using modern diagnostic tools especially laparoscopy. It reduces rates of misdiagnosis. Thorough exploration of the peritoneal cavity is possible with laparoscopy.

Small incision and small scar (avoiding large midline incision in exploratory laparotomy), minimal complications like wound infection, minimal postoperative adhesions and prevention of incisional hernia are the added advantages.

The strength of our study is that we have been able to reduce the length of stay in post operative period, provided the patients with an option of a small scar and prevented complications like wound dehiscence which may occur as a result of large incisions as one of the responsible factors. We also studied a variety of cases involving different systems, traumatic injuries and demonstrated the broad application of laparoscopic procedures as a therapeutic and diagnostic tool. Limitations of our study is that a lesser number of cases have been included in the study group due to including only hemodynamically stable patients.

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