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EFFECTIVENESS OF PHENYLEPHRINE VERSUS NOREPINEPHRINE FOR INITIAL HEMODYNAMIC SUPPORT OF PATIENTS WITH SEPTIC SHOCK

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ABSTRACT

It was clear from past studies that delay treatment has shown its impact on hepatisplanchnic perfusion by phenylephrine. As compared to norepinephrine on administering phenylephrine in patients with delayed administration the levels of pronounced hepatoplanchnic vasoconstriction was increased in a study. Phenylephrine is known as selective α1-receptor agonist which mainly constricts larger arterioles with no virtual effects on terminal arterioles. Norepinephrine has shown its effect on stimulating α1 and α2 receptors which was comparatively low with β1 and β2 receptors. Many studies suggest phenylephrine as first line drug for initial vasopressor in patients with septic shock. that there are no differences between nor epinephrine and phenyl epinephrine, in terms of hemodynamics when they are administered as a first line vasopressor agent in septic shock. Phenylephrine maintains the MAP, without impairing gastrointestinal mucosal perfusion Phenylephrine improves oxygen delivery by improving splanchnic blood flow in septic shock patients. But, these are of limited number of studies to consider for clinical use. On other hand dopamine or norepinephrine is considered as first line drug for increasing peripheral vascular resistance and also to prevent organ perfusion followed by adequate volume therapy. . Cause of septic shock was assessed in different aspects like pneumonia which was noted as 4 patients in phenylephrine group and 5 patients in norepinephrine group. Meningitis was recorded as 6 patients on phenylephrine group and 5 patients in norepinephrine group. Peritonitis was observed to be 5 patients in phenylephrine group and 5 patients in norepinephrine group. Left ventricular work index was assessed in terms of g/m2/beat was 25 ± 11 and 25 ± 8 in phenylephrine and norepinephrine groups respectively. Stroke volume index was assessed in terms of g/m2/beat as 45 ± 18 and 46 ± 13 as baseline in both the groups. And after 12 hours it was assessed to be 49 ± 19 and 50 ± 11 in phenylephrine and norepinephrine groups respectively. Cardiac troponin I in terms of ng/ml was assessed to be 1.0 ± 0.9 in phenylephrine and 0.9 ± 09 in norepinephrine. After 12 hours it was assessed to be 1.1 ± 0.9 and 1.1 ± 0.8 in phenylephrine and norepinephrine group respectively.

Key words: Phenylephrine, Norepinephrine, Septic shock.

INTRODUCTION

Many studies suggest phenylephrine as first line drug for initial inotrope in patients with septic shock[1]. Phenylephrine improves oxygen delivery by improving splanchnic blood flow in septic shock patients[2]. But, these are of limited number of studies to consider for clinical use[3]. On other hand dopamine or is considered

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as first line drug for increasing peripheral vascular resistance and also to prevent organ perfusion followed by adequate volume therapy[4,5]. In septic shock , norepinephrine has shown compromised blood flow to the mesenteric circulation[6-9]. It was clear from past studies that delay treatment has shown its impact on hepatisplanchnic perfusion by phenylephrine[10]. As compared to norepinephrine on administering phenylephrine in patients with delayed administration the levels of pronounced hepatoplanchnic vasoconstriction was increased in a study[11-14]. Phenylephrine is known as selective α1-receptor agonist which mainly constricts larger arterioles with no virtual effects on terminal arterioles[15]. Norepinephrine has shown its effect on stimulating α1 and α2 receptors which was comparatively low with β1 and β2 receptors[16-19].

Thus, from all the above variations and different conclusions from various studies the present study was aimed to assess the phenylephrine and norepinephrine activity as first line drug in hemodynamic support of septic shock patients.

AIMS & OBJECTIVES:

- To assess the clinical outcomes of phenylephrine in patients with septic shock.
- To assess the clinical outcomes and efficacy of norepinephrine in patients with septic shock.
- To assess the clinical evidences and therapeutic approach ranges of hemodynamic support in patients with septic shock.
- To assess and conclude on the best first line drug of choice for hemodynamic support in septic shock patients among phenylephrine and norepinephrine.

MATERIALS & METHODS:

Study has been carried out in Kamineni institute of medical sciences, Narketpally, Nalgonda district, Telangana, India. The study work was carried out in the department of emergency medicine in patients with septic shock associated with hemodynamic challenges. On getting approval from Local Institutional Ethics Committee. Informed consent was obtained from all the patients enrolled into the study to give consent by themselves. Patient enrolment has been started from December 2018 to July 2019. All the patients enrolled into the study were of patients who have fulfilled the septic shock criteria with a mean arterial pressure.

Inclusion criteria:

- Patients who presented with septic shock and mean arterial pressure <65 mmHg .
- Mean arterial pressure (MAP) < 65 mmHg despite of pulmonary artery occlusion pressure(PAOP) which was between 12 to 18 mmHg.
- A central venous pressure lying between 8 to 15 mm Hg.

Exclusion criteria:

- Patients who have presented PAOP with a high ranges of >18 mmHg.
- Patients with medical history of renal failure, severe liver dysfunction (child-Turcotte-Pugh grade C).
- Patients with cardiac problems like significant valvular heart disease, present coronary artery diseases.
- Pregnant patients have been excluded.

Patients on medications like midazolam and sufentanil norepinephrine.

RESULTS & DISCUSSION:

The study included a total of 30 patients who have been divided into 2 groups based on the drug administered in the patients with phenylephrine and norepinephrine. Each group consisted of 15 patients. Mean age of phenylephrine group was observed to be 65, and norepinephrine group was observed to be 67. The percentage of male patients in each group has been assessed and was recorded as 70 in phenylephrine group and 65 in norepinephrine group. Cause of septic shock was assessed in different aspects like pneumonia which was noted as 4 patients in phenylephrine group and 5 patients in norepinephrine group. Meningitis was recorded as 6 patients on phenylephrine group and 5 patients in norepinephrine group. Peritonitis was observed to be 5 patients in phenylephrine group and 5 patients in norepinephrine group. Mortality has been assessed which was assessed to be 6 patients in phenylephrine group with a percentage of 53.3%, and 7 patients in norepinephrine with a percentage of 46.6%. Intensive care unit length in terms of days has been assessed and was found to be 14 in phenylephrine group and16 patients in norepinephrine group, as represented in table 1.

As represented in table 2, hemodynamic variables of study patients has been assessed in both the groups. Pulmonary artery occlusion pressure (mmHg) as baseline in phenylephrine group was 15 ± 2, and in norepinephrine group 15 ± 2. After 12 years it was assessed to be 17 ± 3 in both the groups. Right atrial pressure (mmHg) was assessed to be 13 ± 3 in phenylephrine group and 13 ± 3 in norepinephrine group. After 12 hours it was assessed to be 14 ± 2 in phenylephrine and 15 ± 3 in norepinephrine group. Mean pulmonary arterial pressure (mmHg) was assessed in baseline as 27 ± 5 in phenylephrine and 28 ± 9 in norepinephrine group. Pulmonary vascular resistance index was assessed to be 27 ±5 in baseline of phenylephrine and 28 ± 9 in norepinephrine group. After 12 hours it was assessed as 30 ± 5 and 33 ± 7 in phenylephrine and norepinephrine groups respectively.

Table 1: Baseline characteristics of study patients

	Phenylephrine (n = 15)	**Norepinephrine (n = 16)**
Age (years)	65 (50-72)	67(53-72)
Gender (% of male patients)	70	65
Cause of septic shock	Peritonitis (n = 5), meningitis (n = 6), pneumonia (n = 4)	Peritonitis (n = 5), meningitis (n = 5), pneumonia (n = 5)
Mortality (n (%))	6/15(53.3%)	7/15(46.6%)
Intensive care unit length of stay (days)	14(8 to 26)	16(11 to 25)

Table 2: Hemodynamic variables of study patients

	Phenylephrine	Norepinephrine
Pulmonary artery occlusion pressure (mmHg)		
Baseline	15 ± 2	15 ± 2
12 hours	17 ± 3	17 ± 3
Right atrial pressure (mmHg)		
Baseline	13 ± 3	13 ± 3
12 hours	14 ± 3	15 ± 3
Mean pulmonary arterial pressure (mmHg)		
Baseline	27 ± 5	28 ± 9
12 hours	30 ± 5	33 ± 7
Pulmonary vascular resistance index (dyne·s/cm5/m2)		
Baseline	235 ± 103	293 ± 253
12 hours	348 ± 296	264 ± 105
Right ventricular stroke work index (g/m2/beat)		
Baseline	9 ± 5	8 ± 4
12 hours	12 ± 7	11 ± 4
Left ventricular stroke work index (g/m2/beat)		
Baseline	25 ± 11	25 ± 8
12 hours	37 ± 9	35 ± 14
Stroke volume index (g/m2/beat)		
Baseline	45 ± 18	46 ± 13
12 hours	49 ± 19	50 ± 11
Cardiac troponin I (ng/ml)		
Baseline	1. ± 0.9	0.9 ± 0.9
12 hours	1.1 ± 0.9	1.1 ± 0.8

Right ventricular stroke work index in terms of g/m2/beat was assessed to be 9 ± 5 as baseline and 8 ± 4 as baseline in phenylephrine and norepinephrine groups respectively and after 12 hours it was assessed to be 12 ± 7 in phenylephrine and 11 ± 4 in norepinephrine group. Left ventricular work index was assessed in terms of g/m2/beat was 25 ± 11 and 25 ± 8 in phenylephrine and norepinephrine groups respectively. Stroke volume index was assessed in terms of g/m2/beat as 45 ± 18 and 46 ± 13 as baseline in both the groups. And after 12 hours it was assessed to be 49 ± 19 and 50 ± 11 in phenylephrine and norepinephrine groups respectively. Cardiac troponin I in terms of ng/ml was assessed to be 1.0 ± 0.9 in phenylephrine and 0.9 ± 09 in norepinephrine. After 12 hours it was assessed to be 1.1 ± 0.9 and 1.1± 0.8 in phenylephrine and norepinephrine group respectively.

CONCLUSION:

We conclude from the study that on administration of phenylephrine as first line agent for hemodynamic support in septic shock patients, the MAP was increased without any compromising of hepatosplanchnic and GI perfusion in comparison with norepinephrine.

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