Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1281
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1281*
Original Research Article

INTRAOPERATIVE LOCAL BUPIVACAINE WOUND INFILTRATION VERSUS TRADITIONAL SYSTEMATIC ANALGESIA: A COMPARISON IN TERM OF POST-OPERATIVE PAIN

AHMAD A, ARIF A*, ATAULLAH A, MUHAMMAD F, KHAN MA

Department of Surgery, Lady Reading Hospital Medical Teaching Institute Peshawar, Pakistan
**Corresponding author`s email address:* attaarif1@yahoo.com

(Received, 04th October 2024, Revised 05th November 2024, Published 14th November 2024)

Abstract: *Effective management of post-operative pain is essential for patient recovery and satisfaction, especially in procedures like appendectomies where pain management can influence overall outcomes. Traditional systemic analgesia, while effective, often comes with side effects and limitations. Local infiltration of anesthetics like bupivacaine may provide a targeted approach to pain control with fewer systemic effects.* ***Objective:*** *To compare the effectiveness of intraoperative local bupivacaine wound infiltration versus traditional systemic analgesia in managing post-operative pain in patients undergoing appendectomies.* ***Methods:*** *This randomized controlled trial was conducted at Lady Reading Hospital, Peshawar, following approval from the hospital's Ethical Committee. A total of 60 patients, who consented and met eligibility criteria, were enrolled. All patients underwent appendectomy under general anesthesia, followed by random allocation into two groups. Group A received 0.5% bupivacaine for local wound infiltration, while Group B did not. Both groups were administered intravenous tramadol on demand, with a maximum dose of 400 mg per 24 hours. Post-operative pain was assessed using a Visual Analog Scale (VAS) at 4, 12, and 24 hours post-surgery. Stratified analysis by age and gender was also performed.* ***Results:*** *The study population (mean age: 41.13 ± 7.96 years) included 34 males (56.7%) and 26 females (43.3%). Group A (bupivacaine group) had a significantly lower mean post-operative pain score (3.33 ± 0.66) compared to Group B (systemic analgesia group) with a score of 5.30 ± 0.95 (p=0.00). Age-based stratification revealed significant differences: among 22-30-year-olds, Group A scored 3.00 versus 6.00 in Group B (p=0.00); for 31-50-year-olds, Group A scored 3.36 compared to 5.33 in Group B (p=0.00); and for those over 50, scores were 3.33 in Group A and 4.50 in Group B (p=0.04). Both male and female patients in Group A experienced significantly lower pain scores compared to Group B (p=0.00 for both).* ***Conclusion:*** *Intraoperative bupivacaine wound infiltration significantly reduces post-operative pain in appendectomy patients compared to traditional systemic analgesia. These findings support its use as an effective pain control method. Further research is recommended to optimize dosing and assess the combined use with other analgesics to enhance pain management across various surgical procedures.*

Keywords: Intraoperative Bupivacaine, Pain, Systematic Analgesia

Introduction

Post-operative pain management is a critical component of patient care following surgery, impacting recovery, patient satisfaction, and overall outcomes.(1, 2) Traditionally, systemic analgesics such as opioids and nonsteroidal anti-inflammatory drugs (NSAIDs) have been the mainstay for pain relief.(3-5) However, these methods carry risks of systemic side effects, such as respiratory depression, gastrointestinal disturbances, and potential dependency, especially in cases of opioid use. With an increasing focus on minimizing these adverse effects, there has been a shift towards exploring more localized pain management approaches. Wound infiltration (WI) with local anesthetics (LA) serves as the primary anesthetic for minor surgeries, including laceration repairs, skin surgeries, and the treatment of painful oral or genital lesions.(6) Additionally, it can be used to supplement general anesthesia in various types of surgical procedures.(6) Following surgery under general anesthesia, patients typically experience peak pain within the first 9 to 12 hours postoperatively.(7)

This study aims to compare the effectiveness of intraoperative local bupivacaine wound infiltration with traditional systemic analgesia in managing post-operative pain. By evaluating pain levels, analgesic consumption, and potential side effects, this research seeks to determine whether local infiltration offers superior pain control and an improved post-operative experience for patients.

Objective: To compare the intraoperative local bupivacaine wound infiltration versus traditional systematic analgesia in term of post-operative pain in case of appendectomies.

Methodology

This study was designed as a randomized controlled trial, conducted in the Department of Surgery, Surgical C Ward, at MTI/Lady Reading Hospital Peshawar. The study spanned three months, from July to September 2024. The sample size calculation was conducted using the WHO sample size calculator, setting the significance level at 5% and test power at 90%, with a pooled standard deviation of 1.15. The population mean was estimated at 2, and an anticipated population mean of 3.7 was applied. Based on these parameters, a sample size of 60 participants was established.

Non-probability consecutive sampling was employed to recruit participants, involving patients clinically diagnosed

[Citation Ahmad, A., Arif, A., Ataullah, A., Muhammad, F., Khan, M.A. (2024). Intraoperative local bupivacaine wound infiltration versus traditional systematic analgesia: a comparison in term of post-operative pain. *Biol. Clin. Sci. Res. J.*, **2024***: 1281*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1281]

with appendicitis, aged between 16 and 50, from both genders. Exclusion criteria included patients with known allergies to tramadol or bupivacaine, those requiring general anesthesia, and those with an ASA (American Society of Anesthesiologists) Physical Status classification of III.After obtaining approval from the Ethical Committee of Lady Reading Hospital, Peshawar, patients who were diagnosed and met the inclusion criteria provided written informed consent, either personally or through a guardian. Each patient underwent a detailed history review and a thorough physical examination. A total of 60 patients who presented to our facility were enrolled. Patients were instructed to fast, and preoperative antibiotics were administered. Under general anesthesia, a small incision was made in the lower right abdomen, tissues were retracted, and the appendix was located and isolated, clamped at its base, excised from the cecum, and secured with sutures. Patients were randomized into two groups using the blocked randomization method: Group A received 0.5% bupivacaine for local wound infiltration, while Group B did not receive local infiltration. Both groups received intravenous tramadol on demand, up to a maximum of 400 mg within 24 hours, to manage postoperative pain. Pain outcomes were assessed using a visual analogue scale (VAS), with scores ranging from 0 (no pain) to 10 (worst possible pain), at 4, 12, and 24 hours post-surgery.

The collected data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) Version 25 software. Results for all descriptive data, such as age, were expressed as mean ± standard deviation. Frequency and percentage were presented for qualitative data like gender. Both the groups were compared for postoperative pain using an independent sample T-test at a 5% level of significance. Postoperative pain was stratified by age and gender, and a post-stratification independent sample T-test was used at a 5% level of significance.

Results

A total of 60 patients with mean age of 41.13±7.96 years, were enrolled. The number of male patients were 34(56.7%) and that female patients were 26(43.3%). The distribution of age groups among the participants was as follows: 3 individuals (5.0%) were in the 22-30 years age group, 49 individuals (81.7%) were in the 31-50 years age group, and 8 individuals (13.3%) were aged over 50 years (Table 1). Group A (n=30) reported a mean post-operative pain score of 3.33 ± 0.66, while Group B (n=30) had a mean score of 5.30 ± 0.95 with a p-value of 0.00 (Table 2). The stratification of post-operative pain based on gender and age groups among the 60 participants revealed significant differences between Group A (n=30) and Group B (n=30). In the 22-30 years age group, Group A reported a mean pain score of 3.00 ± 0.00, while Group B had a score of 6.00 ± 0.00, with a p-value of 0.00. For the 31-50 years age group, Group A's mean pain score was 3.36 ± 0.726 compared to 5.33 ± 0.960 in Group B, also with a p-value of 0.00. In those over 50 years, Group A had a mean score of 3.33 ± 0.516, while Group B reported 4.50 ± 0.707, yielding a p-value of 0.04. Regarding gender, males in Group A reported a mean pain score of 3.27 ± 0.66, while males in Group B had a score of 5.25 ± 1.06 (p-value 0.00). Females in Group A reported a mean pain score of 3.41 ± 0.66, whereas those in Group B had a score of 5.35 ± 0.84, with a p-value of 0.00, indicating significant differences in post-operative pain across both age and gender categories (Table 3).

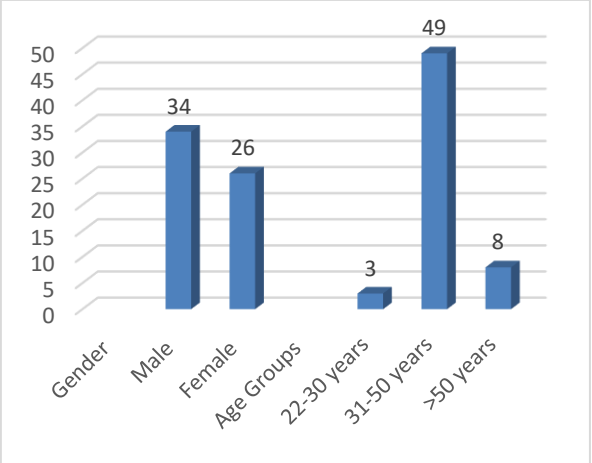

Figure 1: Frequency of patients on the basis of gender and age groups.

Table 1: Patient characteristics of enrolled patients (n=60)

Variables	
Age (Years)	41.13±7.96
Gender	
Male	34(56.7%)
Female	26(43.3%)
Age Groups	
22-30 years	3(5.0%)
31-50 years	49(81.7%)
>50 years	8(13.3%)

Table 2: Post-operative pain of both groups (n=60)

	Group A (n =30)	Group B (n =30)	p-value
Post-operative pain	3.33± 0.66	5.300±0.952	0.00

Table 3: Stratification of pain on the basis of gender and Age Groups (n=60)

	Group A (n = 30)	Group B (n = 30)	p-value
Age Groups			
22-30 years	3.00±0.00	6.00±0.00	0.00
31-50 years	3.36±0.726	5.33±0.960	0.00
>50 years	3.33±0.516	4.50±0.707	0.04
Gender			
Male	3.27±0.66	5.25±1.06	0.00
Female	3.41±0.66	5.35±0.84	0.00

Discussion

The comparative effectiveness of intraoperative local bupivacaine wound infiltration versus traditional systemic analgesia in managing post-operative pain offers valuable

[Citation Ahmad, A., Arif, A., Ataullah, A., Muhammad, F., Khan, M.A. (2024). Intraoperative local bupivacaine wound infiltration versus traditional systematic analgesia: a comparison in term of post-operative pain. *Biol. Clin. Sci. Res. J.*, **2024***: 1281*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1281]

insights into optimizing pain control and improving patient outcomes after surgery. Our findings suggest that local bupivacaine infiltration can provide effective, targeted pain relief, often with reduced reliance on systemic analgesics and their associated risks. Local bupivacaine infiltration works by delivering the anesthetic directly to the surgical site, where it blocks nerve conduction and reduces pain perception in the immediate area.(8, 9) Studies have shown that this approach can significantly decrease the intensity of pain experienced in the early postoperative period, particularly within the first 9 to 12 hours when pain is typically at its peak.(6, 10) The analysis of post-operative pain scores between Group A and Group B reveals a significant difference in pain levels experienced by patients. Group A, which received the intervention of interest, reported a mean post-operative pain score of 3.33 ± 0.66, compared to a higher mean pain score of 5.30 ± 0.95 in Group B. The p-value of 0.00 indicates a statistically significant difference between the two groups, suggesting that the intervention used in Group A was effective in reducing post-operative pain compared to the method applied in Group B. These findings underscore the clinical relevance of the pain management approach used in Group A, as patients in this group experienced substantially lower pain levels. Our study was supported by the study conducted by William Newcomb et al.(11) Several another studies conducted by Reetika Chander et.(12) and Manuel Luque Oliveros et al.(13) Also supported our study finding. Numerous studies have focused on identifying effective drugs for managing pain. Narcotics have long been the cornerstone of post-operative pain control, with morphine considered the standard medication, despite its associated side effects.

Despite these benefits, local bupivacaine infiltration is not without limitations. The duration of action for bupivacaine, while relatively long for a local anesthetic, may not provide complete pain relief throughout the entire postoperative period. Some patients may still require supplemental systemic analgesia once the effect of the local infiltration diminishes. This limitation highlights the need for multimodal pain management strategies that combine local infiltration with other analgesics to ensure continuous and comprehensive pain control.

Moreover, while the procedure for local wound infiltration is relatively simple and can be performed by the surgical team, there is still variability in outcomes depending on factors such as the precise site of infiltration, dosage, and patient-specific factors like pain tolerance and individual response to local anesthetics. Standardizing techniques and dosing protocols could help enhance the reliability of bupivacaine infiltration as an effective pain management approach.

Conclusion

It was concluded that patients who received bupivacaine infiltration reported significantly lower pain scores in the critical early post-operative period compared to those who received only systemic analgesics. This provides effective localized pain relief, minimizes the need for systemic opioids, and reduces the risk of their associated side effects, including nausea, respiratory depression, and dependency. Bupivacaine infiltration offers a more targeted approach to pain control, which not only enhances patient comfort but also facilitates quicker recovery and mobilization. While local infiltration may not eliminate the need for additional analgesia entirely, it represents a valuable component in multimodal pain management strategies aimed at optimizing patient outcomes.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-TCH-232/24)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

ASHFAQ AHMAD (Team C)
Coordination of collaborative efforts.
Study Design, Review of Literature.
ATTAULLAH ARIF (Associate Professor)
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
Conception of Study, Final approval of manuscript.
AAHAN ATAULLAH (Team C)
Manuscript revisions, critical input.
Coordination of collaborative efforts.
FASEEH MUHAMMAD (Team C)
Data acquisition, analysis.
Manuscript drafting.
MUHAMMAD ARSAL KHAN (Team C)
Data entry and Data analysis, drafting article.
Data acquisition, analysis.

References

1. Meissner W, Huygen F, Neugebauer EA, Osterbrink J, Benhamou D, Betteridge N, et al. Management of acute pain in the postoperative setting: the importance of quality indicators. Current medical research and opinion. 2018;34(1):187-96.
2. Small C, Laycock H. Acute postoperative pain management. Journal of British Surgery. 2020;107(2):e70-e80.
3. Bach-Rojecky L, Vađunec D, Žunić K, Kurija J, Šipicki S, Gregg R, et al. Continuing war on pain: a personalized approach to the therapy with nonsteroidal anti-inflammatory drugs and opioids. Personalized medicine. 2019;16(2):171-84.
4. Brogan SE, Mandyam S, Odell DW. Nonopioid analgesics. Pharmacology and Physiology for Anesthesia: Elsevier; 2019. p. 369-89.

5. Hebbes C, Lambert D. Non-opioid analgesic drugs. Anaesthesia & Intensive Care Medicine. 2008;9(2):79-83.
6. Stamenkovic DM, Bezmarevic M, Bojic S, Unic-Stojanovic D, Stojkovic D, Slavkovic DZ, et al. Updates on wound infiltration use for postoperative pain management: a narrative review. Journal of clinical medicine. 2021;10(20):4659.
7. De Cassai A, Bonanno C, Sandei L, Finozzi F, Carron M, Marchet A. PECS II block is associated with lower incidence of chronic pain after breast surgery. The Korean journal of pain. 2019;32(4):286-91.
8. Abrão J, Antunes M, Vicente Garcia L. Local anesthetics infiltration and wound healing process. Topics in Local Anesthetics. 2020;119.
9. Jankovic D. Regional nerve blocks and infiltration therapy: Textbook and color atlas: John Wiley & Sons; 2008.
10. Ilfeld BM, Eisenach JC, Gabriel RA. Clinical effectiveness of liposomal bupivacaine administered by infiltration or peripheral nerve block to treat postoperative pain: a narrative review. Anesthesiology. 2021;134(2):283-344.
11. Newcomb W, Lincourt A, Hope W, Schmelzer T, Sing R, Kercher K, et al. Prospective, double-blinded, randomized, placebo-controlled comparison of local anesthetic and nonsteroidal anti-inflammatory drugs for postoperative pain management after laparoscopic surgery. The American Surgeon. 2007;73(6):618-24.
12. Chander R, Liddle D, Kaur B, Varghese M. Wound infiltration with plain bupivacaine as compared with bupivacaine fentanyl mixture for postoperative pain relief after abdominal surgery. Anesthesia Essays and Researches. 2011;5(2):142-6.
13. Luque Oliveros M, Morilla Romero de la Osa R. Bupivacaine infiltration for acute postoperative pain management after cardiac surgery. Nursing in Critical Care. 2022;27(2):223-32.

[Citation Ahmad, A., Arif, A., Ataullah, A., Muhammad, F., Khan, M.A. (2024). Intraoperative local bupivacaine wound infiltration versus traditional systematic analgesia: a comparison in term of post-operative pain. *Biol. Clin. Sci. Res. J.*, **2024***: 1281*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1281]