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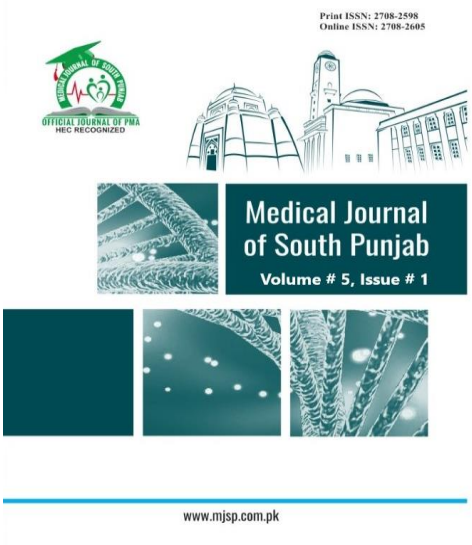

Role of Dexmedetomidine on post-traumatic sress response

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Original Article

Role of Dexmedetomidine on post-traumatic sress response

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ABSTRACT

Objective: *to explore the role of dexmedetomidine on the incidence of postoperative post traumatic stress response (PTSD) in trauma patients in the emergency department.*

Methods: *This randomized clinical trial was carried out at Lady Reading Hospital Peshawar from January 2023 to October 2023. Participants were randomly assigned to receive either normal saline or dexmedetomidine. The study medications included 2ml normal saline or dexmedetomidine 200 µg/2 mL.*

Results: *Postoperative NRS score of normal saline and dexmedetomidine group at day 1 was 4.57±1.79, at day 2 2.66±1.23, and at day was 3 1.84±0.41 gradually decreased, and in dexmedetomidine group, low NRS score was found at day 1 it was 3.09±1.03, at day 2 it was 2.33±0.49 and at day 3 it was 0.59±0.11. Postoperative BAI score was gradually decreased from day 1, 2 and day 3, and BAI score was low in dexmedetomidine group as compared to the normal saline group, (p<0.050).*

Conclusion: *The use of dexmedetomidine intraoperatively has been shown to decrease the post-operative stress in patients of trauma. Dexmedetomidine can be used in emergency traumatic surgeries for sedation and to overcome the post operative complications and stress.*

Keywords: *Dexmedetomidine, stress response, trauma, NRS score, BAI score*

1. INTRODUCTION

Posttraumatic stress disorder (PTSD) is a psychiatric condition that arises following the experience of significant trauma[1]. It is characterized by a range of symptoms including recurring and distress experiencing of the traumatic event, which can manifest as flashbacks and intrusive thoughts[2]. Individuals with PTSD also tend to engage in avoidance behaviors to steer clear of reminders of the trauma[3]. Additionally, there is change in cognition and mood, and heightened states of arousal[4]. These symptoms can persist for years or even decades, with individuals suffering from recurrent episodes that bring back traumatic experiences and maintaining high levels of vigilance and avoidance throughout this period[5].

Post-traumatic stress disorder (PTSD) is a severe damaging and mental disorder that impacts social activities of a person. In the world incidence of PTSD is rising day by day and reached up to 22%[6]. Contributing factors of PTSD include wars, accidents, and natural disasters. Literature shows PTSD prevalence in United States as 6-8%[7], it was 13 to 30% in military. In cases of PTSD development it is quite difficult to manage and handle the risk of suicide[8]. Early management of trauma patients is essential to manage its burden on society and families.

There is a complex pathogenesis involve but mechanisms of neurobiology are not clear or under debate. Research indicates that recurrent traumatic experiences are a core PTSD symptom, closely linked to an abnormally strengthened fear memory[9]. According to the principles of Pavlovian conditioning, environmental cues present during the trauma, such as loud sounds or specific objects, become associated with the aversive experience, like an accident or injury[10]. When individuals are reexposed to a similar environment, it can trigger the fear memory, leading to physiological and behavioral reactions—a phenomenon known as fear conditioning[11].

Study designed to determine the role of dexemedetomidine on occurrence of post operative stress response in traumatic patients presented at emergency department of lady reading hospital, Peshawar, secondary purpose of this study is to establish core foundation for more precise prevention for these patients regarding stress management.

2. METHODOLOGY

This randomized clinical trial was carried out at Lady Reading Hospital Peshawar from January 2023 to October 2023. The study received approval from the ethics board of hospital, and consent was signed by all patients. Patients were assigned randomly to receive either normal saline or dexmedetomidine. The study medications included 2ml normal saline or dexmedetomidine 200 μg/2 mL, with the drug assigned to an anesthetic nurse who was unaware of study groups. Dexmedetomidine was diluted in 50 ml normal saline to obtained final product of 4 μg/mL concentration.

Both drug either placebo or study drug were given at dose of 0.1 μg/kg/hr from the time of induction and to the end of surgical procedure. After surgery infusion was continued for 10 hours on next 3 days. Postoperative assessments included measurement of pulse oxygen, heart rate, blood pressure, over a 3-day period. Perioperative clinical data include any adverse event, or admission to intensive care.

Patients aged 18 to 60 years, who experienced trauma (such as car crashes, falls, or engineering incidents) and required emergency surgery, were eligible for inclusion if they had an American Society of Anesthesiologists (ASA) I, II and III. Patients with 2nd or 3rd degree heat block, history of head injury, language and visual impairment, drug dependence, alcohol abuse, neurological disorder, kidney or liver disorder, hemorrhagic shock, cerebral injury and spinal trauma were excluded.

The main outcome measure was the incidence of PTSD, evaluated by Clinician using PTSD Scale for Diagnostic and NRS score and BAI score one month after the intervention. The diagnostic assessments were conducted by professionally trained physicians, who were blinded to the treatment group assignments, in calm and controlled environments at both assessment points.

SPSS version 27 was used for data analysis, after mean and frequency of numerical and categorical variables test of significance was applied. P value less than or equal to 0.05 was considered as significant.

3. RESULTS

From 280 patients, 135 (48.2%) were included in normal saline group and 145 (51.8%) were included in dexmedetomidine group. The mean age of normal saline and dexmedetomidine group was 44.90±8.23 years and 46.92±6.48 years, respectively. (p=0.328). There were

84 (62.2%) males and 51 (37.8%) females in normal saline group, whereas there were 93 (64.1%) males and 52 (35.9%) females, in dexmedetomidine group. (p=0.740). The average body mass index of normal saline and dexmedetomidine group was 26.68±2.61 kg/m^2 and 25.74±3.46 kg/m^2, respectively. (p=0.868). Smoking, diabetes and hypertension in normal saline group was 39 (28.9%), 42 (31.1%), and 35 (25.9%), respectively. Whereas in dexmedetomidine group, smoking, diabetes and hypertension was 36 (24.8%), 38 (26.2%), and 38 (26.2%), respectively. (p>0.050). There were 77 (57.0%) and 80 (55.2%) patients had ASA status I for normal saline and for dexmedetomidine group, there were 80 (55.2%) and 65 (44.8%) patients had ASA II. (p=0.753). The mean duration of surgery of normal saline and dexmedetomidine group was 124.10±17.21 minutes and 122.48±18.07 minutes. (p=0.430). (Table. I).

Postoperative clinical outcomes of both the groups were shown in table. II. Postoperative VAS score of normal saline and dexmedetomidine group from 1, 6 to 12 hours were gradually decreased, but among the groups, the differences were statistically insignificant, (p>0.050). Postoperative NRS score of normal saline and dexmedetomidine group at day 1, 2 and 3 was gradually decreased, but in dexmedetomidine group, low NRS score was found, and the difference was statistically significant, (p<0.050). Postoperative BAI score was gradually decreased from day 1, 2 and day 3, and BAI score was low in dexmedetomidine group as compared to the normal saline group, (p<0.050). (Table. II).

Adverse effects in both the groups were depicted in figure. I. Nausea, delirium, and pruritus in both the groups had not statistically significant, (p>0.050). (Figure. I).

Table. I
Demographics and baseline profile

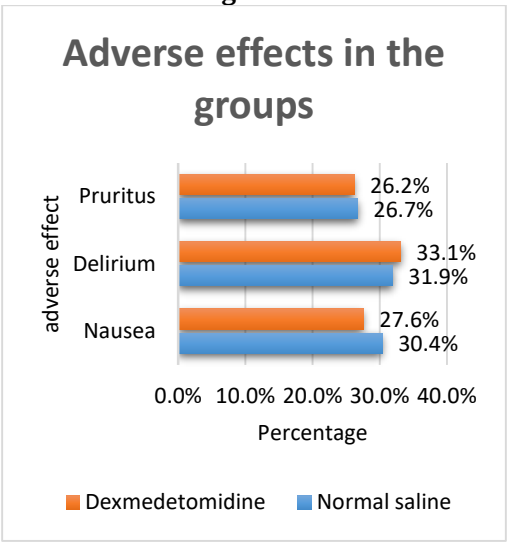
Variable	Group		p-value
	Normal saline	Dexmedetomidine	
Age (years)	44.90±8.23	46.92±6.48	0.328
Gender			
Male	84 (62.2)	93 (64.1)	0.740
Female	51 (37.8)	52 (35.9)	
BMI (kg/m^2)	26.68±2.61	25.74±3.46	0.868
Smoking	39 (28.9)	36 (24.8)	0.443
Diabetes	42 (31.1)	38 (26.2)	0.364
Hypertension	35 (25.9)	38 (26.2)	0.957
ASA status			
I	77 (57.0)	80 (55.2)	0.753
II	58 (43.0)	65 (44.8)	
Duration of surgery (minutes)	124.10±17.21	122.48±18.07	0.430
N (%), mean±standard deviation			

Table. II
Postoperative clinical outcomes

Variable	Group		p-value
	Normal saline	Dexmedetomidine	
Postoperative VAS score			
At 1 hour	4.55±1.89	4.47±2.05	0.720
At 6 hours	2.55±1.11	2.63±1.31	0.589
At 12 hours	0.21±0.12	0.25±0.14	0.064
NRS score			
At day 1	4.57±1.79	3.09±1.03	<0.001

At day 2	2.66±1.23	2.33±0.49	0.003
At day 3	1.84±0.41	0.59±0.11	<0.001
BAI score			
At day 1	17.41±2.18	13.85±5.66	<0.001
At day 2	14.58±2.96	13.46±2.93	0.002
At day 3	13.25±1.98	11.94±2.72	<0.001
N (%), mean±standard deviation			

Figure. I



4. DISCUSSION

PTSD is considered one of the most prevalent psychiatric disorders following exposure to traumatic injury. While most well established management is trauma-focused cognitive behavior therapy for PTSD, its progress has stalled in recent decades, and only about two-thirds of patients respond effectively to it[12]. Furthermore, a significant number of individuals with PTSD do not receive evidence-based treatment[13]. Thus, it is important to focus on preventing PTSD in high-risk situations, such as emergency surgeries for trauma patients. This trial represents the first known study to demonstrate the impact of perioperative dexmedetomidine administration in preventing PTSD.

The suppression of SNS activation through sympatholytic actions, such as the use of an alpha-2 adrenoceptor agonist, can benefit the immune system. DEX, which acts primarily through both central and peripheral nervous system alpha-adrenergic receptors, can reduce acute psychological stress reactions by blocking the positive feedback mechanism of the HPA axis[14].Surgery triggers systemic inflammation, increasing cytokines and stress hormones. Leukocytes migrate to the injury site, initiating healing but also causing complications. These include severe, persistent pain, fatigue from metabolic stress, atrial fibrillation, and cognitive dysfunction[15].

Previous research in this topic reported an association between PTSD and sleep quality, reporting that better sleep can improve symptoms of PTSD[16]. Another study was conducted on low dose administration of dexmedetomidine and association with sleep quality and reported a positive association between both in patients of

trauma who required urgent intervention in emergency department and follow up was advised for several days after procedure. In our study we used at dose of 0.1 μg/kg/hr from the time of induction and to the end of surgical procedure. This better sleep quality may help to understand the mechanism of dexmedetomidine in prevention of PTSD symptoms[17].

In a study conducted by Kallio et al[18] it was demonstrated that Dexmedetomidine effectively mitigates stress-induced increases in blood glucose levels. This effect is achieved through its activity as a postsynaptic α2 adrenergic agonist, which leads to a significant reduction in the release of nor epinephrine.

Korukonda et al[19] reported that the perioperative infusion of Dexmedetomidine effectively attenuates stress-induced hemodynamic fluctuations, reduces Propofol requirements, decreases opioide requirement in peri-operative and post-operative time. Another study was completed by Khare et al[20] and observed sudden rise in heart rate and blood pressure at the time of intubation, laryngoscopy, extubation and pnemoperitoneum in placebo group. But, when dexmedetomidine was given in other group no bradycardia and stress was noted.

5. CONCLUSION

The use of dexmedetomidine intraoperatively has been shown to decrease the post-operative stress in patients of trauma. Dexmedetomidine can be used in emergency traumatic surgeries for sedation and to overcome the post operative complications and stress.

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