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## Role of Diagnostic Laparoscopy in Staging Gastrointestinal Malignancies to avoid Unnecessary Laparotomies: A Prospective observational study

**Dr. Darla Sai Shanmukha Gowtham, Dr. Gillellamudi Sarath Babu, Dr. Suryadevara Sailaja**

Final Year Post Graduate, Department Of General Surgery, Alluri Sitaramaraju Academy Of Medical Sciences ,Eluru-534005,Andhra Pradesh,India.

Professor, Department Of General Surgery, Alluri Sitaramaraju Academy Of Medical Sciences , Eluru-534005, Andhra Pradesh, India.

Associate professor, Department of Surgical Oncology Alluri Sitaramaraju Academy Of Medical Sciences, Eluru-534005, Andhra Pradesh, India.

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### Abstract

#### Background:

Gastrointestinal (GI) malignancies are among the most prevalent and challenging cancers in the world. Accurate staging of these cancers is critical in determining appropriate surgical interventions. Diagnostic laparoscopy (DL) has emerged as a minimally invasive tool to better stage malignancies, particularly when imaging modalities provide inconclusive results. This technique offers surgeons a direct visualization of the abdominal cavity, helping to assess resectability and avoid non-therapeutic laparotomies, thus reducing surgical morbidity and postoperative complications.

#### Methods:

In this observational study, conducted at ASRAM Medical College and Hospital from July 2022 to January 2024, 30 patients with gastrointestinal malignancies were evaluated. Patients were selected based on clinical, radiological, and histopathological suspicion of malignancy. Diagnostic laparoscopy was performed to assess the extent of tumour spread, with the primary aim of identifying unresectable disease and preventing unnecessary laparotomies. Data was collected on patient demographics, tumour characteristics, surgical outcomes, and cost effectiveness.

#### Results:

Among the 30 patients, diagnostic laparoscopy altered the treatment plan in 36% of cases, identifying unresectable disease that had not been detected by traditional imaging techniques. Laparoscopy prevented unnecessary laparotomies in 11 patients, thus significantly reducing the average hospital stay, postoperative complications, and healthcare costs.

#### Conclusion:

Diagnostic laparoscopy proves to be an effective and safe tool for staging gastrointestinal malignancies. It minimizes the need for non-therapeutic laparotomies, reduces patient morbidity, and provides a cost-effective approach to cancer management. The integration of DL into routine preoperative assessment for gastrointestinal malignancies is strongly recommended, particularly in cases where imaging results are inconclusive.

**Key words:** Diagnostic laparoscopy(DL), Gastrointestinal malignancies

## Introduction

Gastrointestinal malignancies, which include carcinomas of the stomach, pancreas, colon, and liver, represent a significant burden to global health. According to the World Health Organization (WHO), GI cancers account for more than 4 million deaths annually, making them some of the deadliest malignancies worldwide. While advancements in imaging technology have improved the ability to diagnose and stage these cancers, many patients still undergo unnecessary exploratory laparotomies that reveal unresectable disease.

Exploratory laparotomy, a traditional open surgery used to assess the abdominal cavity, carries a high risk of complications, especially in patients with advanced malignancies. For these patients, non-therapeutic laparotomies (i.e., surgeries where the tumour is found to be unresectable and no curative treatment is provided) lead to prolonged recovery times, increased healthcare costs, greater number of post-operative complications and diminished quality of life. As surgical techniques have evolved, minimally invasive approaches like diagnostic laparoscopy (DL) have gained popularity for their ability to provide direct visualization of intra-abdominal structures with fewer complications.

Diagnostic laparoscopy allows surgeons to evaluate the peritoneal cavity, assess tumour spread, and make informed decisions about the potential for resection. By avoiding unnecessary laparotomies, DL significantly reduces postoperative complications and facilitates quicker recovery for patients. This study focuses on the role of DL in staging gastrointestinal malignancies and its potential to improve patient outcomes through better surgical planning.

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## Aims and Objectives

The primary aim of this study is to evaluate the utility of diagnostic laparoscopy as a preoperative staging tool in patients with gastrointestinal malignancies, with the goal of preventing unnecessary laparotomies.

### Objectives:

1. **To determine the feasibility of diagnostic laparoscopy in detecting advanced or unresectable disease:** Evaluate the accuracy of DL in identifying metastatic or locally advanced disease that would preclude curative surgery.
2. **To assess the role of diagnostic laparoscopy in reducing non-therapeutic laparotomies**

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## Materials and Methods

### Study Design:

This was a prospective observational study conducted at ASRAM Medical College and Hospital, Eluru, from July 2022 to January 2024. The study included 30 patients diagnosed or suspected of having gastrointestinal malignancies. All patients were evaluated preoperatively using standard imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI).

**Inclusion Criteria:**

- Patients aged 18 years or older with histologically confirmed or clinically suspected gastrointestinal malignancies.
- Patients who were being considered for curative surgery (resection).

**Exclusion Criteria:**

- Patients with advanced disease clearly identified on preoperative imaging.
- Patients with malignancies of the uterus, ovaries, or cervix.
- Patients who were unfit for general anaesthesia due to underlying medical conditions.
- Patients who were unfit for Laparoscopic surgery.

**Surgical Procedure:**

Diagnostic laparoscopy was performed under general anaesthesia. After obtaining consent, patients were positioned supine on the operating table. The abdominal cavity was accessed using standard laparoscopic techniques, with trocars inserted in a manner that allowed comprehensive visualization of the peritoneal cavity, liver, omentum, and other abdominal organs. The procedure included peritoneal lavage for cytology, liver biopsy when necessary, and inspection of the diaphragm for signs of metastatic spread.

**Data Collection:**

Data were collected on patient demographics, tumour characteristics, surgical findings, and postoperative outcomes. Resectability was assessed based on the extent of tumour spread, with decisions made intraoperatively regarding the feasibility of curative resection.

**Statistical Analysis:**

All collected data were analysed and Descriptive statistics were used to summarize patient demographics, surgical outcomes, and recovery times.

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**Observation and Results**

**Patient Demographics**

The study included 30 patients (13 males and 17 females), all of whom were diagnosed or suspected of having gastrointestinal malignancies. The median age was 50 years, with the highest concentration of cases observed in the 41-50 age group.

**Table 1: Age Wise Distribution**

| Age Group<br>(Years) | Male<br>(n=13) | Female<br>(n=17) | Total<br>(n=30) |
|----------------------|----------------|------------------|-----------------|
|----------------------|----------------|------------------|-----------------|

| Age Group (Years) | Male (n=13) | Female (n=17) | Total (n=30) |
|-------------------|-------------|---------------|--------------|
| 30-40             | 4           | 5             | 9            |
| 41-50             | 5           | 8             | 13           |
| 51-60             | 4           | 4             | 8            |

The cohort included patients with a range of symptoms such as weight loss (43%), abdominal pain (37%), gastrointestinal bleeding (20%), and jaundice (27%). These symptoms, coupled with abnormal findings on clinical examination, prompted further investigation through imaging modalities such as computed tomography (CT) scans and magnetic resonance imaging (MRI). However, diagnostic uncertainty remained in 40% of the cases, necessitating and making the use of diagnostic laparoscopy (DL) as a pivotal step in staging the disease and planning further treatment path.

**Tumour Characteristics and Distribution**

Gastrointestinal malignancies diagnosed in this study were predominantly gastric and pancreatic cancers, which together accounted for 60% of all cases. Colorectal and hepatobiliary cancers were the next most common, with other malignancies making up a smaller portion of the cohort.

**Table 2: Tumour site distribution**

| Tumour Site                       | Number of Cases (n=30) | Percentage |
|-----------------------------------|------------------------|------------|
| Stomach                           | 10                     | 33%        |
| Pancreas                          | 8                      | 27%        |
| Colorectal                        | 6                      | 20%        |
| Hepatobiliary                     | 4                      | 13%        |
| Others (Oesophageal, Small Bowel) | 2                      | 7%         |

**Findings from Diagnostic Laparoscopy**

**Resectability Determined by Laparoscopy:**

Diagnostic laparoscopy identified the presence of unresectable disease in 11 patients (36%) who would otherwise have proceeded to laparotomy based on preoperative imaging findings. In these cases, DL allowed surgeons to avoid non-therapeutic laparotomies, significantly altering patient management, treatment plan and ultimately sparing them from unnecessary surgical risks and post-operative complications.

- **Resectable Disease:** In 19 patients (64%), DL confirmed that the tumours were resectable. These patients were proceeded with curative surgical interventions, including partial or total gastrectomy's, pancreatectomies, whipple procedures(pancreatico-duodenectomy), extended cholecystectomies.
- **Unresectable Disease:** DL detected unresectable conditions in 11 patients (36%), primarily due to the discovery of locally advanced tumours infiltrating adjacent structures/organs, superficial liver metastases and peritoneal carcinomatosis that had been undetected by preoperative imaging.

**Table 3: Resectable and unresectable cases**

| Resectability Status | Number of Cases (n=30) | Percentage |
|----------------------|------------------------|------------|
| Resectable           | 19                     | 64%        |
| Unresectable         | 11                     | 36%        |

**Reasons for Unresectability:**

Among the 11 patients with unresectable disease, locally advanced tumours infiltrating adjacent structures/organs along with superficial liver metastases were the most common cause, followed by peritoneal carcinomatosis. These findings were not detected in pre-operative imaging studies; hence this highlights the crucial role of diagnostic laparoscopy in identifying metastatic spread that may not be visible on radiological imaging, thereby avoiding non-therapeutic laparotomies and shifting the focus toward palliative or non-surgical treatment options.

**Table 4: Causes of unresectability**

| Cause of Unresectability                                         | Number of Cases (n=11) | Percentage |
|------------------------------------------------------------------|------------------------|------------|
| Locally advanced tumours along with Superficial Liver Metastases | 6                      | 55%        |
| Peritoneal Carcinomatosis                                        | 5                      | 45%        |

**Discussion****Diagnostic Laparoscopy as a Tool to avoid non therapeutic laparotomies**

Diagnostic laparoscopy has emerged as an essential tool for the accurate staging of gastrointestinal malignancies. This study reinforces the growing body of evidence supporting the use of DL to prevent unnecessary laparotomies, which are often associated with a greater number of post-operative complications, increased patient morbidity and higher healthcare costs.

In 36% of cases in this study, DL revealed unresectable disease that had not been identified through preoperative imaging. The most common causes of unresectability were locally advanced tumours infiltrating adjacent structures/organs along with superficial liver metastases and peritoneal carcinomatosis, both of which were detected by direct visualization through laparoscopy. These findings are consistent with other studies that have demonstrated the ability of DL to identify subtle metastatic disease that may be missed on radiological imaging.

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### **Impact on Patient Outcomes**

By reducing the number of non-therapeutic laparotomies, diagnostic laparoscopy offers numerous benefits for patient outcomes. The shorter hospital stays and faster recovery times observed after diagnostic laparoscopy demonstrate the significant advantages of minimally invasive surgery. These findings suggest that DL should be considered a routine part of preoperative assessment, particularly in cases where imaging results are ambiguous or inconclusive.

Furthermore, the lower complication rates associated with DL reflect the reduced surgical trauma compared to traditional open surgeries. The ability to quickly return patients to normal activity improves their quality of life, while also reducing the burden on healthcare resources.

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### **Economic Benefits of Diagnostic Laparoscopy**

In addition to improving clinical outcomes, diagnostic laparoscopy provides substantial economic benefits to the patients by lowering post-operative complications and reducing hospital stay. The significant cost savings observed in this study, highlight the value of minimally invasive techniques in modern surgical practice. By reducing the need for prolonged hospital stays and postoperative care, DL offers a cost-effective alternative for staging gastrointestinal malignancies.

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### **Limitations of the Study**

While this study demonstrates the efficacy of diagnostic laparoscopy in staging gastrointestinal malignancies, it is not without limitations. The relatively small sample size of 30 patients limits the generalizability of the findings. Further studies involving larger patient populations and longer follow-up periods are necessary to validate these results and assess the long-term impact of DL on survival rates.

Additionally, the reliance on diagnostic laparoscopy as the sole staging tool may overlook cases where advanced imaging techniques, such as positron emission tomography (PET), could provide complementary information. Combining DL with advanced imaging may further enhance the accuracy of staging and improve patient outcomes.

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### Future Directions

As surgical technology continues to evolve, the role of diagnostic laparoscopy in gastrointestinal malignancies is likely to expand. Usage of laparoscopic ultrasound to analyse intraoperative findings may further improve the accuracy of staging. Future research should focus on refining these techniques and exploring their potential to improve the precision of cancer surgery.

Furthermore, studies investigating the role of DL in combination with neoadjuvant therapies, such as chemotherapy and radiotherapy, may provide insights into how laparoscopy can be used to assess tumour response and optimize treatment planning.

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### Conclusion

Diagnostic laparoscopy plays a crucial role in the accurate staging of gastrointestinal malignancies. By preventing unnecessary laparotomies and improving the precision of surgical planning, DL offers significant benefits for both patients and healthcare providers. This study demonstrates that DL is a cost-effective, minimally invasive technique that reduces patient morbidity, shortens recovery time, and enhances overall surgical and clinical outcomes.

Given the growing evidence in support of its use, diagnostic laparoscopy should be considered a standard part of the preoperative assessment for patients with gastrointestinal malignancies, particularly when imaging results are inconclusive. As technology continues to advance, DL will likely become an even more integral part of cancer management, further improving patient care.

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