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COMPARATIVE STUDY OF PORT SITE INFILTRATION AND INTRA-PERITONEAL INJECTION OF BUPIVACAINE VERSUS CONVENTIONAL ANALGESICS IN POST-OPERATIVE PAIN CONTROL FOLLOWING LAPAROSCOPIC SURGERIES

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ABSTRACT

Introduction: Pain management is critical for patients undergoing laparoscopic surgery, particularly laparoscopic cholecystectomy, which can induce pain from multiple sources including incision sites, deep abdomen, and shoulder irritation..

Methods: The study spanned from January 2023 to March 2024 at SMCH, involving 40 patients. Data collected included patient demographics, surgical details, duration, hospital stay, and pain assessment using Visual Analogue Scale (VAS).

Results: Patients receiving port site and intra-peritoneal bupivacaine infiltration (Group A) exhibited a mean hospital stay of 2.55 ± 0.51 days, compared to 2.5 ± 0.51 days in those receiving conventional analgesics (Group B). Early mobilization rates were higher in Group A (55.0%) compared to Group B (45.0%). Pain scores, although similar initially, trended favorably for bupivacaine infiltration, aligning with prior studies on intraperitoneal bupivacaine efficacy.

Conclusion: Port site and intra-peritoneal bupivacaine infiltration show promise in reducing post-surgical pain following laparoscopic surgery. However, further research is essential to establish their definitive superiority over conventional analgesics.

Keywords: Laparoscopic surgery, Laparoscopic cholecystectomy, Post-surgical pain, Pain management, Bupivacaine, Port site infiltration, Intra-peritoneal injection, Visual Analogue Scale (VAS), Retrospective cohort study, Hospital stay

INTRODUCTION

Pain management is a critical aspect of care for patients undergoing laparoscopic surgery, particularly in procedures like laparoscopic cholecystectomy. These include somatic pain from incision sites, visceral pain from manipulation and insufflation within the abdominal cavity, and referred pain to the shoulder due to irritation of the phrenic nerve.

Somatic Pain: Pain at the incision sites is primarily due to tissue trauma and inflammation resulting from trocar insertion and manipulation during surgery. While it is localized and responsive to local anesthetic techniques, it can significantly impact patient comfort and recovery.

Visceral Pain: Deep abdominal pain arises from stretching of the peritoneum and visceral manipulation during the laparoscopic procedure. This type of pain tends to be diffuse and can persist post-surgically, necessitating effective pain management strategies to ensure patient well-being and facilitate early mobilization.

Shoulder Pain: Shoulder pain following laparoscopic cholecystectomy is a well-recognized phenomenon attributed to irritation of the phrenic nerve, which is commonly associated with the insufflation of carbon dioxide into the abdominal cavity. This referred pain can be intense and persistent, posing a challenge for effective pain control.

Current Pain Management Strategies

In clinical practice, several approaches are employed to manage post-surgical pain following laparoscopic cholecystectomy, each with varying degrees of effectiveness and potential side effects:

Nonsteroidal Anti-inflammatory Drugs (NSAIDs): These agents are commonly used to reduce inflammation and provide analgesia through inhibition of prostaglandin synthesis. While effective for mild to moderate pain, their use may be limited by potential gastrointestinal and renal side effects.
Local Anesthetic Wound Infiltration: This technique involves the infiltration of local anesthetics (e.g., bupivacaine) into the surgical incision sites to provide localized pain relief. It targets somatic pain directly and can reduce the need for systemic analgesics.
Intermittent Narcotic Injections: Opioids remain a cornerstone for managing moderate to severe post-surgical pain. However, their use is associated with respiratory depression, nausea, constipation, and the risk of dependence, necessitating careful dosing and monitoring.

Rationale for the Study

Despite these existing strategies, optimizing pain management following laparoscopic cholecystectomy remains an ongoing challenge. The aim of this study is to compare the efficacy of two innovative techniques—port site infiltration and intra-peritoneal injection of bupivacaine—with conventional analgesics in alleviating post-surgical pain.
Port Site Infiltration: This technique involves the administration of local anesthetics directly into the port sites used for trocar insertion. By targeting the somatic component of pain, port site infiltration aims to provide immediate and targeted pain relief.
Intra-peritoneal Injection of Bupivacaine: In contrast, intra-peritoneal injection of bupivacaine targets both somatic and visceral sources of pain within the abdominal cavity. This method aims to reduce pain originating from peritoneal stretch and visceral manipulation, potentially enhancing overall pain control.
By directly comparing these novel approaches with conventional analgesics, this study seeks to contribute valuable insights into the optimal handling of post-surgical pain following laparoscopic surgeries. The findings are expected to inform clinical practice guidelines and improve patient outcomes by minimizing pain, reducing opioid consumption, and enhancing recovery following laparoscopic cholecystectomy

METHODOLOGY

Study Design

This study will be conducted as a retrospective cohort study at SMCH from January 2023 to March 2024. The retrospective design allows for the examination of existing data from medical records, providing insights into the comparative effectiveness of pain management strategies following laparoscopic surgery.

Study Population

The research population consists of individuals who have undergone laparoscopic surgery at SMCH during the study period. This will encompass various types of laparoscopic procedures, with a focus on laparoscopic cholecystectomy due to its commonality and established post-surgical pain profile.

Sample Size

A total of 40 patients included in the study, divided into two groups:

- **Group A (Port Site and Intra-peritoneal)**: Patients who received both port site infiltration and intra-peritoneal injection of bupivacaine for post-surgical pain management.
- **Group B (Post-surgical Analgesics)**: Patients who received conventional post-surgical analgesics such as NSAIDs, opioids, or a combination thereof.

Exclusion Criteria

- Known allergies to bupivacaine or other study medications.
- Conversion from laparoscopic to open surgery.
- Development of post-surgical complications affecting pain management.
- Chronic medication users, including opioids, steroids, NSAIDs, alcohol, to avoid potential confounding effects on pain perception.
- Patients with obesity (BMI > 30) and those with multiple chronic illnesses, as these factors may influence pain outcomes.

Data Collection

- **Patient Demographics**
- Demographic data typically include variables such as age, sex, BMI, and comorbidities. These are important to describe the characteristics of the study population.
- **Surgery Duration**

- The duration of surgery, measured in minutes, provides insight into the complexity and invasiveness of the procedure.
- **Hospital Stay**
- Length of hospital stay, measured in days, reflects recovery time and potential complications post-surgery.
- **Pain Assessment (VAS Score)**
- The VAS score is a subjective measure of pain intensity, Pain scores are recorded at various time points post-surgically (e.g., immediately post-op, 6 hours, 12 hours).
- Continuable variables were compared using the independent sample t-test. Significance was defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Science Inc., Chicago, IL).

Duration of Hospital Stay

- **Group A**: Mean duration of stay = 2.55 ± 0.51 days
- **Group B**: Mean duration of stay = 3.5 ± 0.51 days

Interpretation:

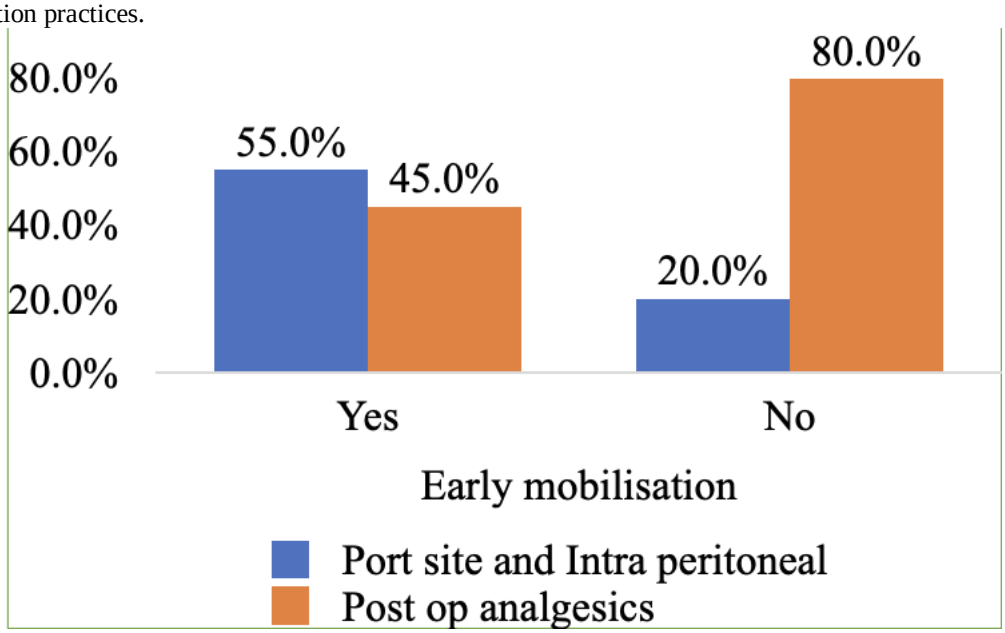
Group A had a significantly shorter mean duration of hospital stay (2.55 days) compared to those who received conventional analgesics (Group B) with a mean duration of 3.5 days. The difference of 0.95 days (approximately 23 hours) is substantial and SIGNIFICANTLY EVIDENT.

Early Mobilization Among Patients with Port Site Involvement

- Among patients with port site involvement, 55.0% underwent early mobilization.
- 45.0% of patients with port site involvement did not undergo early mobilization.

Interpretation:

Majority (55.0%) of patients with port site involvement underwent early mobilization, indicating adherence to recommended post-surgical care protocols aimed at promoting faster recovery and reducing complications. However, it's essential to consider individual patient factors and clinical decisions that might influence mobilization practices.



Baseline VAS Scores

- **Group A**: 1.62 ± 0.87
- **Group B**: 2.51 ± 1.81
- **p-value**: 0.055 (non-significant)

Interpretation:

At baseline (presumably immediately post-surgically), Group A had a mean VAS score of 1.62, while Group B had a higher mean VAS score of 2.51. The p-value of 0.055 suggests that the difference in baseline pain scores between the two groups was not significantly evident, although there seems to be a trend towards lower pain scores in Group A.

VAS Scores After 6 Hours

- **Group A**: 2.98 ± 0.99
- **Group B**: 4.58 ± 1.96
- **p-value**: 0.002 (significant)

Interpretation:

After 6 hours post-surgically, Group A had a mean VAS score of 2.98, whereas Group B had a significantly higher mean VAS score of 4.58. The p-value of 0.002 indicates a significantly evident difference in pain scores between the two groups at this time point, with Group A experiencing lower pain intensity compared to Group B.

VAS Scores After 12 Hours

- **Group A**: 3.54 ± 1.25
- **Group B**: 4.96 ± 1.51
- **p-value**: 0.002 (significant)

Interpretation:

At 12 hours post-surgically, Group A continued to show lower pain scores with a mean VAS score of 3.54, whereas Group B had a higher mean VAS score of 4.96. Similar to the 6-hour mark, the difference was significantly evident (p = 0.002), indicating better pain control in Group A compared to Group B.

VAS Scores By 14 Hours

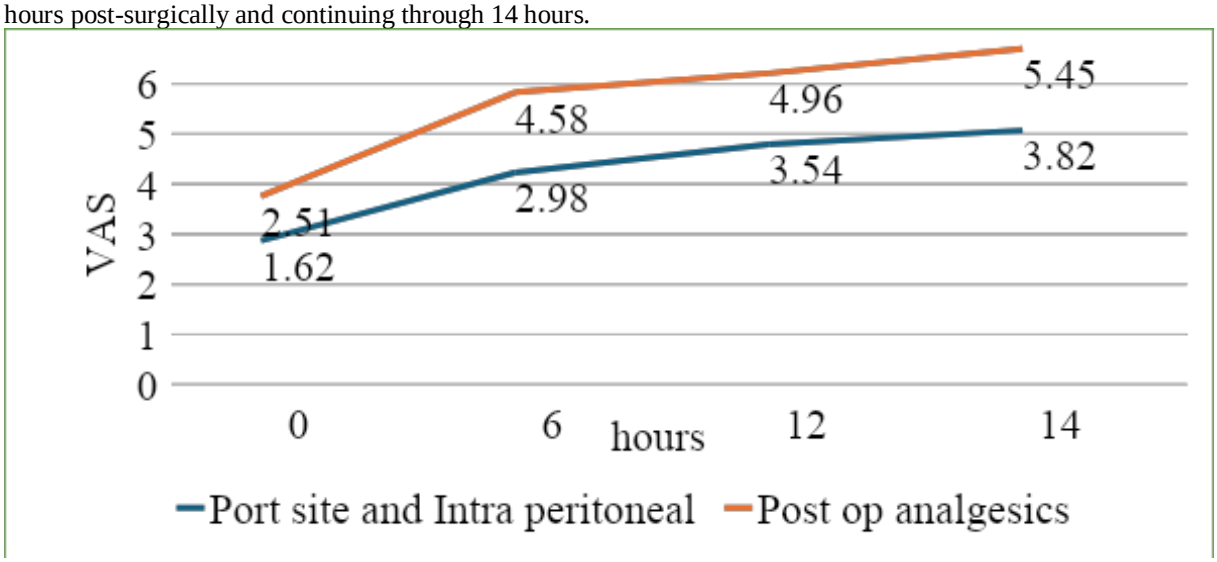
- **Group A**: 3.82 ± 1.12
- **Group B**: 5.45 ± 1.88
- **p-value**: 0.001 (significant)

Interpretation:

By 14 hours post-surgically, Group A maintained lower pain scores with a mean VAS score of 3.82, while Group B had a mean VAS score of 5.45. The difference remained significantly evident (p = 0.001), confirming sustained effectiveness of the pain management strategy in Group A compared to Group B.

Statistical Analysis

The statistical significance ($p < 0.05$) across all time points after baseline indicates that patients who received both port site infiltration and intra-peritoneal infiltration (Group A) had significantly lower VAS pain scores compared to those who received conventional analgesics (Group B). This suggests that the combined infiltration technique is more effective in managing post-surgical pain following laparoscopic surgery, starting as early as 6 hours post-surgically and continuing through 14 hours.



DISCUSSION

The efficacy of bupivacaine in alleviating postoperative pain after laparoscopic surgery has been investigated in several studies, yielding varying results. Gupta et al. and Roy et al. have reported promising outcomes with intraperitoneal instillation of local anesthetics, including bupivacaine, following laparoscopic cholecystectomy. Their findings indicate that this approach significantly reduces postoperative pain intensity and decreases the need for rescue analgesia. The rationale behind intraperitoneal administration is its direct application to the surgical site, potentially mitigating pain at the source of tissue injury.

In our study, we explored the use of port site infiltration with bupivacaine as an alternative strategy to conventional analgesics. Our results suggest that port site infiltration provides superior pain relief compared to traditional pain management protocols. This technique involves injecting bupivacaine directly around the incision sites, aiming to block nerve impulses and reduce pain transmission from the wounds.

However, conflicting evidence exists regarding the effectiveness of bupivacaine injections at the incision site. Studies examining its use specifically at the incision site for laparoscopic cholecystectomy have reported mixed findings. Some studies indicate that such injections do not lead to significant improvements in postoperative pain relief, suggesting limited efficacy compared to other methods of administration.

Moreover, in the context of laparoendoscopic single-site surgery for benign adnexal disease, bupivacaine injected at the incision site has been shown to be ineffective in reducing postoperative pain. This underscores the variability in outcomes depending on the surgical procedure and the specific application of bupivacaine.

CONCLUSION

The efficacy of bupivacaine in reducing postoperative pain after laparoscopic surgery remains a topic of debate and ongoing research. Studies by Gupta et al. and Roy et al. suggest that intraperitoneal instillation of bupivacaine can significantly reduce postoperative pain and decrease the need for rescue analgesia in laparoscopic cholecystectomy. In contrast, findings from studies examining bupivacaine injection at the incision site show mixed results, with some studies indicating no significant pain relief benefits.

Our own investigation into port site infiltration of bupivacaine demonstrated reduced pain compared to conventional analgesics, highlighting a potential alternative method for pain management in laparoscopic procedures.

However, the variability in outcomes across studies underscores the need for further research to definitively establish the superiority of bupivacaine over conventional analgesics in different surgical contexts. Future studies should focus on refining the administration techniques, dosages, and patient selection criteria to optimize pain management strategies in laparoscopic surgery.

In conclusion, while both intraperitoneal instillation and port site infiltration of bupivacaine show promise for reducing postoperative pain, continued investigation is crucial to elucidate their precise role and effectiveness in enhancing patient outcomes following laparoscopic procedures.

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