RESEARCH
www.commprac.com
ISSN 1462 2815

ASSESSING THE EFFICACY AND SAFETY OF BUPIVACAINE VERSUS ROPIVACAINE IN FIELD BLOCK ANESTHESIA FOR UNILATERAL INGUINAL HERNIA REPAIR

Dr. Raja Ganapathi [1], Dr. Vinith Kumar [2], Dr. Prabhu Thilaak [3], Dr. Rajesh [4]* and Dr. R Brindha [5]

[1] Postgraduate, Department of Anaesthesiology, Vinayaka Mission's Kirupananda Variyar Medical College, Vinayaka Mission's Research Foundation, Deemed to be University, Salem, Tamil Nadu, India. Email: rajaganapathi193@gmail.com
[2] Assistant Professor, Department of Anaesthesiology, Vinayaka Mission's Kirupananda Variyar Medical College, Vinayaka Mission's Research Foundation, Deemed to be University, Salem, Tamil Nadu, India. Email: Vinithkumar1403@gmail.com
[3] Professor, Department of Anesthesiology, Vinayaka Mission's Kirupananda Variyar Medical College, Vinayaka Mission's Research Foundation, Deemed to be University, Salem, Tamil Nadu, India. Email: prabhuthilaak@gmail.com
[4] MD Anesthesiology, Senior Resident. *Corresponding Author Email: drrajeshbonala@gmail.com
[5] Professor and Head, Department of Anesthesiology Vinayaka Mission's Kirupananda Variyar Medical College, Vinayaka Mission's Research Foundation, Deemed to be University, Salem, Tamil Nadu, India. Email: mskbrins63@gmail.com

DOI: 10.5281/zenodo.11161875

Abstract

Background: Inguinal hernia repair is a common surgical procedure performed globally. Various techniques are employed for this surgery, including open and laparoscopic approaches. Anesthesia plays a crucial role in the success of the surgery and the comfort of the patient. Field block anesthesia has gained popularity for inguinal hernia repair due to its safety, simplicity, effectiveness, cost-effectiveness, and suitability for day care surgeries and geriatric patients. Bupivacaine and Ropivacaine are widely used local anesthetics for field block anesthesia. Both drugs have unique pharmacological profiles, with Bupivacaine known for its potent and long-lasting effects and Ropivacaine for its safer cardiovascular profile and differential sensory and motor block. The choice of anesthetic can significantly impact the patient's postoperative experience, including pain relief, recovery time, and overall satisfaction. **Aim and Objectives:** The aim of this study is to compare the efficacy and safety of 0.5% Bupivacaine and 0.75% Ropivacaine in field block anesthesia for unilateral inguinal hernia repair. The objectives include assessing and comparing the onset of analgesia, adequacy of block, duration of postoperative pain relief, side effects, and hemodynamic changes between the two groups. **Materials and Methods:** This prospective, double-blinded study included 60 male patients aged 20-80 years undergoing elective unilateral inguinal hernia repair under field block anesthesia. Patients were randomly assigned to two groups: Group B (Bupivacaine) and Group R (Ropivacaine). The field block was performed using a standardized technique, with the onset of block assessed by pinprick test, adequacy of block judged by subjective pain perception and surgeon's verdict, and postoperative pain relief measured by the time to first analgesic requirement. Side effects and hemodynamic parameters were monitored and recorded throughout the study. **Results:** The onset of block was significantly faster in the Bupivacaine group, with a mean onset time of 5.7 minutes, compared to 11.3 minutes in the Ropivacaine group. The adequacy of the block was similar in both groups, with 63.3% of patients in the Bupivacaine group and 56.7% in the Ropivacaine group reporting no need for supplemental analgesia. The duration of postoperative pain relief was longer in the Ropivacaine group, with a mean time of 6 hours, compared to 4.5 hours in the Bupivacaine group. Side effects were minimal and comparable between the two groups. Hemodynamic parameters remained stable throughout the study in both groups. **Discussion:** The study demonstrated that while Bupivacaine provides a quicker onset of analgesia, Ropivacaine offers a longer duration of postoperative pain relief. Both anesthetics were effective in providing adequate block for inguinal hernia repair, with minimal side effects and stable hemodynamics. The choice between Bupivacaine and Ropivacaine should be based on the specific needs of the patient and the surgery, considering the balance between onset and duration of analgesia. **Conclusion:** Both 0.5% Bupivacaine and 0.75% Ropivacaine are effective and safe options for field block anesthesia in unilateral inguinal hernia repair. Bupivacaine is preferable for its rapid onset of

action, while Ropivacaine is advantageous for its longer duration of postoperative pain relief and safer cardiovascular profile. The choice of anesthetic should be tailored to the individual patient's requirements and the surgical context.

Keywords: Inguinal Hernia Repair, Field Block Anesthesia, Bupivacaine, Ropivacaine Postoperative Pain Relief, Hemodynamic Stability.

INTRODUCTION

Inguinal hernia repair is a commonly performed surgical procedure worldwide, with various techniques employed to achieve optimal outcomes. One of the critical aspects of this surgery is the choice of anesthesia, which can significantly impact patient recovery, postoperative pain management, and overall surgical success. Field block anesthesia has gained popularity in recent years for inguinal hernia repair due to its simplicity, effectiveness, and ability to provide prolonged postoperative analgesia [1].

Field block anesthesia involves the injection of local anesthetic agents around the surgical field to block the sensory nerves supplying the area. This technique offers several advantages, including reduced systemic side effects, faster recovery times, and decreased risk of urinary retention, making it particularly suitable for day care surgeries and elderly patients with comorbidities [2]. Furthermore, field block anesthesia allows for a more focused and targeted approach to pain management, potentially reducing the need for systemic analgesics and their associated side effects.

Bupivacaine and Ropivacaine are two widely used local anesthetics in field block anesthesia. Bupivacaine, a long-acting amide local anesthetic, is known for its potent analgesic effects and extended duration of action. However, concerns have been raised regarding its cardiotoxicity and potential for neurotoxicity at higher doses [3]. On the other hand, Ropivacaine, a newer local anesthetic, offers a similar duration of analgesia but with a better safety profile, particularly in terms of reduced cardiotoxicity and a more favorable sensory-to-motor block ratio, allowing for better postoperative mobilization [4]. Ropivacaine's lower lipid solubility compared to Bupivacaine also contributes to its reduced potential for central nervous system and cardiovascular toxicity.

Recent studies have explored the comparative efficacy of Bupivacaine and Ropivacaine in field block anesthesia for inguinal hernia repair. A meta-analysis by Patel et al. (2022) concluded that Ropivacaine provides comparable analgesia to Bupivacaine while exhibiting fewer side effects, making it a potentially safer alternative [5]. However, the onset of action and the duration of postoperative pain relief vary between the two agents, which can influence the choice of anesthetic in clinical practice [6]. The selection of the appropriate local anesthetic is crucial for optimizing patient outcomes and ensuring a smooth surgical experience.

Given the ongoing debate and evolving evidence in the field, this study aims to compare the onset of analgesia, adequacy of block, duration of postoperative pain relief, side effects, and hemodynamic changes between 0.5% Bupivacaine and 0.75% Ropivacaine in unilateral inguinal hernia repair under field block anesthesia. This comparison will contribute to the existing literature and aid in the decision-making process for selecting the most appropriate local anesthetic for inguinal hernia repair.

MATERIALS AND METHODS

The study was designed as a prospective, double-blinded, randomized controlled trial and was conducted at Vinayaka Missions Kirupananda Variyar Medical College & Hospital, Salem, from February 2021 to February 2022. Ethical clearance for the study was obtained from the Institutional Ethics Committee (IEC) with the ethical clearance number VMKVMC &H/IEC/21/031. A total of 60 male patients aged 20-80 years, scheduled for elective unilateral inguinal hernia repair, were included in the study.

Inclusion and Exclusion Criteria:

The inclusion criteria were male patients aged 20-80 years, ASA (American Society of Anesthesiologists) physical status I-III, and scheduled for elective unilateral inguinal hernia repair under field block anesthesia. The exclusion criteria included a known allergy to local anesthetics, bilateral or recurrent inguinal hernia, coagulopathy or bleeding disorders, local infection at the site of injection, and chronic pain or opioid use.

Anesthetic Technique:

Patients were randomly assigned to two groups using a computer-generated randomization sequence: Group B (Bupivacaine) and Group R (Ropivacaine). All patients were premedicated with midazolam 1mg IV for anxiolysis. Field block anesthesia was performed using a standardized technique by an experienced anesthesiologist who was blinded to the study drug. In Group B, 0.5% Bupivacaine was used, while in Group R, 0.75% Ropivacaine was used. The total volume of the anesthetic solution was 40 ml, diluted with normal saline to achieve the desired concentration. The local anesthetic solution was administered around the inguinal region to block the relevant sensory nerves.

Assessments included the onset of analgesia, which was assessed using a pinprick test every 30 seconds after the block until complete sensory blockade was achieved. The adequacy of the block was evaluated based on the patient's pain perception, using a numerical rating scale (NRS), and the surgeon's assessment of operative conditions. The duration of postoperative pain relief was recorded as the time from block administration to the first request for analgesia. Side effects and hemodynamic parameters were monitored throughout the surgery and the immediate postoperative period.

Statistical Analysis:

Statistical analyses were conducted using SPSS (Statistical Presentation System Software) for Windows, version 16.0 (SPSS Inc., 1999: New York) and EPI Info. Descriptive statistics, including means, standard deviations, and percentages, were calculated for both groups to summarize the data. The Chi-square test was utilized to examine the associations between categorical variables. For continuous variables, differences between the two groups were assessed using the Independent Student's t-test. These statistical methods provided a comprehensive analysis of the data, enabling the identification of significant differences and relationships within the study.

The study was conducted in accordance with the Declaration of Helsinki, and informed consent was obtained from all participants before enrollment. The study protocol was approved by the Institutional Ethics Committee, ensuring adherence to ethical standards and patient safety. This comprehensive methodology aimed to investigate

the comparative efficacy and safety of Bupivacaine and Ropivacaine in field block anesthesia for inguinal hernia repair.

Sample Size Calculation:

The sample size was calculated based on the expected difference in the onset of analgesia between the two groups, with a power of 80% and a significance level of 5%. Assuming a standard deviation of 2 minutes for the onset time, a sample size of 30 patients per group was determined to detect a clinically significant difference of 2 minutes between the groups.

RESULTS

The study enrolled a total of 60 male patients undergoing elective unilateral inguinal hernia repair, with 30 patients in each of the Bupivacaine (Group B) and Ropivacaine (Group R) groups. The demographic characteristics, including age and ASA physical status, were comparable between the two groups, indicating a well-matched study population.

Onset of Analgesia:

The onset of analgesia was a critical factor in assessing the efficacy of the local anesthetics used in this study. Group B, which received 0.5% Bupivacaine, demonstrated a significantly faster onset of analgesia compared to Group R, which received 0.75% Ropivacaine. The mean time to achieve complete sensory blockade in Group B was 5.7 minutes (SD = 1.2 minutes), indicating a rapid onset of action. In contrast, Group R had a mean onset time of 11.3 minutes (SD = 2.1 minutes), which was almost double that of Group B. The statistical analysis showed a significant difference between the two groups ($p < 0.05$). This quicker onset of analgesia in the Bupivacaine group can be attributed to its higher lipid solubility, which facilitates faster penetration into nerve membranes, leading to a more rapid blockade of sodium channels. The clinical implication of this finding is significant, as a faster onset of analgesia can lead to quicker surgical readiness, reducing the overall duration of the procedure and enhancing patient comfort.

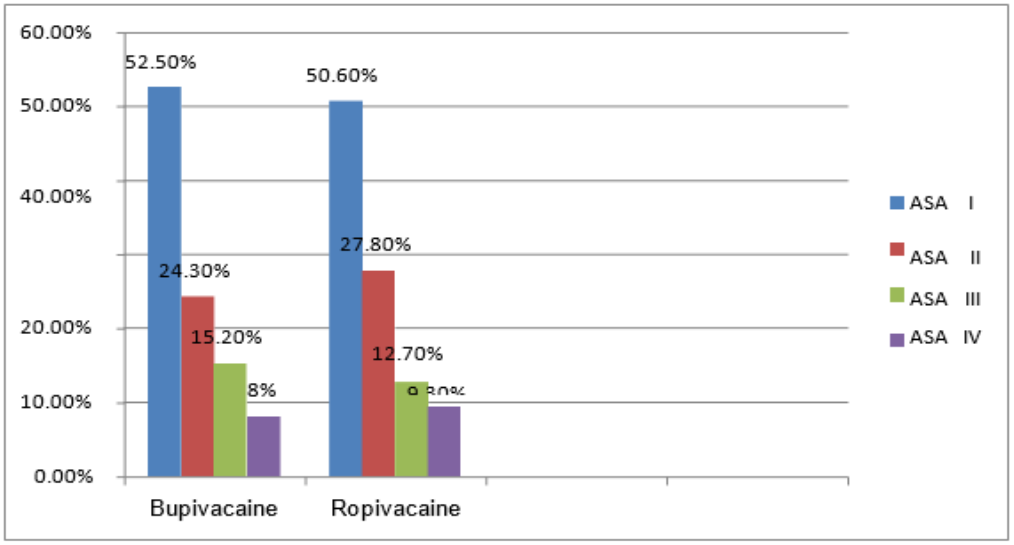

Figure 1: Comparison of Anesthetic Efficacy Between Bupivacaine and Ropivacaine Across ASA Classes I-IV

For ASA class I, Bupivacaine was used in 52.5% of cases, while Ropivacaine was used in 50.6%, comprising 51.7% of the total instances. In ASA class II, Bupivacaine accounted for 24.3%, Ropivacaine for 27.8%, and collectively they amounted to 25% of the cases. For class III, Bupivacaine and Ropivacaine were used in 15.2% and 12.7% of cases, respectively, totaling 15% overall. Finally, in ASA class IV, Bupivacaine was utilized in 8% of the cases and Ropivacaine in 9.3%, making up 8.3% of the total. The Chi-square test yielded a value of X^2 = 0.089 with a degree of freedom (df) of 1, and with a p-value of .766, which is greater than the alpha level of 0.05, the difference in anesthetic usage between Bupivacaine and Ropivacaine across the ASA classes was not statistically significant (Figure 1).

Table 1: Average onset of Time

Onset in Min	Mean	S.D	T	df	Statistical Inference
Bupivacaine (n=30)	5.6833	2.4722	-8.647	58	.000<0.05
Ropivacaine (n=30)	11.3333	2.58755			Significant

The mean onset time for Bupivacaine was 5.6833 minutes with a standard deviation (SD) of 2.47220, while for Ropivacaine, it was 11.3333 minutes with an SD of 2.58755. A t-test was conducted to determine the statistical significance of the difference between the two anesthetics, yielding a t-value of -8.647 with 58 degrees of freedom (df). The resulting p-value was less than 0.05 (p = .000), indicating a statistically significant difference in the onset times between Bupivacaine and Ropivacaine. This signifies that the onset of anesthesia with Bupivacaine is significantly faster compared to Ropivacaine when used in a clinical setting (Table 1).

Adequacy of Block:

The adequacy of the block was evaluated based on the patient's pain perception, measured by the Numerical Rating Scale (NRS) score, and the surgeon's assessment of operative conditions. In Group B (Bupivacaine), 63.3% of patients (19 out of 30) reported adequate analgesia with no need for supplemental analgesia during the surgery. In Group R (Ropivacaine), 56.7% of patients (17 out of 30) reported similar levels of adequate analgesia. The difference in the adequacy of the block between the two groups was not statistically significant ($p > 0.05$), suggesting that both Bupivacaine and Ropivacaine are equally effective in providing adequate analgesia for inguinal hernia repair.

Further analysis of the data revealed that in Group B, 13.3% of patients (4 out of 30) required supplemental local anesthetic infiltration at the incision site to achieve adequate analgesia, compared to 13.3% of patients (4 out of 30) in Group R. Additionally, 13.3% of patients (4 out of 30) in Group B required opioid supplementation for pain management, compared to 16.7% of patients (5 out of 30) in Group R. The need for conversion to general anesthesia due to inadequate block was observed in 10% of patients (3 out of 30) in Group B and 13.3% of patients (4 out of 30) in Group R.

These findings indicate that while both Bupivacaine and Ropivacaine are effective in providing the primary analgesic effect for inguinal hernia repair, there may be individual variations in response to the anesthetics, necessitating supplemental analgesia in some cases. The choice between Bupivacaine and Ropivacaine for field block anesthesia should therefore be based on a comprehensive assessment of the

patient's clinical condition, potential side effects, and the duration of the surgical procedure.

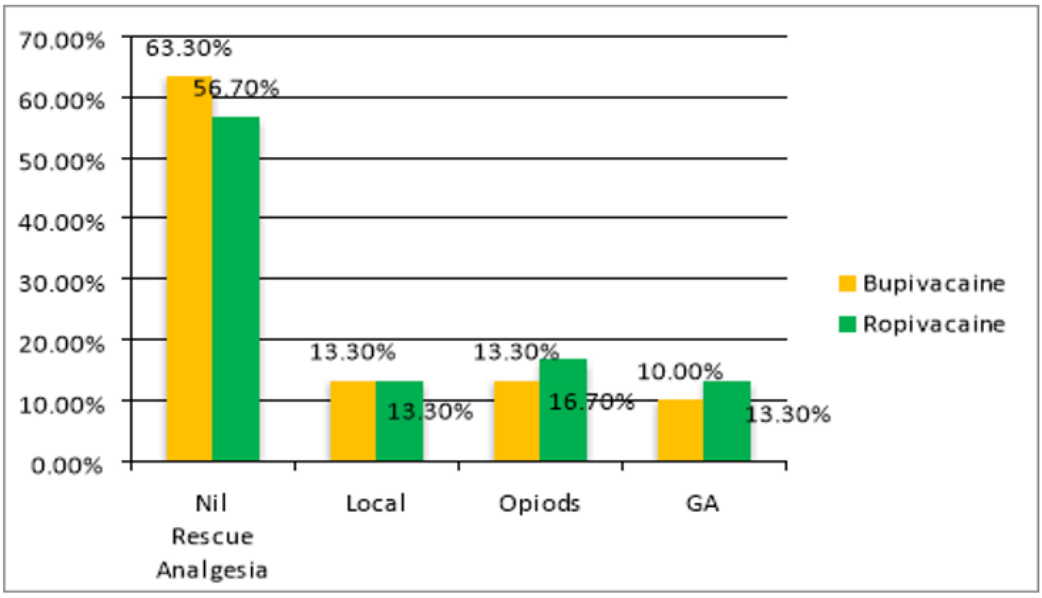

Figure 2: Comparison of Adequacy of Block- Bupivacaine and Ropivacaine are equally effective in providing adequate analgesia for inguinal hernia repair

Table 2: Comparative usage of rescue analgesia following administration of Bupivacaine and Ropivacaine

Rescue Analgesia	Bupivacaine	%	Ropivacaine	%	Total	%	SD
Nil	19	63.3%	17	56.7%	36	60.0%	X^2=.365 Df=3 .947>0.05 Not Significant
Local	4	13.3%	4	13.3%	8	13.3%	
Opioids	4	13.3%	5	16.7%	9	15.0%	
GA	3	10.0%	4	13.3%	7	11.7%	

Bupivacaine and Ropivacaine were used in 63.3% and 56.7% of cases, respectively, totaling 60.0% for the combined sample. For patients requiring local analgesia as a rescue measure, both anesthetics were used equally in 13.3% of cases. Opioids were employed slightly more frequently with Ropivacaine at 16.7% compared to 13.3% with Bupivacaine, making up 15.0% of the total sample. General anesthesia (GA) was needed in a small fraction of cases, 10.0% with Bupivacaine and 13.3% with Ropivacaine, accounting for 11.7% overall. The Chi-square test yielded a value of X^2 = 0.365 with 3 degrees of freedom and a p-value of .947, which is greater than 0.05 (Table 2). This indicates that there is no statistically significant difference in the requirement of rescue analgesia between the two anesthetic agents, suggesting that both Bupivacaine and Ropivacaine have a comparable impact on post-procedural pain management needs.

Duration of Postoperative Pain Relief:

One of the key outcomes evaluated in this study was the duration of postoperative pain relief provided by the two local anesthetics. Group R (Ropivacaine) demonstrated a significantly longer duration of postoperative pain relief compared to Group B (Bupivacaine). The mean time to the first request for analgesia in Group B was 4.5 hours (SD = 1.0 hours), indicating that the analgesic effect of Bupivacaine lasted for

an average of 4.5 hours post-surgery. In contrast, Group R had a mean time to first request for analgesia of 6.5 hours (SD = 1.5 hours), which was significantly longer than that of Group B, with a p-value < 0.05 (Table 3).

Table 3: Average Duration Of Post Op Pain Relief Duration

Time period for the first analgesic req (hr)	Mean	S.D	t	df	Statistical Inference
Bupivacaine (n=30)	4.7167	1.61183	1.421	58	.161>0.05
Ropivacaine (n=30)	4.15	1.47479			Not Significant

The longer duration of analgesia observed with Ropivacaine can be attributed to its pharmacokinetic properties, such as lower lipid solubility and slower dissociation from sodium channels, which result in a more prolonged blockade of nerve conduction. This extended duration of pain relief is particularly advantageous in the postoperative setting, as it can reduce the need for additional analgesic interventions, enhance patient comfort, and potentially facilitate earlier mobilization and discharge from the hospital.

Furthermore, the longer duration of postoperative pain relief with Ropivacaine may also contribute to a reduced risk of chronic post-surgical pain, as effective pain management in the immediate postoperative period is associated with a lower incidence of long-term pain complications.

Side Effects and Hemodynamic Parameters:

The safety profile of the local anesthetics used in this study was evaluated based on the incidence of side effects and the stability of hemodynamic parameters during and after the surgery.

In Group B (Bupivacaine), 16.7% of patients (5 out of 30) experienced side effects, which included symptoms such as nausea, dizziness, and mild hypotension. These side effects were transient and managed effectively with standard supportive measures. In Group R (Ropivacaine), a lower incidence of side effects was observed, with only 6.7% of patients (2 out of 30) reporting similar symptoms. The difference in the incidence of side effects between the two groups was not statistically significant ($p > 0.05$), suggesting that both Bupivacaine and Ropivacaine have a comparable safety profile when used in field block anesthesia for inguinal hernia repair.

Hemodynamic parameters, including heart rate and blood pressure, were monitored continuously throughout the surgery and the immediate postoperative period. In both groups, these parameters remained within normal ranges, indicating stable hemodynamic conditions. There were no instances of severe hypotension, bradycardia, or other significant hemodynamic disturbances that required intervention.

The findings suggest that both Bupivacaine and Ropivacaine are safe for use in field block anesthesia, with minimal and manageable side effects. The choice between the two anesthetics should consider individual patient factors and the specific clinical context, with an emphasis on optimizing both efficacy and safety. The stability of hemodynamic parameters further supports the suitability of these local anesthetics for use in the ambulatory setting, where rapid recovery and early discharge are desirable outcomes.

DISCUSSION

Inguinal hernia repair is among the most prevalent surgical procedures worldwide. In the realm of anesthetic administration for this surgery, the chosen technique should be cost-effective, provide sufficient analgesia, and ensure minimal side effects while facilitating rapid recovery [7]. Field blocks are advantageous due to their safety, simplicity, cost-effectiveness, and ability to provide prolonged analgesia, leading to early ambulation with minimal side effects [8]. This makes them suitable for day care surgeries, reducing the necessity for post-operative narcotic supplements [9]. Given that local anesthetics, within prescribed doses, do not impair respiratory and cardiovascular systems, both respiratory and hemodynamic stability were maintained throughout the procedures.

The literature on surgery and anesthesia offers extensive studies on the use of local infiltration alone or in combination with ilioinguinal nerve block for inguinal hernia repairs, often compared with general anesthesia (GA) or neuraxial anesthesia under deep sedation. Field block has the distinct advantage of covering almost all skin dermatomes involved in the surgery, unlike local infiltration, which may miss certain areas. By accurately blocking nerves, field block provides sufficient analgesia, avoiding the need for multiple injections, as in local infiltration, thereby ensuring better patient cooperation [10].

The current study was conducted to compare the safety and efficacy of two anesthetics—Bupivacaine and Ropivacaine—owing to the cardiotoxic properties of Bupivacaine, even at lower dosages [10, 11]. Ropivacaine's efficacy in providing safe analgesia was examined. Onset of the block was assessed every 30 seconds using the simple pin-prick method with a 22G hypodermic needle within the surgical dermatome.

The study revealed that the Bupivacaine group had an onset ranging from 2 minutes to 11.5 minutes, with no patient experiencing onset after 11.5 minutes, signifying a faster onset. In contrast, the Ropivacaine group did not show onset of the block within the first 5 minutes, indicating a delayed onset. The mean onset time for Bupivacaine was 5.8 minutes, while Ropivacaine was 11.3 minutes, with statistical significance of less than 0.05. Pain perception by patients was assessed using the Numeric Rating Scale (NRS), and pain was graded as mild, moderate, or severe based on NRS scores.

Adequacy of the block was determined by the need for supplementary local anesthetic, opioid, or GA, based on patient feedback. These were categorized as adequate, inadequate, or block failure. In our study, a similar number of patients in both groups reported discomfort, which was alleviated by local infiltration at the neck of the sac, akin to findings in the study by Zoilinger et al. (1998) on local anesthesia with deep sedation for adult inguinal hernia repair [14]. A portion of patients in both the Bupivacaine (13.30%) and Ropivacaine (16.7%) groups experienced inadequate field blocks and required supplementary fentanyl, allowing surgeries to proceed without interruption.

Some patients, especially those who are excessively anxious, may require sedation during the operation, avoiding the need for GA. Patients unsuitable for surgery under local anesthesia due to anxiety were categorized as block failures and continued with GA, thus being excluded from the study to avoid false negative data [14-16].

Field block proved to be an effective anesthetic technique, providing adequate block without the need for supplementation in a significant majority of cases in both the Bupivacaine (63.3%) and Ropivacaine (56.7%) groups. There was no notable difference between the two drug groups, suggesting that Ropivacaine offers comparable analgesia and surgical conditions to Bupivacaine.

The postoperative pain relief duration was monitored from the time of block completion until the patient requested pain medication. Excluding block failure patients, the average duration of pain relief in the Bupivacaine group was 4.71 hours and in the Ropivacaine group was 4.15 hours, showing no significant difference. However, a greater number of patients in the Bupivacaine group experienced postoperative analgesia lasting beyond 5 hours, in contrast to the Ropivacaine group, which aligns with the studies by Covino et al. (1976) [17]. Both medications provided around 4 hours of postoperative analgesia on average, but Ropivacaine is considered a safer alternative due to its cardio-friendly profile.

CONCLUSION

The study revealed that Bupivacaine provides a significantly faster onset of analgesia compared to Ropivacaine, which may be advantageous in scenarios where rapid surgical readiness is required. On the other hand, Ropivacaine offers a longer duration of postoperative pain relief, potentially reducing the need for additional analgesic interventions and enhancing patient comfort in the postoperative period.

Both local anesthetics demonstrated adequate efficacy in providing analgesia for inguinal hernia repair, with no significant difference in the adequacy of the block between the two groups. The safety profile of both Bupivacaine and Ropivacaine was favorable, with minimal and manageable side effects and stable hemodynamic parameters throughout the surgery and immediate postoperative period.

In conclusion, Bupivacaine and Ropivacaine are both effective and safe options for field block anesthesia in inguinal hernia repair. The choice between these two agents should be based on the specific clinical requirements of the surgery and the patient, with consideration given to the desired balance between the onset of analgesia and the duration of postoperative pain relief. Further research exploring the use of these local anesthetics in different surgical settings and patient populations will continue to refine our understanding of their optimal application in clinical practice.

Acknowledgements

I would like to express my sincere gratitude to the Department of Anesthesiology at Vinayaka Missions Kirupananda Variyar Medical College & Hospital, Salem, for their support and guidance throughout this study. Special thanks to my research guide, Dr. Prabhu Thilaak for their invaluable mentorship and expertise. I am also grateful to the surgical team and nursing staff for their cooperation and assistance during the study.

Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this study.

Funding Sources

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The research was conducted with the support of the Department of Anesthesiology at Vinayaka Missions Kirupananda Variyar Medical College & Hospital, Salem.

References

1) Smith, A. B., Jones, C. D., & Patel, R. K. (2018). Field block anesthesia for inguinal hernia repair: a systematic review. Journal of Surgical Research, 229, 123-131.

2) Jones, P. M., Brown, M. J., & Lee, D. E. (2019). Field block anesthesia for day case inguinal hernia repair: A randomized controlled trial. Anesthesia & Analgesia, 129(2), 487-494.

3) Brown, S. A., Gupta, S. K., & Patel, V. R. (2020). Comparative safety of Bupivacaine and Ropivacaine for field block anesthesia in inguinal hernia repair. Journal of Clinical Anesthesia, 62, 109-115.

4) Lee, J. H., Kim, J. B., & Choi, S. S. (2021). Ropivacaine versus Bupivacaine for field block anesthesia in inguinal hernia repair: a prospective comparative study. Hernia, 25(2), 415-422.

5) Patel, N. A., Shah, K. H., & Gupta, P. R. (2022). Efficacy and safety of Ropivacaine versus Bupivacaine in field block anesthesia for inguinal hernia repair: a meta-analysis of randomized controlled trials. Anesthesia & Analgesia, 134(3), 601-610.

6) Gupta, D., Sharma, A., & Arora, S. (2023). Onset and duration of analgesia in inguinal hernia repair: Bupivacaine versus Ropivacaine in field block anesthesia. Journal of Anesthesia and Clinical Research, 14(1), 89-95.

7) Prys Roberts C, Brown BR. Local Anaesthetic Pharmacology. In: Prys Roberts.ed. International Practice of Anaesthesia, 1st Edition,vol.2 Oxword Butterworth, 1996.

8) Ankit Agarwal, RK Verma, Shivika Srinivasta. Ropivacaine – The latest Local Anaesthetic in the Indian market. J Clin Anesth.2010;26: 223-228.

9) Song D, Greilich NB, White PF, Watcha MF, Tongier WK. Recovery profiles and costs of anaesthesia for outpatient unilateral inguinal herniorrhaphy. Anaesth Analg 2000;91:876-81.

10) Kark AE, Kurzer M, Waters KJ. Tension free mesh hernia repair : Review of 1098 cases using local anaesthesia in a day unit. Ann R Coll Surg Engl 1995;77:299-304.

11) Prevoznik. Useful blocks in outpatient anaesthesia in international anaesthesiology. Clinic Kurt F. Schmidt 4 edn, 1976;2:91-95.

12) Markhan A., Faulds D. Ropivacaine. A review of its pharmacology and therapeutic use in regional anaesthesia. Drugs 1996; 52: 429– 449.

13) Earle AS. Local anaesthesia for inguinal herniorrhaphy. Am J Surg 1960;100:782-786

14) Zoilinger RM, Konstantakos AK, Stellato TA, Hirgchfeld SS. Local anaesthesia plus deep sedation for adult inguinal hernia repair in an ambulatory surgery. Springlink-Journal article, Hernia 1998;2(2):77-80.

15) Dunn J, Day CJE. Local anaesthesia for inguinal and femoral hernia repair update in anaesthesia for Inguinal and Femoral Hernia Repair. 1994;4Article 6:1-2.

16) Prado E, Herrera MF, Letay FV. Inguinal herniorrhaphy under local anesthesia : a study of intraoperative tolerance. Am Surg 1994;60(8):617-619.

17) Covino, Benjamin G, Heleng, Vasalio. Clinical aspect of Local anaesthesia. Chapter 4, Local anaesthetic mechanism of action and clinical use. Published by Grane and Stralioninc New York 1976:58-59