EFFECT OF DEXMEDETOMIDINE ON NOREPINEPHRINE REQUIREMENTS IN CRITICALLY ILL PATIENT WITH SEPTIC SHOCK

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INTRODUCTION

Septic shock is characterized by hemodynamic instability, carrying high mortality. Management follows the Surviving Sepsis Campaign guidelines, emphasizing fluid resuscitation, early vasopressor (mainly norepinephrine) use, appropriate antimicrobial therapy and other supportive measures. Norepinephrine improves vascular tone mainly and cardiac output through its α1 and β1 agonism. It is the first vasopressor line to use in hypotensive septic shock patients. Alpha-adrenergic receptors may also become desensitized and downregulated as a result of sympathetic overstimulation due to excessive catecholamines contributing to hemodynamic instability and poor outcomes. Dexmedetomidine, an α2-agonist sedative analgesic, shows promise in many fields and there is uprising role in sepsis by reducing inflammatory responses and mortality. Dexmedetomidine increases vasopressor responsiveness maintaining hemodynamics without respiratory depression. However, its side effects especially bradycardia are still a concern.

AIM OF THE WORK

To assess the effect of dexmedetomidine on norepinephrine requirements as a vasopressor in critically ill patients with septic shock.

PATIENTS AND METHODS

Patients: This randomized controlled trial included 90 patients aged 18–65 years with septic shock admitted to the Critical Care Department, Alexandria University Hospitals. Informed consent from next-of-kin and approval from the Medical Ethical Committee were obtained.

Inclusion Criteria: Diagnosis of septic shock according to Sepsis-3 definitions: hypotension requiring vasopressors to maintain MAP ≥65 mmHg and serum lactate >2 mmol/L despite adequate fluid resuscitation.

Exclusion Criteria: Pregnant or lactating women, Patients with any form of bradycardia, Acute fulminant hepatic failure, Patients with other types of shock (e.g., cardiogenic, hypovolemic, obstructive).

Methods: Patients were randomized into two groups: Group I received norepinephrine only, and Group II received norepinephrine plus dexmedetomidine. Data collection included demographics, full history, clinical and laboratory evaluation, ECG, chest X-ray, APACHE II, and SOFA scores. Management follows the Surviving Sepsis Campaign 1-hour bundle. Patients followed up for the study endpoints through their critical illness and ICU stay.

Outcome Measures: Norepinephrine dosage, vasopressor-free days, mechanical ventilation days and ICU stay, 7-day and 28-day mortality

RESULTS

Table1 : Comparison between the two groups according to important follow up parameters

	Group I	Group II	P
On admission (Mean ± SD.)	(n = 45)	(n = 45)	
MABP (mmHg)	48.87 ± 11.22	54.51 ± 6.61	0.005*
Heart Rate (beats/min)	125.0 ± 14.39	127.8 ± 10.76	0.299
Respiratory rate (Cycle/min.)	28.33 ± 3.85	28.53 ± 3.59	0.799
SOFA score Median (IQR)	10.0 (8.0 – 14.0)	12.0 (9.0 – 14.0)	0.280
Day 2 (Mean ± SD.)	(n = 44)	(n = 45)	
MABP (mmHg)	76.32 ± 11.14	83.89 ± 6.71	<0.001*
Heart Rate (beats/min)	101.8 ± 12.73	93.24 ± 9.37	0.001*
Respiratory rate (Cycle/min.)	24.39 ± 3.81	22.11 ± 2.70	0.002*
SOFA score Median (IQR)	8.0 (5.0 – 12.0)	10.0 (5.0 – 12.0)	0.993
Day 3 (Mean ± SD.)	(n = 42)	(n = 45)	
MABP (mmHg)	80.60 ± 11.73	91.58 ± 5.86	<0.001*
Heart Rate (beats/min)	100.9 ± 13.25	89.47 ± 8.80	<0.001*
Respiratory rate (Cycle/min.)	20.76 ± 3.38	19.20 ± 2.04	0.012*
Day 4 (Mean ± SD.)	(n = 39)	(n = 45)	
MABP (mmHg)	82.41 ± 9.76	93.02 ± 8.12	<0.001*
Heart Rate (beats/min)	98.49 ± 12.42	86.42 ± 10.99	<0.001*
Respiratory rate (Cycle/min.)	19.62 ± 3.10	17.33 ± 2.70	<0.001*
SOFA score Median (IQR)	6.0 (2.50 – 9.0)	6.0 (2.0 – 10.0)	0.860
Day 5 (Mean ± SD.)	(n = 35)	(n = 43)	
MABP (mmHg)	85.23 ± 9.94	94.16 ± 10.50	<0.001*
Heart Rate (beats/min)	95.66 ± 12.13	83.60 ± 12.38	<0.001*
Respiratory rate (Cycle/min.)	18.20 ± 2.58	16.74 ± 2.61	0.016*
Day 6 (Mean ± SD.)	(n = 31)	(n = 39)	
MABP (mmHg)	89.39 ± 8.21	95.03 ± 11.86	0.028*
Heart Rate (beats/min)	92.48 ± 10.11	79.46 ± 9.68	<0.001*
Respiratory rate (Cycle/min.)	17.0 ± 1.75	16.82 ± 2.89	0.762
SOFA score Median (IQR)	4.0 (1.0 – 6.0)	3.0 (1.0 – 8.0)	0.884
Day 7 (Mean ± SD.)	(n = 27)	(n = 33)	
MABP (mmHg)	90.81 ± 9.32	99.91 ± 9.32	<0.001*
Heart Rate (beats/min)	93.78 ± 10.90	75.67 ± 9.36	<0.001*
Respiratory rate (Cycle/min.)	17.22 ± 2.81	15.97 ± 1.76	0.039*

IQR: Inter quartile range **p**: p value for comparing between **Group I** and **Group II**
***:** Statistically significant at **p ≤ 0.05** **MABP :** Mean Arterial Blood Pressure
SOFA: Sequential Organ Failure Assessment

Table 2: Comparison between the two groups according to the study endpoints

	Group I (n = 45)		Group II (n = 45)		P
Total Norepinephrine dose (mg)					
Median (IQR)	130.0 (58.0 – 208.0)		102.0 (52.0 – 150.0)		0.141
Total Norepinephrine days					
Median (IQR)	5.0 (3.0 – 9.0)		5.0 (4.0 – 8.0)		0.981
Vasopressors free days					
Median (IQR)	3.0 (0.0 – 4.0)		4.0 (2.0 – 5.0)		0.019*
Days of mechanical ventilation					
Median (IQR)	4.0 (0.0 – 8.0)		4.0 (1.0 – 7.0)		0.828
ICU stay					
Median (IQR)	8.0 (5.0 – 14.0)		9.0 (6.0 – 12.0)		0.412
	No.	%	No.	%	
Day 7 Mortality	8	17.8	6	13.3	0.561
Day 28 Mortality	20	44.4	13	28.9	0.126

IQR: Inter quartile range **p**: p value for comparing between **Group I** and **Group II**
***:** Statistically significant at **p ≤ 0.05** **ICU**: Intensive Care Unit

CONCLUSION

Dexmedetomidine use in septic shock patients was linked to higher MAP at the same norepinephrine doses, meaning lower vasopressor needs. It improved heart and respiratory rate control without deep sedation. Additionally, it resulted in more vasopressor-free days indicating better hemodynamics and tissue perfusion.

However, dexmedetomidine showed no significant difference in SOFA scores, 7- and 28-day mortality, mechanical ventilation days, or ICU stay duration. While hypotension and bradycardia are known side effects, they did not occur at statistically significant rates in this study, suggesting dexmedetomidine was safe and well-tolerated in the studied septic shock population.