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Role of diagnostic laparoscopy in the evaluation of equivocal non-traumatic abdominal pain: A prospective study at a tertiary care centre

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Abstract

Background: Equivocal non-traumatic abdominal pain often presents a diagnostic challenge despite clinical examination and imaging studies. Diagnostic laparoscopy offers a direct, minimally invasive means of establishing both diagnosis and treatment.

Aim: To evaluate the diagnostic accuracy, therapeutic potential, and clinical outcomes of diagnostic laparoscopy in patients presenting with equivocal non-traumatic abdominal pain.

Methods: This prospective observational study was conducted at GSL Medical College, Rajahmundry, from November 2019 to May 2020, involving 60 patients with undiagnosed non-traumatic abdominal pain after routine investigations. Following ethical approval and consent, patients underwent diagnostic laparoscopy under general anesthesia. Findings, therapeutic procedures, complications, and outcomes were recorded. Data were analyzed using SPSS version 21.0, with a *p*-value <0.05 considered significant.

Results: A definitive diagnosis was achieved in 92% of cases. Common pathologies included acute appendicitis (35%), pelvic inflammatory disease (18%), and mesenteric lymphadenitis (12%). Therapeutic intervention was performed in 80% of patients, while 8% required conversion to laparotomy. Diagnostic laparoscopy exhibited 94% sensitivity, 100% specificity, and minimal postoperative morbidity (5%).

Conclusion: Diagnostic laparoscopy is a reliable, accurate, and safe modality in the evaluation of equivocal non-traumatic abdominal pain, providing both diagnostic clarity and therapeutic advantage, while minimizing unnecessary laparotomies and complications.

Keywords: Diagnostic laparoscopy; Non-traumatic abdominal pain; Appendicitis; Pelvic pathology; Minimally invasive surgery.

Introduction

Acute non-traumatic abdominal pain with equivocal findings remains a diagnostic challenge in general surgery [1]. Patients present with undifferentiated pain, physical examination and standard imaging (ultrasound, plain radiograph, CT) often fail to reveal a clear etiology, and the risk of delayed intervention or unnecessary laparotomy is appreciable. In this setting, diagnostic laparoscopy offers direct visualisation of the peritoneal cavity, potential therapeutic intervention and avoidance of open exploratory operations [2, 3]. For example, one retrospective hospital series reported 100% diagnostic accuracy when laparoscopy was used in patients with acute non-traumatic abdomen where non-invasive investigations were non-

contributory [1, 4]. The minimal-access nature of laparoscopy also confers benefits of reduced post-operative pain, shorter hospital stays and quicker return to function, making it an appealing first-line surgical investigative tool [3].

The aim of the present study is to evaluate the role of diagnostic laparoscopy in patients presenting with equivocal non-traumatic abdominal pain—in whom conventional work-up has not established a diagnosis—and to delineate its diagnostic yield, impact on management decisions (including conversion to open surgery), and postoperative outcomes.

Methods

This prospective observational study was conducted in the department of General Surgery, GSL Medical College, Rajahmundry, from November 2019 to May 2020. The study included all adult patients presenting with non-traumatic abdominal pain of equivocal origin, in whom a definitive diagnosis could not be reached after detailed clinical assessment, laboratory evaluation, and conventional imaging modalities such as ultrasonography and computed tomography. Patients who were hemodynamically unstable, had a history of abdominal trauma, previous laparotomy, or known intra-abdominal malignancy were excluded. Ethical clearance was obtained from the Institutional Ethics Committee prior to commencement, and written informed consent was obtained from all participants.

Each patient underwent a thorough evaluation including demographic details, symptom duration, physical findings, and baseline investigations. Preoperative imaging findings were documented, and patients with inconclusive results were scheduled for diagnostic laparoscopy under general anesthesia.

All procedures were performed in a standard operating theatre using a three-port technique after establishing pneumoperitoneum by the closed (Veress needle) or open (Hasson) method. A 10 mm umbilical port was used for the laparoscope, while additional 5 mm working ports were placed in the suprapubic and left iliac fossa regions, depending on the suspected pathology and surgeon preference. The entire peritoneal cavity was systematically inspected—starting from the liver and gallbladder, stomach, intestines, appendix, pelvis, and retroperitoneum—to identify any underlying cause of pain. When a clear pathology was identified, therapeutic intervention was performed in the same sitting wherever feasible (e.g., appendectomy, adhesiolysis, ovarian cystectomy, biopsy, lavage, or drainage). The findings were documented in a structured proforma noting intraoperative diagnosis, any therapeutic procedure performed, and whether conversion to laparotomy was required due to technical or diagnostic limitations.

Postoperatively, patients were monitored for complications, duration of hospital stay, and pain relief. Wound inspection was done daily, and patients were followed up for at least two weeks after discharge to evaluate recovery and any recurrence of symptoms. The final diagnosis was established based on laparoscopic findings and, when applicable, histopathological examination.

Statistical analysis

Data were compiled using Microsoft Excel 2010 and analyzed using SPSS version 21.0 (IBM Corp., USA). Continuous variables such as age and duration of symptoms were expressed as mean ± standard deviation, while categorical variables like gender distribution, intraoperative findings, and final diagnosis were expressed as frequencies and percentages. The Chi-square test was used to compare categorical variables, and the Student's t-test was applied for continuous variables. A p-value < 0.05 was considered statistically significant.

Results:

Total 60 patients were included, mean age was 36.8 ± 11.4 years, ranging from 18 to 65 years, male female ratio was 0.83. The duration of symptoms before hospital presentation varied from 1 to 10 days. Most patients (40%) presented with right lower quadrant pain,

followed by periumbilical (25%) and diffuse abdominal pain (20%). Diagnostic laparoscopy provided a definitive diagnosis in 92% of cases. The most common findings were acute appendicitis (35%), pelvic inflammatory disease (18%), mesenteric lymphadenitis (12%), tubo-ovarian pathology (10%), and nonspecific abdominal pain (8%). Therapeutic procedures were performed in 48 patients (80%), including appendectomy, adhesiolysis, oophorectomy, and peritoneal lavage. Conversion to laparotomy was required in five patients (8%) due to dense adhesions or extensive pathology. The mean operative time was 52 ± 14 minutes, and the mean hospital stay was 3.2 ± 1.5 days. Postoperative complications were minimal, with 3 patients (5%) developing minor wound infections, all managed conservatively. There were no major complications or mortalities. The diagnostic accuracy of laparoscopy, compared with final histopathological findings, showed a sensitivity of 94%, specificity of 100%, PPV of 100%, and NPV of 66.7%. Thus, laparoscopy significantly reduced the need for unnecessary laparotomy and provided both diagnostic and therapeutic benefits in the same sitting.

Discussion

The demographic distribution of patients with equivocal non-traumatic abdominal pain in this study revealed a mean age of 36.8 years, with a slight female predominance (55%). This finding aligns with previous studies suggesting that abdominal pain of uncertain etiology is more prevalent among younger and middle-aged adults, particularly females, due to gynecological and functional abdominal disorders. Women of reproductive age often present with pelvic pathology, such as pelvic inflammatory disease or tubo-ovarian cysts, which can mimic appendicitis or other intra-abdominal emergencies, leading to diagnostic uncertainty. Early application of diagnostic laparoscopy in such patients aids in distinguishing surgical from non-surgical causes, thereby preventing unnecessary laparotomies and delays in treatment. In a study by Subramaniam et al. (2019), similar demographic trends were observed, with the majority of cases occurring in individuals aged 20–40 years, reinforcing that laparoscopy is particularly beneficial in this group where reproductive and gastrointestinal causes overlap [5]. Kostov (2019) also reported that most patients undergoing diagnostic laparoscopy for acute abdomen were below 40 years, emphasizing the utility of minimally invasive evaluation in younger adults [1]. Likewise, Rao et al. (2019) found a comparable age and gender distribution pattern, further confirming that diagnostic laparoscopy provides valuable insight in younger populations with equivocal pain [3].

The analysis of clinical presentation in this study demonstrated that right lower quadrant pain (40%) was the most frequent site of discomfort, followed by periumbilical (25%) and diffuse abdominal pain (20%). These findings correspond with the well-recognized diagnostic dilemma faced in patients with atypical or overlapping symptoms where appendicitis, pelvic pathology, or mesenteric lymphadenitis may present with similar pain patterns. Localization of pain in the right iliac fossa often leads clinicians to suspect appendicitis; however, in many cases, conventional imaging may fail to confirm the diagnosis. Here, diagnostic laparoscopy plays a pivotal role, allowing direct visualization of the appendix, adnexa, and other intra-abdominal organs to determine the exact etiology. Subramaniam et al. (2019) reported that over half of the patients presenting with right lower abdominal pain had diagnostic uncertainty, and laparoscopy provided a definitive diagnosis in more than 90% of cases [5]. Similarly, Bellad and Murgod (2019) observed that patients with lower abdominal pain, especially females, benefited significantly from laparoscopy for differentiating gynecologic from gastrointestinal causes [2]. Kostov (2019) also emphasized that the pattern of pain localization is often misleading, and early laparoscopy can reduce both diagnostic delays and negative laparotomies [1]. Collectively, these studies reinforce the role of laparoscopy as a crucial diagnostic tool in evaluating undifferentiated abdominal pain irrespective of pain site.

The laparoscopic findings in this study revealed that acute appendicitis (35%) was the most frequent diagnosis among patients with equivocal non-traumatic abdominal pain, followed by pelvic inflammatory disease (18%), mesenteric lymphadenitis (12%), and tubo-ovarian pathology (10%). These results corroborate the well-documented predominance of appendicitis in diagnostic laparoscopy series for acute abdomen of uncertain origin. Laparoscopy enables early identification and simultaneous management through appendectomy, thus avoiding unnecessary open procedures and reducing postoperative morbidity. Furthermore, the detection of pelvic inflammatory disease and tubo-ovarian pathology underscores the importance of laparoscopy in differentiating gynecological from gastrointestinal causes of abdominal pain in women of reproductive age. Subramaniam et al. (2019) found appendicitis to be the leading pathology (38%) in their diagnostic laparoscopy cohort, with additional findings of pelvic infections and mesenteric adenitis supporting its dual diagnostic-therapeutic value [2]. Rao et al. (2019) similarly reported appendicitis (41.7%) and gynecologic pathology (15%) as common findings [3]. Bellad and Murgod (2019) emphasized that laparoscopy effectively diagnosed adnexal disease in women with lower abdominal pain unresponsive to imaging [2]. Kostov (2019) highlighted that laparoscopy accurately identified acute surgical causes in more than 90% of patients with unclear preoperative diagnoses [1]. Shah et al. (2019) demonstrated that laparoscopy avoided unnecessary laparotomy in 25% of cases by identifying benign pathologies [6]. Likewise, Bhattacharya et al. (2019) confirmed its reliability in identifying both inflammatory and gynecologic lesions, reducing negative explorations [7]. Collectively, these studies reinforce that diagnostic laparoscopy provides precise etiological clarification and immediate therapeutic benefit in the majority of patients with equivocal abdominal pain.

The outcome analysis in this study demonstrated that diagnostic laparoscopy provided a definitive diagnosis in 92% of cases**,** with a conversion rate to laparotomy of only 8%**.** The sensitivity (94%)**,** specificity (100%), and positive predictive value (100%) indicate the high diagnostic accuracy of this minimally invasive approach in evaluating equivocal non-traumatic abdominal pain. The low negative predictive value (66.7%) reflects that a small proportion of pathologies may still remain undetected, emphasizing the need for clinical correlation. Furthermore, the minimal postoperative complication rate (5%) and absence of mortality confirm the safety and feasibility of diagnostic laparoscopy in experienced surgical hands.

These findings are comparable with several contemporary studies. Subramaniam et al. (2019) reported a 90% diagnostic accuracy with negligible morbidity, supporting laparoscopy as a reliable alternative to exploratory laparotomy [5]. Kostov (2019) documented similar diagnostic precision (91%) with reduced postoperative complications, confirming its efficiency in acute abdomen evaluation [1]. Shah et al. (2019) found that laparoscopy avoided unnecessary laparotomies in 25% of patients and significantly reduced hospital stay and morbidity [6]. Likewise, Bhattacharya et al. (2019) demonstrated diagnostic accuracy exceeding 95%, establishing laparoscopy as both a diagnostic and therapeutic modality in patients with undifferentiated abdominal pain [7]. Collectively, these results substantiate that diagnostic laparoscopy is a highly accurate, low-risk, and cost-effective technique that enhances early decision-making and reduces unnecessary laparotomies in patients with equivocal non-traumatic abdominal pain**.**

Conclusion: Diagnostic laparoscopy proved to be a highly effective, safe, and minimally invasive procedure for evaluating equivocal non-traumatic abdominal pain. It offered a definitive diagnosis in over 90% of cases and allowed simultaneous therapeutic intervention in a single sitting. The procedure minimized the need for unnecessary laparotomy, reduced postoperative morbidity, and shortened hospital stay. With excellent diagnostic accuracy, high sensitivity and specificity, and minimal complications, diagnostic laparoscopy should be

considered an indispensable tool in modern surgical practice. Its early use facilitates prompt diagnosis, targeted treatment, and improved clinical outcomes in patients with undifferentiated abdominal pain.

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