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Original Article

Comparison of Dexmedetomidine with Tramadol for Treatment of Shivering Post Spinal Anaesthesia

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ABSTRACT

Objective: To compare the efficacy of Dexmedetomidine with Tramadol for shivering post-spinal anaesthesia.
Study Design: Quasi-experimental study.
Place and Duration of Study: Department of Anaesthesia, Combined Military Hospital, Rawalpindi Pakistan, from Jul to Dec 2020.
Methodology: A total of 158 patients who underwent gynaecological, orthopaedic and general surgical procedures under spinal anaesthesia using 0.5% hyperbaric Bupivacaine 12-15 mg were included in the study. Out of these 158 patients, 64% (102 patients) developed shivering after spinal anaesthesia. These 102 patients were divided into two equal groups, i.e., Group-D (n=51), who received 0.5 µg/kg Dexmedetomidine and Group-T (n=51), who received 0.5 mg/kg tramadol. The response in the next 15 mins was evaluated objectively as "effective" or "non-effective" by the treating Anesthesiologist.
Results: Dexmedetomidine and Tramadol were effective in treating shivering following spinal anaesthesia. Our study showed that Dexmedetomidine was more effective than Tramadol in treating shivering, with an effectiveness of 88.2 % shivering relief in Group-D and an effectiveness of 51 % shivering relief in Group-T. The effectiveness was significant in both groups, with statistical significance in Group-D compared to Group-T (p<0.05).
Conclusion: Shivering relief was more responsive in patients who received Dexmedetomidine than Tramadol after spinal anaesthesia.

Keywords: Dexmedetomidine, Efficacy, Shivering, Spinal, Tramadol.

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INTRODUCTION

The core temperature of the human body maintains hemostasis in a narrow range of 36.5^{O} to 37^{O}C. As a response to cold, there is a thermoregulatory response in the human body that results in repetitive skeletal muscle contractions, termed shivering.[1] Shivering is a common complication after spinal anaesthesia, and the reported incidence is around 55 %.[2] Spinal anaesthesia causes peripheral vasodilation and temperature redistribution from the core to the peripheries, rapidly decreasing core body temperature. As compensation for this effect, shivering occurs to maintain body temperature hemostasis.[3] The gold standard for measuring core body temperature is using a tympanic probe. Spinal anaesthesia prevents vasoconstriction by blocking the sympathetic fibres, thus making the patients prone to shivering.[4]

Pharmacological treatment of shivering by intrathecal Meperidine and Dexamethasone was effective in treating shivering after spinal anesthesia.[5] Non-pharmacological treatment for shivering includes forced-air warming, using blankets and warm intravenous fluids. The most frequently used pharmacological treatment includes Clonidine, Pethidine, Tramadol, Nefopam and Ketamine.[6] Studies have shown that, at present, no standard treatment for shivering is available.[7,8] Dexmedetomidine is a selective agonist at α2 receptors causing sedation, decreases anxiety and analgesia without causing depression of respiratory function and has been found to treat shivering effectively following spinal anaesthesia with fewer side effects.[9,10] Tramadol is a centrally-acting opioid that prevents the reuptake of noradrenaline and releases 5-hydroxytryptamine (5-HT). It also acts on µ receptors and activates them. The study aims to establish a local protocol for shivering relief post-spinal anesthesia by comparing the efficacy of Dexmedetomidine and Tramadol, as current pharmacological treatments lack standardization, and each drug's effectiveness is assessed through a quasi-experimental study conducted at Combined Military Hospital Rawalpindi. The study was conducted to formulate a local protocol for shivering relief by finding the drug of choice with the least possible deleterious effects.

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METHODOLOGY

The quasi-experimental study was conducted at the Department of Anaesthesia, Combined Military Hospital Rawalpindi, from July 2020 to December 2020 after obtaining approval of the Ethical Committee (ERC no 70/05/20) Combined Military Hospital, Rawalpindi. The sample size was calculated using the WHO sample size calculator version 2.0, keeping the anticipated population proportion (P1) & (P2) were 100% and 55% respectively.10 The non-probability consecutive sampling technique was used.

Inclusion Criteria: Patients with ASA (American Society of Anesthesiologists) physical status I & II of either gender, aged 18-70 years, undergoing any elective surgery under neuraxial anaesthesia, were included.

Exclusion Criteria: Patients with debilitating illness, and those allergic to the drugs were excluded from the study.

As per the study protocol, all the patients were questioned, briefed and advocated about the procedure. Before the procedure, the patients' history, clinical examination, and investigations were reviewed, and the vital signs of all the patients were noted. Patients who developed grade 3 or 4 shivering were treated with Dexmedetomidine and Tramadol. Body temperature (tympanic membrane temperature) was recorded with a Dragger Fabius Ear Thermometer probe at the start of shivering and 5, 10 and 15 minutes after the shivering treatment. Non-invasive standard monitoring was used during surgeries. Neuraxial anaesthesia was given at the lumbar vertebra 3–4/4–5 interspaces, with 12-15 mg hyperbaric Bupivacaine. Opioids were not given during the procedure, and patients were given oxygen at the rate of five l/minute by face mask. Patients were not deliberately warmed during anaesthesia; however, the preloading fluids were pre-warmed to normal body temperature. Out of a total of 158 patients, the 102 patients who experienced grade 3 or 4 shivering during the operation were then divided into Group-D and Group-T. Group-D received dexmedetomidine 0.5µg/kg (n=51), and Group-T received tramadol 0.5mg/kg (n=51). Both the drugs were diluted in 5.0ml of normal saline and given intravenously over 3–5 minutes (Figure).

The study drugs were administered at the start of shivering, and the time that passed from the start of the treatment to the cessation of shivering was recorded. If the shivering was not controlled in 15 minutes, the intervention was taken as ineffective. Treatment effectiveness was evaluated objectively as "effective" or "non-effective" by the treating Anesthesiologist. Vital signs of patients and side effects of study drugs were recorded during this period.

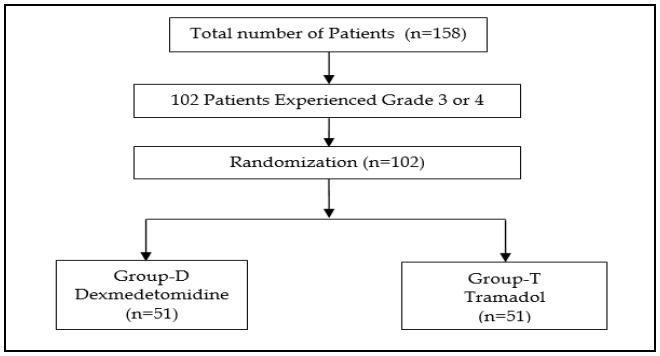

Figure: Patient Flow Diagram (n=158)

Statistical Package for Social Sciences (SPSS) version 24.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-va lue of ≤0.05 was set as the cut-off value for significance.

RESULTS

A total of 158 patients were included in this study, out of which 102 patients experienced grade 3 or 4 shivering. These patients were then divided into two equal groups (n=51). There were 37.2% males and 62.8% females in Group D, while 25.5% males and 74.5% were females in Group T, respectively, as shown in Table-I.

Table-I: Patient Demographic Profile (n=102)

Patient Data	Dexmedetomidine-Group	Tramadol-Group
Age (Years)	34.75±13.6	47.14±13.6
Weight (Kgs)	67.73±9.63	63.29±9.0
Gender		
Male	19(37.2%)	13(25.5%)
Female	32(62.8%)	38(74.5%)

The response rate was highest in Group-D (88.2 % effective), which was significant compared to Group-T (*p*=0.001) (Table-II). In Group-D, 22 patients developed mild side effects of hypotension (23.53%) and bradycardia (19.6%), while in Group-T, hypotension (9.8%) and nausea and vomiting (5.8%) were observed, as shown in Table-III. All the side effects were treated in the Anaesthesia Care Unit, and patients were stabilized before shifting to the Inpatient Department.

Table-II: Comparison of type of Drug Administered with Treatment Response (n=102)

Type of Drug	Treatment Response		*p*-value
	Effective	Ineffective	
Dexmedetomidine (Group-D)	45(88.2%)	6(11.8%)	<0.001
Tramadol (Group-T)	26(51%)	25(49%)	

Key: Response to treatment, Effective: Shivering stopped within 15 minutes, Ineffective: Shivering continued after 15 minutes

Table-III: Adverse effects in Study Groups (n=102)

Adverse effects	Dexmedetomidine-Group (n=51)	Tramadol-Group (n=51)
Hypotension	12(23.53%)	5(9.8%)
Bradycardia	10(19.6%)	-
Nausea and Vomiting	-	3 (5.8%)

DISCUSSION

Spinal anaesthesia is the best option because of its quick beginning, predominant barricade, and generally safe from disease.[11] It is the most generally utilized strategy for cesarean sections and lower limb surgeries.[12] Shortcomings associated with SA include a relatively short duration of anaesthesia, analgesia and shivering. The shivering during neuraxial anaesthesia was 64.5% in our study, comparable to the shivering, which was 55% in the previous study.[13]In our study, Dexmedetomidine has been found effective in treating shivering within 15 minutes after the commencement of shivering post-spinal anaesthesia. This was comparable to the a study by Abdel-Ghaffar *et al.*,[3] which showed efficacy when Dexmedetomidine was used in doses of 0.3 and 0.5µg/kg, respectively. However, the same drug was ineffective when the dose was decreased to 0.2µg/kg.[3]

In our study, 12 out of 51 patients developed hypotension, and 10 out of 51 patients developed bradycardia in the dexmedetomidine group. Samantaray *et al*. explained in their study about hypotension associated with dexmedetomidine usage.[14] In the same way, five patients had hypotension, and three patients experienced nausea and vomiting in the tramadol group. Another study done by Karim Nasseri *et al*. compared Dexmedetomidine with bupivacaine (group BD) vs normal saline and bupivacaine (group BN). It was seen that shivering was reduced from 52% in the BN group to 0.24% in the BD group.[15]

Hidayah *et al*. compared intravenous tramadol and intravenous Ketamine to treat shivering after spinal anaesthesia and found both the drugs to be effective, but Ketamine in the dose of 0.5mg/kg had multiple adverse effects compared to Tramadol in the same dose.[16] He *et al*. also compared the effect of intrathecal Dexmedetomidine, administered as an adjunct to hyperbaric bupivacaine for Cesarean delivery, on the incidence and severity of shivering associated with spinal anaesthesia and found it reduced.[17] Gautam *et al*. also compared different regimens and found that Dexmedetomidine decreases shivering.18 Venkatraman *et al*. concluded in their study that Dexmedetomidine is better than Tramadol and clonidine in the control of shivering due to its quicker beginning and less repeat rate.[19]

The results of our study were comparable with other studies and showed promising similar results as there was a reduction of shivering after spinal anaesthesia. It has reduced the shivering, improving the outcome of the patient by reducing morbidity and enhancing the quality of life with relatively few side effects. However, the adverse effects of the drugs used in our study should be kept in mind, and other drugs can be tested for the treatment of shivering with relatively fewer side effects and more beneficial effects for the patient to formulate clinical guidelines for the cure of shivering after spinal anaesthesia.

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CONCLUSION

Dexmedetomidine was relatively more effective than Tramadol for curing shivering after spinal anaesthesia. However, the side effects of hypotension and bradycardia with Dexmedetomidine can lead to detrimental effects in patients with a previous cardiovascular illness. In the same way, Tramadol with fewer side effects might not be as effective as Dexmedetomidine.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

CRR & MS: Conception, study design, drafting the manuscript, approval of the final version to be published.

BM & UH: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

SA & AT: Data acquisition, critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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