MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2023.12.251.255

OPEN ACCESS

Key Words
Postoperative analgesia, infraumbilical surgery, hyperbaric bupivacaine, ropivacaine

Corresponding Author
Madhuri Rohan Patil,
Department of Anaesthesia, Government Medical College, Jilla Peth, Jalgaon 425001, India
yogitabavaskar@gmail.com

Author Designation
[1,2,5]Associate Professor
[2]Proffesor and HOD
[4]Assistant Professor

Received: 22 November 2023
Accepted: 27 November 2023
Published: 30 November 2023

Citation: Amit Ananda Hiwarkar, Surekha Chavan, Rajesh Subhedar, Madhuri Patil and Yogita Bavaskar, 2023. Duration of Postoperative Analgesia: A Cross-Sectional Comparison between Hyperbaric Bupivacaine and Ropivacaine in Infraumbilical Surgeries. Res. J. Med. Sci., 12: 251-255, doi: 10.59218/makrjms.2023.12.251.255

Duration of Postoperative Analgesia: A Cross-Sectional Comparison between Hyperbaric Bupivacaine and Ropivacaine in Infraumbilical Surgeries

[1]Amit Ananda Hiwarkar, [2]Surekha Chavan, [3]Rajesh Subhedar, [4]Madhuri Rohan Patil and [5]Yogita Bavaskar

Department of Anaesthesia, Government Medical College, Jilla Peth, Jalgaon-425001, India.

Department of Community Medicine, Government Medical College, Jalgaon, India.

ABSTRACT

Effective postoperative pain management is crucial for patient recovery, especially in infraumbilical surgeries. Hyperbaric bupivacaine and ropivacaine are widely used anesthetics but their comparative efficacy in terms of duration of analgesia is not well-established. This study aims to compare the duration of postoperative analgesia provided by these two agents. To evaluate and compare the duration of postoperative analgesia between hyperbaric bupivacaine and ropivacaine in patients undergoing infraumbilical surgeries. In this cross-sectional study, 200 patients undergoing infraumbilical surgeries were randomly assigned to receive either hyperbaric bupivacaine or ropivacaine. The primary outcome was the duration of postoperative analgesia, measured by the time until the first request for additional pain relief. Secondary outcomes included pain intensity scores and the incidence of side effects. The study found that patients receiving hyperbaric bupivacaine experienced a significantly longer duration of postoperative analgesia compared to those receiving ropivacaine. The average time to first analgesic request was longer in the bupivacaine group. Pain intensity scores were similar in both groups and no significant differences in side effects were observed. Hyperbaric bupivacaine provides a longer duration of postoperative analgesia compared to ropivacaine in infraumbilical surgeries, which may be beneficial for patient comfort and reducing the need for additional pain medication. These findings suggest that hyperbaric bupivacaine could be a preferred choice for postoperative pain management in these surgeries.

INTRODUCTION

Postoperative pain management is a critical component of patient care, particularly after infraumbilical surgeries. Effective analgesia not only ensures patient comfort but also facilitates quicker recovery and reduces the likelihood of chronic pain development[1]. Among the various agents used for postoperative pain relief, local anesthetics like hyperbaric bupivacaine and ropivacaine are frequently employed due to their efficacy and safety profiles[2].

Hyperbaric bupivacaine, known for its prolonged anesthetic effect, has been widely used in spinal anesthesia for abdominal surgeries[3]. Its hyperbaric nature allows for a more targeted and controlled spread of anesthesia, which is crucial in infraumbilical procedures[4]. On the other hand, ropivacaine a newer agent is preferred by some clinicians due to its reduced cardiotoxicity and motor blockade, making it a safer option in certain patient populations[5].

However, despite their widespread use, there is limited data directly comparing the duration of analgesia between hyperbaric bupivacaine and ropivacaine specifically in the context of infraumbilical surgeries. Understanding the comparative efficacy of these drugs is essential for optimizing postoperative pain management strategies[6].

Aim: To comprehensively compare and evaluate the duration of postoperative analgesia provided by hyperbaric bupivacaine and ropivacaine in patients undergoing infraumbilical surgeries.

Objectives:

- To precisely measure and compare the duration of effective postoperative analgesia provided by hyperbaric bupivacaine and ropivacaine in patients undergoing infraumbilical surgeries
- To assess the safety and side effect profiles of hyperbaric bupivacaine and ropivacaine when used in infraumbilical surgeries
- To evaluate the impact of analgesic effectiveness on overall patient satisfaction and recovery outcomes

MATERIALS AND METHODS

Study design: This study is a cross-sectional comparative analysis conducted at a single tertiary care center. The aim is to compare the duration of postoperative analgesia between hyperbaric bupivacaine and ropivacaine in infraumbilical surgeries.

Participants: A total of 200 patients scheduled for elective infraumbilical surgeries were included.

Inclusion criteria: Patients aged 18-65 years, ASA (American Society of Anesthesiologists) physical status I or II, scheduled for infraumbilical surgery under spinal anesthesia.

Exclusion criteria: Patients with allergies to local anesthetics, chronic pain conditions, opioid tolerance, or contraindications to spinal anesthesia.

Randomization and blinding: Patients were randomly assigned in a 1:1 ratio to receive either hyperbaric bupivacaine or ropivacaine. Randomization was performed using computer-generated random numbers. Both the patients and the evaluators assessing outcomes were blinded to the group allocation.

Intervention: Group A (n = 100) received hyperbaric bupivacaine 0.5% and Group B (n = 100) received ropivacaine 0.75% intrathecally. The volume and concentration of the anesthetics were standardized according to body weight and surgical requirements.

Assessment of analgesia duration: The primary outcome measured was the duration of postoperative analgesia, defined as the time from administration of the spinal anesthetic to the first request for pain medication. Pain scores were assessed using the Visual Analog Scale (VAS) at regular intervals postoperatively.

Safety and side effects monitoring: Patients were monitored for any immediate side effects during and after the surgery, including hypotension, bradycardia, nausea or neurological symptoms. Adverse events were recorded and analyzed for both groups.

Statistical analysis: Data were analyzed using appropriate statistical tests (e.g., t-test, chi-squared test) depending on the type of data. A p-value of less than 0.05 was considered statistically significant. Statistical software SPSS 21.0 was used for data analysis.

Ethical considerations: The study protocol was approved by the Institutional Review Board. Informed consent was obtained from all participants. The study was conducted in accordance with the Declaration of Helsinki.

OBSERVATION AND RESULTS

Table 1 presents a comparative analysis of the duration of postoperative analgesia between the two drugs. Hyperbaric Bupivacaine shows a higher mean duration of analgesia at 181.79 minutes with a standard deviation of 30.39, compared to Ropivacaine, which has a mean duration of 152.46 min and a standard deviation of 31.20. The differences in analgesia duration between the two drugs were statistically significant, as indicated by an independent t-test value of 6.73 and a p-value of less than 0.05. This suggests that hyperbaric bupivacaine provides a longer

Table 1: Comparison of postoperative analgesia duration: Hyperbaric bupivacaine vs. Ropivacaine in infraumbilical surgeries

Drug	Mean duration (min)	Standard deviation
Hyperbaric bupivacaine	181.79	30.39
Ropivacaine	152.46	31.20

Independent t-test: 6.73 p<0.05 Significant

Table 2: Safety and side effect profiles in infraumbilical surgeries: Hyperbaric bupivacaine vs. Ropivacaine

Drug	Side Effects n(%)
Hyperbaric Bupivacaine	17 (17.00)
Ropivacaine	21 (21.00)

Z-Statistic: 0.933 p-Value: 0.527 Not Significant

Table 3: Patient satisfaction and recovery outcomes: Hyperbaric bupivacaine vs. Ropivacaine in infraumbilical surgeries

Drug	Patient satisfaction n(%)
Hyperbaric bupivacaine	85 (85.00)
Ropivacaine	72 (72.00)

Independent t test: 2.255; p<0.05; Significant

statistically significant, as indicated by an independent t-test value of 6.73 and a p-value of less than 0.05. This suggests that hyperbaric bupivacaine provides a longer duration of postoperative analgesia compared to ropivacaine in patients undergoing infraumbilical surgeries.

Table 2 compares the incidence of side effects between the two anesthetic drugs. In the study, 17% of patients administered with Hyperbaric Bupivacaine experienced side effects, while a slightly higher percentage of 21% was observed in patients receiving Ropivacaine. However the difference in the incidence of side effects between the two drugs was not statistically significant, as indicated by a Z-statistic of 0.933 and a p-value of 0.527. This suggests that both Hyperbaric Bupivacaine and Ropivacaine have similar safety profiles with respect to the occurrence of side effects in infraumbilical surgeries.

Table 3 presents a comparison of patient satisfaction levels between the two drugs. It shows that a higher percentage of patients (85%) were satisfied with the postoperative analgesia and recovery outcomes when treated with Hyperbaric Bupivacaine, compared to 72% satisfaction among those who received Ropivacaine. The difference in patient satisfaction rates between the two groups is statistically significant, as indicated by an independent t-test value of 2.255 and a p-value of less than 0.05. This suggests that Hyperbaric Bupivacaine may be more effective in terms of patient satisfaction and recovery outcomes in infraumbilical surgeries compared to Ropivacaine.

DISCUSSIONS

The findings from Table 1, which compares the duration of postoperative analgesia between Hyperbaric Bupivacaine and Ropivacaine in infraumbilical surgeries, can be discussed in the context of existing literature. The table shows that Hyperbaric Bupivacaine has a significantly longer mean duration of analgesia (181.79 min) compared to Ropivacaine (152.46 min) with a statistical significance indicated by an independent t-test value of 6.73 and a p-value of less than 0.05. This result aligns with the findings of Oraon *et al.*[5] who reported that hyperbaric bupivacaine generally provides a longer duration of analgesia due to its higher lipid solubility and slower systemic absorption. In contrast the shorter duration of analgesia with ropivacaine, as observed in this study, is consistent with the findings of Anant *et al.*[6] who noted that ropivacaine, while safer in terms of cardiotoxicity, tends to have a shorter duration of action.

Furthermore, Goyal *et al.*[7] highlighted that the duration of analgesia is an important factor in patient recovery, as longer-lasting analgesia can reduce the need for additional pain medication and improve patient comfort. The significant difference in the duration of analgesia between these two drugs, as demonstrated in this study, is thus clinically relevant. However, it is important to balance these findings with the broader clinical context. As Kore Shilpa *et al.*[8] pointed out the choice of anesthetic should also consider patient-specific factors and potential side effects. While hyperbaric bupivacaine offers a longer duration the overall clinical decision should also account for individual patient tolerance and safety profiles.

The data presented in Table 2, which compares the safety and side effect profiles of Hyperbaric Bupivacaine and Ropivacaine in infraumbilical surgeries, show similar rates of side effects between the two drugs 17% for Hyperbaric Bupivacaine and 21% for Ropivacaine. The lack of a statistically significant difference, as indicated by a Z-statistic of 0.933 and a p-value of 0.527, suggests that both anesthetics have comparable safety profiles in this context.

This finding is consistent with the research conducted by Lee *et al.*[9] who reported that both hyperbaric bupivacaine and ropivacaine have similar safety profiles when used in lower abdominal surgeries. Their study emphasized the importance of monitoring for specific side effects such as hypotension and bradycardia but found no significant differences between the two anesthetics.

Additionally a study by Nag *et al.*[10] focused on the overall tolerability of local anesthetics in various surgical procedures. They noted that while certain anesthetics might have specific side effect profiles the overall incidence of adverse reactions tends to be similar across different agents when used in standard dosages. However, it's important to note that the safety of an anesthetic agent is not solely determined by the incidence of side effects. As highlighted by Nagwekar *et al.*[11] factors such as patient demographics, surgical duration and individual patient

sensitivities play a crucial role in determining the appropriateness of an anesthetic. Therefore, while the side effect profiles of Hyperbaric Bupivacaine and Ropivacaine may be similar the choice of anesthetic should consider these additional factors.

Table 3, highlighting patient satisfaction and recovery outcomes in infraumbilical surgeries when using Hyperbaric Bupivacaine versus Ropivacaine, reveals a significantly higher satisfaction rate with Hyperbaric Bupivacaine (85%) compared to Ropivacaine (72%). The statistical significance of this difference is underscored by an independent t-test value of 2.255 and a p-value of less than 0.05. This observation aligns with the findings of Agarwal *et al.*[12] who noted that longer-lasting analgesics, such as hyperbaric bupivacaine, often correlate with higher patient satisfaction due to prolonged pain relief and reduced need for additional pain medication. This improvement in patient comfort can significantly impact overall satisfaction with the surgical experience.

Hasaraddi *et al.*[13] also supports this result, suggesting that the pharmacological properties of ropivacaine, while advantageous in terms of safety, may not provide as long-lasting analgesia as bupivacaine, potentially leading to earlier pain onset post-surgery and lower satisfaction scores. However, it's important to balance these findings with broader clinical considerations. As Vasanth *et al.*[14] point out, patient satisfaction is multifactorial and can be influenced by various aspects of the surgical and postoperative experience, not just the choice of analgesic. This includes factors like the quality of overall care, patient education about pain management and individual pain tolerance levels.

CONCLUSION

Efficacy in pain management: The study clearly demonstrated that hyperbaric bupivacaine provides a significantly longer duration of postoperative analgesia compared to ropivacaine in infraumbilical surgeries. This was evidenced by the longer mean duration of analgesia in patients who were administered hyperbaric bupivacaine.

Patient satisfaction: Higher patient satisfaction was observed in the group receiving hyperbaric bupivacaine. This could be attributed to the extended duration of pain relief, reducing the need for additional analgesics post-surgery and contributing to a more comfortable recovery process.

Safety and side effects: In terms of safety and side effects, both drugs demonstrated similar profiles, with no significant differences in the incidence of side effects. This suggests that both hyperbaric bupivacaine and ropivacaine are safe options for infraumbilical surgeries, considering their respective side effect incidences.

Clinical implications: The findings of this study have important implications for clinical practice. The choice between hyperbaric bupivacaine and ropivacaine for postoperative analgesia should consider not only the duration of analgesia but also patient preferences, individual medical histories and specific surgical contexts. While hyperbaric bupivacaine offers the advantage of prolonged pain relief, ropivacaine remains a viable option, especially in scenarios where its safety profile might be more suitable.

Recommendations for future research: Further studies are recommended to explore long-term outcomes, patient satisfaction in different surgical contexts and the effectiveness of these anesthetics across diverse patient demographics. Additionally, research focusing on optimizing dosages for individual needs could further enhance postoperative pain management strategies. In conclusion, this study contributes valuable insights into the comparative effectiveness of hyperbaric bupivacaine and ropivacaine in managing postoperative pain in infraumbilical surgeries, with implications for enhancing patient care and recovery experiences.

Limitations of Study

Cross-sectional design: As a cross-sectional study the research captures data at a single point in time. This design limits the ability to assess long-term outcomes and changes in patient conditions over time, which can be crucial in understanding the full impact of postoperative analgesia.

Single center study: The study being conducted at a single tertiary care center may limit the generalizability of the findings. Different centers may have varying protocols, patient demographics and surgical techniques, which can influence the effectiveness and safety profiles of the anesthetics.

Sample size and demographics: Although the sample size of 200 is substantial, it may not fully represent the broader patient population. Additionally the study may have limited demographic diversity, which can affect the applicability of the results to different groups, including varying ages, genders and ethnicities.

Patient-specific factors: The study may not adequately account for patient-specific factors such as previous medical history, individual pain thresholds and pre-existing conditions that can influence the effectiveness of analgesia and patient satisfaction.

Subjectivity in pain measurement: The assessment of pain and patient satisfaction is inherently subjective and can be influenced by individual patient perceptions, potentially introducing bias in the evaluation of analgesic effectiveness.

Variability in surgical procedures: Infraumbilical surgeries encompass a range of procedures that may differ in complexity and duration. This variability could impact the analgesic requirements and recovery profiles, which the study might not fully address.

Dosage and administration protocols: The study might have standardized dosages and administration methods for the drugs, which may not reflect the variety of practices in different clinical settings. This can impact the extrapolation of the study's findings to routine clinical practice.

Lack of longitudinal follow-up: The absence of longitudinal follow-up restricts insights into potential long-term effects, such as the development of chronic pain or the long-term impact on quality of life.

REFERENCES

1. Ahmad, M.S., S.A. Haider, A. Adnan, A. Sultan, M.S. Saleemi and U. Khan, 2022. Comparison of dexmedetomidine plus bupivacaine versus bupivacaine alone for spinal anesthesia in patients undergoing abdominal hysterectomy. Pak. Armed. Forces. Med. J., 72: 1908-1911.
2. Andres, J.D., S. Hayek, C. Perruchoud, M.M. Lawrence and M.A. Reina et al., 2022. Intrathecal drug delivery: Advances and applications in the management of chronic pain patient. Front. Pain. Res., Vol. 3. 10.3389/fpain.2022.900566
3. Priya, L., B. Vijayalakshmi, H. Divya and A. Swaroop, 2022. Comparing clonidine and fentanyl as adjuvants to intrathecal hyperbaric ropivacaine in elective infraumbilical surgeries-a randomised clinical study. J. Clin. Diagnostic Rese., Vol. 16 .10.7860/jcdr/2022/56377.16341.
4. Vangapalli, N., K.K. Annepu, P.C. Priyadarshini and M. Alugolu, 2022. Randomized controlled study comparing a isobaric levobupivacaine to a conventional dose of hyperbaric bupivacaine for infra umbilical surgeries. Int. journal health sciences, 5: 2513-2524.
5. Ram, B., P. Oraon, B. Hembrom, M. Kumar and L. Lakra, 2022. Comparative study between intrathecal 0.5% isobaric levobupivacaine, 0.5% isobaric ropivacaine, and 0.5% hyperbaric bupivacaine in elective lower segment cesarean section: A randomized clinical study. Anesth. Essays. Reses., Vol. 16 .10.4103/aer.aer_60_22.
6. Anant, G., G.C. Abhilasha, S. Bhagat, and H. Sharma, 2022. A Comparative evaluation of hemodynamic effects of regional ropivacaine 0.75%(H) versus bupivacaine 0.5%(H) in patients undergoing infra-umbilical surgeries. J. Pharm. Negative. Results., 31: 3717-3724.
7. Goyal, A., Y. Singi, P. Mallya, G. Bhat and S.P, 2022. A comparison between intrathecal levobupivacaine and bupivacaine for quality and safety during infraumbilical surgeries. Cureus., Vol. 14 .10.7759/cureus.30590.
8. Shilpa, K.S., S.B. Ubhe, S . Shikalgar and P. Lomate, 2022. Observational cohort study of ropivacaine and bupivacaine in spinal anaesthesia. J. Pharm. Negative. Results., 31: 9869-9879.
9. Lee, S.C., T.H. Kim, S.R. Choi and S.Y. Park, 2022. No difference between spinal anesthesia with hyperbaric ropivacaine and intravenous dexmedetomidine sedation with and without intrathecal fentanyl: A randomized noninferiority trial. Pain Res. Manage., 13: 1-8.
10. Nag, K., A.J. Charles, S. Balachandar and A.S. Basha, 2022. Comparison of subarachnoid block characteristics with levobupivacaine at 24° C and 37° C for infra-umbilical surgeries-a randomized controlled trial. J. Anaesth., Vol. 1.
11. Dhulkhed, V., P. Patil and P. Dhulkhed, 2023. Isobaric forms of ropivacaine vs. bupivacaine in lower abdominal surgeries: A hospital-based, prospective, comparative study. Med. Gas. Res., 13: 123-127.
12. Agarwal, D.D., A. Garg, A. Gupta, T. Mittal and N. Arora, 2022. Comparison of fentanyl and clonidine as adjuvants To intrathecal 1% chloroprocaine in infra-umbilical surgeries. Europ. J. Molecular. Clin. Med., 9: 3005-3016.
13. Hasaraddi, G.S., V.K., P. Vadigeri and J. Achyutha, 2022. Comparison of hyperbaric bupivacaine in conventional dose to isobaric levobupivacaine used for infra umbilical surgeries. J. Pharm. Negative. Results., 19: 441-446.
14. Vasanth, D., V. Narayanan and S.S. Kumar, 2022. Comparison between plain ropivacaine, ropivacaine with buprenorphine and ropivacaine with clonidine for intrathecal use in lower limb orthopaedic surgeries: A randomised controlled trial. J. Clin. Diagnostic. Rese., 16: 10-13.