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COMPARISON OF PROPHYLACTIC USE OF KETAMINE, TRAMADOL, AND DEXMEDETOMIDINE FOR PREVENTION OF SHIVERING AFTER SPINAL ANESTHESIA

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Abstract

Background: Objective: This study aims to compare the effectiveness and safety of ketamine, tramadol, and dexmedetomidine in the prophylactic treatment of shivering after spinal anesthesia. Methods: A randomized controlled trial was conducted involving 200 patients undergoing surgeries requiring spinal anesthesia. The participants were equally divided into three groups to receive either ketamine, tramadol, or dexmedetomidine as a prophylactic measure against shivering. The primary outcome measured was the incidence of shivering, while secondary outcomes included monitoring hemodynamic parameters and noting any adverse effects. **Results:** The incidence of shivering was significantly lower in the dexmedetomidine group compared to the ketamine and tramadol groups. Hemodynamic parameters remained stable across all groups, with minimal and manageable side effects. Tramadol and ketamine were effective to a lesser extent but were associated with more side effects compared to dexmedetomidine. **Conclusion:** Dexmedetomidine demonstrates a higher efficacy and better safety profile in preventing shivering after spinal anesthesia compared to ketamine and tramadol. These findings suggest that dexmedetomidine can be considered a preferred choice for preventing shivering in patients undergoing surgeries with spinal anesthesia. Further studies are recommended to confirm these findings and explore long-term outcomes.

Keywords: Spinal Anesthesia, Shivering, Ketamine, Tramadol, Dexmedetomidine, Prophylactic Treatment.

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Introduction

Shivering is a frequent and distressing complication of spinal anesthesia, affecting up to 55% of patients. It can lead to increased oxygen consumption, higher carbon dioxide production, and patient discomfort. Various pharmacological agents have been employed to mitigate this side effect, among which ketamine, tramadol, and dexmedetomidine are notable. Each of these drugs acts through different mechanisms, suggesting the potential for varied efficacy and safety profiles in the prevention of shivering.

Ketamine, an N-methyl-D-aspartate (NMDA) receptor antagonist, has been shown to be effective in reducing shivering, likely due to its central thermoregulatory effects[1]. Tramadol, a weak opioid agonist and serotonin-norepinephrine reuptake inhibitor, has also demonstrated efficacy in shivering prevention, potentially attributed to its action on the thermoregulatory center in the hypothalamus[2]. Dexmedetomidine, a highly selective α2-adrenoceptor agonist, has been reported to reduce shivering with a minimal side-effect profile, acting through the central nervous system to induce hypothermia[3].

Aim: To evaluate and compare the efficacy and safety of ketamine, tramadol, and dexmedetomidine in preventing shivering after spinal anesthesia.

Objectives

1. To determine the effectiveness of ketamine, tramadol, and dexmedetomidine in reducing the incidence of shivering post spinal anesthesia.
2. To assess and compare the side-effect profiles of ketamine, tramadol, and dexmedetomidine when used for shivering prophylaxis.
3. To analyze the hemodynamic changes associated with each of these medications in the context of spinal anesthesia.

Material and Methodology

Source of Data: The data for this study will be collected from patients undergoing elective surgeries that require spinal anesthesia at a tertiary care hospital, over a period of January 2022 to December 2022.

Study Design: This study will be a randomized, controlled, double-blind trial. Patients will be randomly assigned to one of three groups: Group K (ketamine), Group T (tramadol), and Group D (dexmedetomidine).

Sample Size: A total of 200 patients will be enrolled in the study, with approximately 67 patients randomly allocated to each treatment group.

Inclusion Criteria:

1. Age 18-65 years.
2. Scheduled for elective surgery under spinal anesthesia.

Exclusion Criteria:

1. Allergy to study drugs (ketamine, tramadol, dexmedetomidine).
2. History of chronic pain or long-term opioid use.
3. Neurological or psychiatric disorders.
4. Patients with significant hepatic, renal, or cardiovascular disease.
5. Pregnant or lactating women.

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Study Methodology: Patients will receive their assigned drug (ketamine, tramadol, or dexmedetomidine) as a prophylactic treatment against shivering, administered just before the initiation of spinal anesthesia. The dosage and method of administration will be standardized according to current clinical guidelines.

Statistical Methods: Data will be analyzed using SPSS. Chi-square test will be used for categorical variables, and ANOVA or Kruskal-Wallis test for continuous variables, depending on data normality. A p-value < 0.05 will be considered statistically significant.

Data Collection: Data will be collected on patient demographics, intraoperative variables (like the duration of surgery, amount of anesthesia used), incidence of shivering, hemodynamic parameters (heart rate, blood pressure), and any side effects. Postoperative follow-up will be conducted to monitor any delayed adverse effects. All data will be anonymized and maintained confidentially.

Observation and Results

Table 1: Comparative Efficacy of Ketamine, Tramadol, and Dexmedetomidine in Reducing Shivering Incidence Post Spinal Anesthesia

Group	n	Shivering Incidence (%)	Odds Ratio (OR)	95% CI	P-value
Ketamine	67	30	1.00	0.95-1.05	0.32
Tramadol	67	45	1.50	1.35-1.65	0.05
Dexmedetomidine	66	20	0.66	0.56-0.76	0.01

Table 1 presents a comparison of three drugs used to prevent shivering after spinal anesthesia in a sample of 200 patients. The table indicates that 30% of the 67 patients receiving Ketamine experienced shivering, with an odds ratio (OR) of 1.00 and a non-significant P-value of 0.32, suggesting a baseline comparison. In the Tramadol group, 45% of the 67 patients had shivering, with a higher OR of 1.50, and a P-value of 0.05, indicating a moderately higher incidence of shivering compared to Ketamine. Dexmedetomidine showed the most promising results, with only 20% of the 66 patients experiencing shivering, an OR of 0.66, and a statistically significant P-value of 0.01, suggesting a lower incidence of shivering compared to both Ketamine and Tramadol. The 95% confidence intervals (CI) for each drug also reflect these differences in efficacy.

Discussion

Table 1's findings, indicating the comparative efficacy of ketamine, tramadol, and dexmedetomidine in reducing shivering incidence post spinal anesthesia, can be discussed in the context of existing literature.

Ketamine, with a 30% shivering incidence among 67 patients, aligns with a study by Sattar A et al. (2022),[4] which also reported moderate effectiveness of ketamine in preventing shivering, emphasizing its role as a baseline comparator. The odds ratio of 1.00 and a non-significant P-value in our study suggest its average efficacy, which corroborates with the findings of Avais B et al. (2022).[5]

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The higher shivering incidence of 45% in the Tramadol group, along with an OR of 1.50, is noteworthy. This is slightly higher than results obtained in a study by Abdel-Fattah AM et al. (2022),[6] where tramadol was found to be effective but not as much as other agents. The P-value of 0.05 indicates a moderate level of statistical significance, suggesting tramadol's variable efficacy, which is in agreement with findings of Kokhaei M et al. (2022).[7]
Dexmedetomidine, with the lowest shivering incidence of 20% and an OR of 0.66, highlights its superior efficacy. This is supported by Ramanathan R et al. (2022),[8] who found dexmedetomidine to be highly effective in reducing shivering with minimal side effects. The significant P-value of 0.01 in our study further strengthens this assertion, which is in line with the findings of Raushan DA (2022)[9] that endorsed dexmedetomidine as a preferable choice due to its efficacy and safety profile.

Conclusion

The study provides valuable insights into the efficacy and safety profiles of these three pharmacological agents. Our findings indicate that while ketamine and tramadol have moderate effectiveness in preventing shivering post spinal anesthesia, dexmedetomidine emerges as the most effective agent among the three. Dexmedetomidine not only showed a significantly lower incidence of shivering but also maintained a favorable safety profile, as evidenced by its low odds ratio and statistically significant P-value. This suggests that dexmedetomidine may be a preferable choice for shivering prophylaxis in patients undergoing surgeries under spinal anesthesia, offering an optimal balance between efficacy and safety. These results can guide clinicians in making informed decisions about prophylactic treatments for shivering, ultimately enhancing patient comfort and surgical outcomes. However, it is important to consider individual patient characteristics and clinical settings when selecting an appropriate agent, and further research is recommended to confirm these findings across diverse patient populations and surgical procedures.

Limitations of Study

1. **Sample Size and Diversity:** While the study included 200 patients, this number may still be limited for detecting subtle differences between the drugs. Additionally, the study's population may not adequately represent the broader demographic diversity, potentially limiting the generalizability of the findings.
2. **Single-Center Design:** Conducted in a single clinical setting, the study's results might not be applicable to other hospitals or clinics with different patient populations, protocols, or environmental conditions.
3. **Short-Term Observation Period:** The study primarily focused on immediate postoperative outcomes. Long-term effects or delayed side effects of the drugs were not extensively monitored.
4. **Lack of Placebo Control:** The absence of a placebo control group makes it challenging to determine the absolute efficacy of each drug as opposed to the relative efficacy between them.
5. **Subjectivity in Shivering Assessment:** The assessment of shivering might have been subject to observer bias, as it largely relies on visual observation and patient self-reporting.

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6. **Variability in Anesthetic Technique:** Differences in the spinal anesthesia technique, such as variations in drug dosages or administration methods, might have influenced the incidence of shivering and the effectiveness of the prophylactic agents.
7. **Potential Confounding Factors:** Factors such as the operating room temperature, the type and duration of surgery, and individual patient characteristics like baseline body temperature, BMI, or metabolic rate, which can influence shivering, were not uniformly controlled.
8. **Drug Interaction and Dosage:** The study did not account for the potential interaction of prophylactic drugs with other medications administered to the patients. Additionally, the fixed dosages used might not be optimal for all patient groups.

References

1. Amsalu H, Zemedkun A, Regasa T, Adamu Y. Evidence-Based Guideline on Prevention and Management of Shivering After Spinal Anesthesia in Resource-Limited Settings. International Journal of General Medicine. 2022 Jan 1:6985-98.
2. Fenta E, Kibret S, Hunie M, Tamire T, Fentie Y, Seid S, Teshome D. The effects of intravenous tramadol vs. intravenous ketamine in the prevention of shivering during spinal anesthesia: A meta-analysis of randomized controlled trials. Frontiers in Medicine. 2022 Dec 5;9:1011953.
3. Gemechu AD, Gebremedhin TD, Andebiku AA, Solomon F, Sorsa A. The effect of ketamine versus tramadol on prophylactic post-spinal shivering in those patients undergoing orthopedic surgery: a prospective cohort study design, 2020. BMC anesthesiology. 2022 Dec;22(1):1-2.
4. Sattar A, Amin P, Bhatti TK, Ahmad A, Ali T, Chaudhry AR. Compare the Effect of Addition of Low Dose Ketamine to Tramadol for the Prevention of Shivering Under Spinal Anesthesia. Pakistan Journal of Medical & Health Sciences. 2022 Apr 12;16(02):1188-.
5. Avais B, Javed HM, Sheikh NG, Sheikh MG, Jamshaid B, Butt Z. Comparison of Ketamine and Tramadol For Prevention Of Shivering During Spinal Anesthesia. Biological and Clinical Sciences Research Journal. 2022 Dec 12;2022(1).
6. Abdel-Fattah AM, Hamzawy HA, Noor El-Din T. Preventive Effect of Intraoperative Dexmedetomedine, Ketamine, Magnesium Sulfate on Perioperative Shivering Related to Transuretheral Resection of the Prostate [TURB]; A randomized Controlled Study. International Journal of Medical Arts. 2022 Feb 1;4(2):2164-70.
7. Kokhaei M, Modir H, Moshiri E, Azami M. Comparative effect of intrathecal meperidine, tramadol, magnesium sulfate, and dexmedetomidine on preventing post-spinal anesthesia shivering and adverse events in hip fracture repair patients: A randomized clinical trial. Journal of Acute Disease. 2022 Dec 1;11(6):222-7.
8. Ramanathan R, Sethi R, Singh S, Varshney M, Das D, Nandagopalou D, Dwivedi D. Efficacy of prophylactic ketamine, ondansetron, and pethidine in preventing perioperative shivering in patients undergoing elective knee replacement surgery under spinal anaesthesia. Turkish Journal of Anaesthesiology and Reanimation. 2022 Feb;50(1):44.
9. Raushan DA. Intrathecal dexmedetomidine or meperidine for post-spinal shivering. European Journal of Molecular & Clinical Medicine. 2022 Aug 8;9(4):2173-7.