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Adverse Events in Laparoscopic Appendectomy Under Spinal Anesthesia: Intraoperative and Postoperative Perspectives

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ABSTRACT

Background: Laparoscopic Appendectomy (LA) has become the preferred approach for treating acute appendicitis due to its minimally invasive nature, which leads to reduced postoperative discomfort, shorter hospital stays, and faster recovery compared to open appendectomy. This study evaluates the efficacy and safety of LA performed under spinal anesthesia in a resource-limited setting, aiming to provide insights into patient outcomes and adverse effects.

Materials and methods: This prospective observational study was conducted at Brahman Baria Medical College Hospital over a 28-month period from February 2022 to June 2024, the study included 188 patients (108 females, 80 males, mean age 25.5 years) diagnosed with acute appendicitis. Patients were selected based on specific inclusion criteria and underwent routine blood tests and ultrasound examinations.

Results: The results indicated a mean surgery time of 22.80 minutes and a mean hospital stay of 2 days. Intraoperative complications were minimal, with shoulder pain and nausea being the most common. Postoperative adverse events included nausea, vomiting, and mild shoulder pain, showcasing that while complications were present, they were generally mild and manageable.

Conclusion: The study highlights the effectiveness and safety of LA in a limited-resource environment, contrasting outcomes with those in higher-income countries, emphasizing the importance of healthcare infrastructure and technology in surgical outcomes.

KEY WORDS

Acute appendicitis; Laparoscopic appendectomy; Patient outcomes; Resource-limited settings; Spinal anesthesia.

INTRODUCTION

Laparoscopic Appendectomy (LA) has gained popularity as a surgical treatment for acute appendicitis because of its less invasive nature, reduced postoperative discomfort, shorter hospital stays and quicker recovery time than open appendectomy. One of the most frequent surgical emergencies in the world is laparoscopic appendectomy. Additionally, it can impact people of any age, children are more likely to experience it.[1] Major outcomeslike perforation and peritonitis can arise if treatment is delayed.[2] Therefore, early diagnosis and treatment depend on preventing side effects and guaranteeing a full recovery.Although the advantages of laparoscopic appendicectomy are well acknowledged, clinical interest in its efficacy and safety is still growing, especially concerning intraoperative and postoperative adverse effects.[3] Whereas they are rare, these incidents can range from minor issues like wound infections to more catastrophic outcomes including organ damage and anesthetic issues.[4-5] Comprehending these hazards is essential for enhancing patient results and directing surgical choices. Furthermore, tailoring surgical methods and preoperative preparations requires an awareness of patient-specific factors such as age, gender, Body Mass Index (BMI) and concurrent illnesses that may affect complication rates.[6]Laparoscopic Appendectomy is typically characterized clinically by pain that goes from the periumbilical region to the right iliac fossa, as well as fever, vomiting, leukocytosis and soreness at

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McBurney's point.[7] Even while these symptoms are considered common, unexpected presentations and parallels with other gastrointestinal illnesses might make diagnosis challenging. In locations with limited resources, where modern imaging modalities may not be readily available, scoring systems such as the Alvarado score have been developed to increase diagnostic accuracy.[8-9] Furthermore, preoperative examinations, such as basic blood tests and sonographic exams, are critical for verifying the diagnosis and identifying any potential contraindications to laparoscopic surgery. Laparoscopic Appendicectomy has limitations despite its many advantages.[10] Additionally, some patient conditions, such as severe obesity, appendicular abscess, or extensive peritonitis, may pose significant challenges during laparoscopic procedures, necessitating careful patient selection to lower risks.[11] The kind of anesthetic used is another crucial consideration; in some cases, spinal anesthesia is becoming a good substitute for general anesthesia.[12] Although spinal anesthetics have benefits including improved postoperative pain management, fewer airway problems, and quicker recovery, they are contraindicated in some circumstances, such as spinal anomalies, blood diseases, and excruciating back pain.Every patient was thoroughly advised of the hazards, including the possibility of being converted to general anesthesia and was asked to fill out standardized questionnaires on their surgical experience. This study intends to provide a thorough understanding of LA's impact on treatment quality and patient satisfaction by including patient perspectives.The objectives of this study are intended to close gaps in the literature by offering thorough information on the efficacy and safety of laparoscopic surgery performed under spinal anesthesia when resources are scarce.

MATERIALS AND METHODS

This prospective observational study was conducted at BrahmanBaria Medical College Hospital from February 2022 to June 2024. It was carried out according to the approval of the Hospital Ethics Committee. The study was conducted over a 28-month period where LA was performed on 188 patients (108 female and 80 male) of ASA grade I or II, who presented with acute appendicitis. Inclusion criteria included, pain in the right iliac fossa, shifting of periumbilac pain to the right iliac fossa, muscle guarding, tenderness at McBurney's point, vomiting, fever, leukocytosis and age more than 12 years and clinical scores for diagnosing Acute Appendicitis by Alvarado score.[8] All the patients had routine blood tests and a sonographic examination. Patients with generalized peritonitis, appendicular abscess or perforation, and a palpable mass, any cause of contraindication for spinal anesthesia or pneumoperitoneum, lack of cooperation, psychiatric disease, bleeding disorders, known sensibility to local or narcotic analgesics, being younger than 12 or older than 45 years of age, infection at spinal anesthesia injection site, spinal deformity or severe back pain, history of bradyarrhythmia, obesity (Body mass index > 30 kg/m^2) other major systemic illness like uncontrolled diabetes or uncontrolled hypertension, history of allergy or hypersensitivity to local anesthetics, a history of abdominal surgery, or pregnancy were excluded from the study. The patients who needed to convert the procedure to open appendicectomy were excluded from the study. All patients were informed about spinal anesthesia in detail. The patients were informed about the risk of conversion to general anesthesia and all patients provided informed consent. Simple questionnaire forms were developed so patients could comment on the operation. Data were analyzed using SPSS version 26.

RESULTS

The study found that, The mean age of patients was 25.5 years ranging from 12 to 45 years, with a mean BMI of 22.55 kg/m^2 ranging from 16.60 to 29.00 kg/m^2 (Table I). The mean age of study population is 25.5±9.25 indicating a young adult population with moderate variability in age. The male female ratio 80:108. Mean body mass index was 22.55±4.05. Mean surgery time 22.80 minutes' ±10.50 seconds. Moreover, mean total surgery time 52.10 minutes' ±16.50 seconds. Mean hospital stay was 2±1 suggesting that the procedure required a short hospitalization. The distribution of Maximal Sensorial Block (MSB) heights, presented as dermatomal levels, was, T2: 24 (12.76%) patients, T3: 143 (76.06) patients, T4: 21 (11.17%) patients. (Table I).

Intraoperative adverse events included abdominal discomfort 35 (18.61%), 28 (14.89%) Shoulder pain 51 (27.12%) Nausea/vomiting 51 (29 15.42%), hypotension 18 (9.57%) with no cases of bradycardia or respiratory complications. There were no cases of urinary retention or wound infections. Cosmetic outcomes were highly satisfactory, and all patients reported a positive operational experience at the 1-month follow-up. (Table II)

The postoperative adverse events with the most common being affecting Headache 12 (6.38%) followed by shoulder pain in 20 (10.63%) patients, and Nausea/vomiting 26 (13.82%). Notably, no cases of urinary retention were reported (0%). These findings indicate that while most adverse events were mild, nausea/vomiting and shoulder pain were more frequent,

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highlighting areas for targeted preoperative counseling and management. (Table III)

Table I Characteristics of the patients and procedure related times (n = 188)

Characteristic	Value
Age (Year)	25.5±9.25
Sex, male: Female	80:108
Body mass index (kg/m^2)	22.55±4.05
Surgery time (Min)	22.80±10.50
Total time (min)	52.10±16.20
Hospital stay (Day)	2±1
MSB, T2 :T3 :T4	24:143:21

Values are presented as mean ± standard deviation, number of patients or median (Range).

MSB, maximal sensorial block height (Dermatomal level).

Table II Intraoperative adverse events (n = 188)

Adverse event	No. (%)
Abdominal discomfort	35 (18.61)
Anxiety	28 (14.89)
Shoulder pain	51 (27.12)
Nausea/vomiting	29 15.42
Hypotension	18 (9.57)
Bradycardia	0 (0)
Respiratory discomfort/depression	0 (0)

Table III Postoperative adverse events (n = 188)

Adverse event	No. (%)
Headache	12 (6.38)
Shoulder pain	20 (10.63)
Urinary retention	0 (0)
Nausea/vomiting	26 (13.82)

DISCUSSION

In the study it reflected that the mean age of 25.5 ± 9.25 years, reflecting a young adult population with moderate age variability in Bangladesh. Similarly, another study conducted in South Africa reported a mean age of 37.9 years (Range: 13–93 years) in the non-trauma cohort, with acute appendicitis being the most common diagnosis.[13] Reflecting the various contexts of these studies, a comparative study carried out in South Africa reveals regional variations in patient demographics and medical presentations between Bangladesh and South Africa. In contrast to the South African cohort, which included an older population and more complicated surgical cases, the Bangladeshi cohort was younger, healthier and had shorter hospital stays and a lower BMI. The clinical outcomes and resource allocation strategies are impacted by regional healthcare contexts and demographic differences.

The study indicated intraoperative adverse events, including shoulder pain 27 (12%) abdominal discomfort 18 (61%) nausea/vomiting 15 (42%) anxiety 14 (89%) and hypotension 9 (57%) with no reported cases of bradycardia or respiratory complications. Postoperative issues included shoulder pain 10 (63%), nausea/vomiting 13 (82%) and headaches 6 (38%), with no instances of urinary retention or wound infections. All patients were discharged within 24 hours, with a median hospital stay of 2 days (Range 1–3). Cosmetic outcomes were highly satisfactory and all patients reported a positive operational experience during the 1-month follow-up. There was a study conducted in vietnam in the year 2010with 147 patients in three teaching hospitals, analyzed postoperative symptoms using descriptive statistics and Pearson's Product-Moment Correlation.[14] The findings identified seven symptoms occurring within three days after surgery: pain, tiredness, sleeplessness, abdominal distension, urinary retention, anxiety and dizziness. These results emphasize the need for effective management strategies to address the most problematic postoperative symptoms. The demographic parallels between Bangladesh and other Global South nations like Vietnam affect the results of surgeries. The availability of sophisticated laparoscopic equipment, qualified anesthesiologists and perioperative care facilities are only a few examples of the healthcare infrastructure constraints that both nations frequently encounter. According to our result, these limitations may result in increased rates of both intraoperative and postoperative pain.

In this study, the postoperative adverse events in Bangladesh, with nausea/vomiting 13 (82%), shoulder pain (10.63%), and headaches (6.38%) being the most common. Notably, no cases of urinary retention were reported, indicating predominantly mild adverse events. Comparatively, a study in India analyzed 634 patients with Acute Appendicitis (AA) where 418 underwent open and 216 laparoscopic appendectomies.[15] Right iliac fossa pain was the most common symptom (94.63%) and histopathological assessment revealed rates of suppurative (8.3%) and gangrenous appendicitis (2.87%). Surgical Site Infections (SSI) were reported in 23.82% of open cases but none in the laparoscopic group, highlighting the latter's lower complication rate. Postoperative durations for open and laparoscopic approaches were 4.91 ± 0.86 and 2.98 ± 0.76 days, respectively, with statistically significant differences (p = 0.04150). While open appendectomy remains effective, its higher complication rates contrast with the safer and more precise laparoscopic approach, which is increasingly favored for AA management.

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However, due to better healthcare systems, highly qualified surgical teams and technological advancements, first-world countries like the USA report far fewer problems. Among these advancements include the introduction of sophisticated laparoscopic instruments that reduce shoulder strain and diaphragmatic discomfort, such as high-definition cameras and automated insufflators.[16] Since general anesthesia eliminates the issues associated with spinal anesthesia, such as anxiety, hypotension, and inadequate muscle relaxation, it is the standard in first-world settings for laparoscopic procedures. In the USA, postoperative care has been substantially improved and postoperative problems have significantly decreased due to the widespread adoption of Enhanced Recovery After Surgery (ERAS) protocols, which prioritize early mobility, optimal pain management, and preventative measures for nausea and vomiting.[17] In addition, longer hospital stays and thorough follow-ups, including advanced imaging and laboratory diagnostics, ensure early detection and effective management of any complications, thereby contributing to better overall outcomes. Conversely, limited access to advanced laparoscopic technology and perioperative care in resource-limited settings, such as Bangladesh, increases the likelihood of complications like shoulder pain and abdominal discomfort. Moreover, resource-limited healthcare systems in countries like Bangladesh lack the capacity to implement advanced protocols like ERAS, which are standard in first-world settings. Cultural factors, such as patient anxiety and reluctance to undergo general anesthesia due to fear or traditional beliefs, further contribute to higher rates of intraoperative anxiety and discomfort. Finally, persistent investments in healthcare infrastructure, research, and training allow surgeons to use safer and more efficient procedures, resulting in improved outcomes in first-world countries. The emphasis on improved recovery methods and patient-centered care emphasizes significant disparities in outcomes between settings with ample and limited resources.

LIMITATIONS

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study provides valuable insights with positive outcomes like brief hospital stays, pleasing cosmetic results, and few complications, this study demonstrates the effectiveness and safety of laparoscopic appendectomy in settings with limited resources. Even though common side effects like nausea and vomiting and shoulder pain were noted, they were usually mild and controllable. The importance of sophisticated technologies and healthcare infrastructure in lowering complications is highlighted by comparisons with other nations. To improve results, customized preoperative counseling, improved perioperative care, and the purchase of contemporary surgical equipment are essential. It is advised that more multicenter research be conducted with bigger sample sizes in order to confirm these results and direct clinical procedures around the world.

RECOMMENDATIONS

To reduce adverse events in laparoscopic appendicectomy, within a month, doctors should arrange follow-up appointments to assess recovery and discuss any outstanding concerns. Large-scale samples can help to improve the Laparoscopic Appendicectomy results in Bangladesh. Major complications are reduced and patient safety is ensured by using a two-stage insufflation procedure and maintaining a controlled intra-abdominal pressure. However, the problems presented by spinal anesthetic limits and diaphragmatic pain underline the importance of tailoring methods to improve outcomes.

DISCLOSURE

All the authors declared no conflict of interest.

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