Dopamine versus norepinephrine infusion in management of septic Shock in critically ill patients

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Abstract: Background: Sepsis is a clinical syndrome of life-threatening organ dysfunction caused by a dysregulated response to infection. In septic shock, there is a critical reduction in tissue perfusion; acute failure of multiple organs, including the lungs, kidneys, and liver. **Aim of the Work:** is to determine the clinical outcome of dopamine versus norepinephrine infusion in management of shock in critically ill patients. **Patients And Methods:** this prospective comparative double-blinded study was conducted at intensive care units of Ain shams university and Mansoura University, from January 2018 to June 2018. After obtaining approval of the study protocol from the local ethical committee, as well as fully informed written consents signed by the patients' closet relatives, 50 patients admitted at ICU with septic shock. **Results:** Norepinephrine infusion is more preferred than dopamine infusion in patients with septic shock in improving tissue perfusion as regarding MAP, HR, UOP. Dopamine is associated with more arrhythmic events. **Conclusion:** norepinephrine was more effective and reliable than dopamine in achieving the goal. Moreover, norepinephrine showed no adverse effects on peripheral blood flow or on renal blood flow, as was evidenced by normalization of urine output in patients on norepinephrine infusion.
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Key words: Dopamine, norepinephrine infusion, septic shock, critically ill patients

1. Introduction

Sepsis is a clinical syndrome of life-threatening organ dysfunction caused by a dysregulated response to infection. In septic shock, there is a critical reduction in tissue perfusion; acute failure of multiple organs, including the lungs, kidneys, and liver. Common causes include many different species of gram-positive and gram-negative bacteria. Immuno-compromised patients may have uncommon bacterial or fungal species as a cause. Signs include fever, hypotension, oliguria, and confusion. Diagnosis is primarily clinical combined with culture results. Early recognition and treatment is critical. Treatment is aggressive fluid resuscitation, antibiotics, surgical excision of infected or necrotic tissue and drainage of pus, and supportive care [(1)].

The administration of fluids, which is the first-line therapeutic strategy, is often insufficient to stabilize the patient's condition, and vasopressors agents are frequently required to correct hypotension [(2)]. Among the most frequently used agents are dopamine and norepinephrine. Both dopamine and norepinephrine affect the alpha-adrenergic and beta-adrenergic receptors, though to varying degrees. The effects of alpha-adrenergic receptors lead to increased vascular tone. However, it could decrease the cardiac output as well as the regional flow of blood, particularly in cutaneous, renal, and splanchnic bed [(3)].

Dopamine is an α- and β-adrenergic agonist that also stimulates dopaminergic receptors DA1 and DA2. DA1 stimulation causes renal and visceral vasodilation in healthy animals and humans; DA2 stimulation inhibits norepinephrine reuptake at the synapse. In healthy humans, the effects of dopamine are dosage dependent. At lower dosages (1 to 3 μg/kg/min), it dominates the dopaminergic, at medium dosages (3 to 10 μg/kg/min), it dominates the β1- adrenergic, at higher dosages it dominates the α1- adrenergic effect (10 to 20 μg/kg/min) [(4)].

The recommended doses of norepinephrine are 0.10 to μg/kg/min [(5)].

Aim of the Work

The aim of this study is to determine the clinical outcome of dopamine versus norepinephrine infusion in management of shock in critically ill patients.

2. Patients and methods

The present prospective comparative double-blinded study was conducted at intensive care units of Ain Shams University and Mansoura University, from January 2018 to June 2018. After obtaining approval of the study protocol from the local ethical committee, as well as fully informed written consents signed by the patients' closet relatives, 50 patients admitted at ICU with septic shock.

Patients were randomly selected, using sealed envelopes, and divided into two equal groups: group A included 25 patients assigned to receive

norepinephrine infusion with doses from 0.10 to 0.15 µg/kg/min. and group B included 25 patients assigned to receive dopamine infusion with doses from 10 to 20 µg/kg/min.

Inclusion criteria included:

Patients diagnosed with septic shock and mean arterial pressure (MAP) < 70 mm Hg or systolic blood pressure (SBP) < 90 mm Hg and signs of tissue hypoperfusion (altered mental status, mottled skin, urine output < 0.5 mL/kg/h).

Exclusion criteria included:-

Patients who already receiving other vasopressoragentformorethan4hoursduringcurrent episode of shock, having a serious arrhythmia, brain stem death, age less than 18 years, pregnant female and limb ischemia were excluded from the study.

During the time of study, standard monitoring for all patients was done, including central venous catheterization (CVP), Systolic and diastolic blood pressure, heart rate body temperature, respiratory rate and urine output. All data were documentedfromthetimeofstartingthestudyevery6hours for 24hours.

Arterial blood gases were collected at time of starting the study and after 24 hours.

Statistical analysis

Data were entered, processed and analyzed using SPSS version 16. Categorical variables were expressed as number and percent. Continuous data were described as mean standard deviation, median, minimum and maximum. P value was considered statistically significant at ≤ 0.05.

The following tests were used:

Chi-square test: for comparison of categorical variables between 2groups., **Student t-test:** for comparison of parametric continuous data between 2groups., **Mann Whitney test:** for comparison of non-parametric continuous data between 2groups., **Paired t test:** for comparison of paired parametric continuous data from the same group., **Wilcoxon test:** for comparison of paired non- parametric continuous data from the same group., **Repeated measure ANOVA:** for comparison of parametric continuous data from three or more matched groups., **Freidman test:** for comparison of non-parametric continuous data from three or more matched groups.

3. Results

Table (1): Cause of sepsis among studied cases

Etiology	N (%)
1. Pneumonia	16 (32)
2. Pancreatitis	5 (10)
3. Peritonitis	13 (26)
4. UTI	8 (16)
5. Multiple myeloma	1 (2)
6. Miscellaneous	7 (14)
Total	**50 (100)**

Table (1) shows that most common cause of sepsis among studied cases was pneumonia (32%) followed by peritonitis (26%).

Table (2): Heart rate among studied groups.

Heart rate	No1	Norepinephrine group (Mean±SD)	No2	Dopamine group (Mean±SD)	P# value
1.Baseline	25	84.2±21.6	25	90.5±20.8	0.3
2.6 h	25	80±16.9●	24	97.6±26.9●	0.01*
3.12 h	24	79.3±17.8●	20	99.3±26●	0.004*
4.18 h	22	77.3±15.5●	19	97.2±26.3●	0.005*
5.24 h	22	77.1±15.6●	18	97.8±26.8●	0.004*

No 1: number of patients in norepinephrine group, No2: number of patients in Dopamine group, h: hour. P# value: p value between the groups assessed by student's t test. *: Statistical significance was defined as P ≤ 0.05.

● : significant from baseline by paired ttest

Table (2) shows that increase heart rate was significant (p<0.05) higher among dopamine group compared to norepinephrine group at 6, 12, 18, 24hours.

Table (3): Systolic blood pressure in the studiedgroups.

SBP (mmHg)	No 1	Norepinephrine group (Mean±SD)	No2	Dopamine group (Mean±SD)	P# value
1.Baseline	25	53.2±4.7	25	51.6±13.7	0.2
2.6 h	25	62.8±12.4●	24	55.4±7.2●	0.02*
3.12 h	24	72.1±16.4●	20	61.5±9.3●	0.01*
4.18 h	22	77.2±20.3●	19	70±11.2●	0.2
5.24 h	22	83.2±19.4●	18	78.8±13.2●	0.5
P## value		≤ 0.001		≤ 0.001	

SBP=systolic blood pressure, h: hour. No 1: number of patients in norepinephrine group. No2: number of patients in Dopamine group. P# value: p value between the groups assessed by student's t test. P## value: p value within group assessed by repeated measure ANOVA.
*: Statistical significance was defined as P ≤ 0.05.
● : significant from baseline by paired t test.

Table (3) shows that norepinephrine group had significant (p <0.05) higher mean systolic blood pressure compared to dopamine group at 6 and 12 hours. Moreover, comparison of mean systolic blood pressure within each group shows that mean systolic blood pressure was significant higher at 6,12,18,24 hours compared to baseline systolic blood pressure in both norepinephrine and dopamine groups.

Table (4): Diastolic blood pressure in the studied groups.

DBP (mmHg)	No 1	Norepinephrine group (Mean±SD)	No2	Dopamine group (Mean±SD)	P# value
1.Baseline	25	30.8±9.5	25	32.8±7.9	0.4
2.6 h	25	38±10.4	24	35.4±7.7	0.3
3.12 h	24	47.1±14.8●	20	42±11.5●	0.2
4.18 h	22	50±15.4●	19	46.8±11.6●	0.5
5.24 h	22	55.5±15.1 ●	18	55±12●	0.9
P## value		≤ 0.001		≤ 0.001	

DBP: Diastolic Blood Pressure. h: hour. No 1: number of patients in norepinephrine group. No2: number of patients in Dopamine group. P# value: p value between the groups assessed by student's test. P## value: p value within group assessed by repeated measure ANOVA.
● : Significant from baseline by paired t test.

Table (4) shows no statistically significant difference between 2 groups regarding mean diastolic blood pressure. While mean diastolic blood pressure was significanthigherat12,18,24 hours compared to baseline in both norepinephrine and dopamine groups.

Table (5): Central venous pressure in the studied groups.

CVP (mmH2O)	No 1	Norepinephrine group Median (Min-Max)	No2	Dopamine group Median (Min-Max)	P# value
1.Baseline	25	4.5(2-23)	25	4(2-13)	0.4
2.6 h	25	8.5(2-22) ●	24	6.5(0.15) ●	0.2
3.12 h	24	10(5-23) ●	20	8(4-16) ●	0.3
4.18 h	22	12(9-23) ●	19	10.5(4-18) ●	0.2
5.24 h	22	15(9-22) ●	18	13.5(6-18) ●	0.05*
P## value		≤ 0.001		≤ 0.001	

CVP: Central Venous Pressure. h: hour. No 1: number of patients in norepinephrine group. No2: number of patients in Dopamine group. P# value: p value between the groups assessed by Man Whitney test. P## value: p value within group assessed by Freidman test. *: Statistical significance was defined as P ≤ 0.05.
● : Significant from baseline by Wilcoxontest.

On comparing central venous pressure within each group, CVP was significant higher at 6,12, 18 and 24 hours compared to baseline CVP in both norepinephrine and dopamine groups.

Table (6): Urinary output in the studied groups.

UOP (Ml/hr)	No1	Norepinephrine group Median (Min-Max)	No2	Dopamine group Median (Min-Max)	P# value
1.Baseline	25	20(0-50)	25	5(0-50)	0.1
2.6 h	25	50(0-30) ●	24	10(0-150) ●	0.02*
3.12 h	24	100(0-800) ●	20	50(0-350) ●	0.06
4.18 h	22	150(0-1700) ●	19	100(0-600) ●	0.09
5.24 h	22	250(0-2500) ●	18	145(0-850) ●	0.1
P## value		≤ 0.001		≤ 0.001	

UOP: Urinary output. h: hour. No 1: number of patients in norepinephrine group. No2: number of patients in Dopamine group. P# value: p value between the groups assessed by Man Whitney test. P## value: p value within group assessed by Freidmantest.

● : Significant from baseline by Wilcoxontest.

Table (6) shows a statistically significant (p= 0.02) higher urinary output in norepinephrine group compared to dopamine group. In addition, urinary out put was significant higher at 6, 12, 18 and 24 hour compared to baseline urinary output in both groups.

Table (7): ABG in the studied groups.

Parameter	No1	Norepinephrine group (Mean ±SD)	No2	Dopamine group (Mean ±SD)	P# value
1. pH (baseline)	25	7.2±0.2	25	7.30±0.1	0.007*
pH (24 h)	22	7.3±0.1	18	7.33±0.09	0.2
P## value		≤ 0.001*		0.004*	
2. PaO2 (baseline) (mmHg)	25	86.1±21.3	25	96.9±16.2	0.04*
PaO2 (24h) (mmHg)	22	95.4±24	18	98.1±11.9	0.7
P## value		0.04*		0.9	
3. PaCO2 (baseline) (mmHg) Median (Min- Max)	25	37.6(16.7-11.2)	25	40(28-101)	0.6
PaCO2 (24 h) (mmHg) Median (Min- Max)	22	38(22-89)	18	39(27-85)	0.8
P## value		0.7		0.1	
4. SO2 (baseline) (mmHg)	25	90.5±5.7	25	93.2±4.8	0.07
SO2 (24h) (mmHg)	22	92.7±6.4	18	91.5±13.1	0.7
P## value		0.06		0.4	
5. HCO3 (baseline) (mmmole)	25	13.9±4.5	25	19.5±4.3	≤ 0.001*
HCO3 (24h) (mmmole)	22	17.4±5	18	20.8±3.6	0.02*
P## value		≤0.001*		0.003*	

No 1: number of patients in norepinephrine group. No2: number of patients in Dopamine group. h: hour. P# value: p value between the groups assessed by student's t test or Man Whitney Test as appropriate. P## value: p value within group assessed by paired t test or Wilcoxon test as appropriate.

Table (7) shows that pH, Pao_2, So_2 and HCO_3 were significant higher in dopamine group compared to norepinephrine group at baseline.

On comparing ABG parameters within each group, it was found that pH was significant higher at 24 hour compared to baseline in both groups. Also, paO_2 was significant higher at 24 hour compared to baseline in norepinephrine group. In addition, both groups had significant higher HCO_3 at 24 hour compared to baseline.

4. Discussion

The incidence of sepsis and septic shock is increasing world widely and it is a common cause of mortality in the intensive care unit (ICU). Sepsis is characterized by an activation of inflammation causing venous and arterial dilation, which leads to drop in systemic vascular resistance and systolic blood pressure. This drop in blood pressure and hypoperfusion to vital organs result in multiorgan failure leading to increased mortality in septic shock. Therefore, one of the early goals of resuscitation in patients with septic shock is to restore adequate organ perfusion. The initial management is to give fluid boluses. Vasopressors are added in patients who remain hypotensive despite adequate fluid resuscitation. According to the Surviving Sepsis Campaign guidelines either dopamine or norepinephrine may be considered as the first-line agent to correct hypotension of septic shock [(6)].

In our study we found the superiority of norepinephrine infusion over dopamine infusion in improving tissue perfusion in patients with septic shock as regarding systolic blood pressure, urine

output and increasing CVP. In addition we found that dopamine is associated with a significant increase in heart rate.

Many studies have been done to compare the clinical effect of norepinephrine and dopamine in patients with septic shock in order to infer the superiority of one over the other. Most of them recommended norepinephrine over than dopamine in improving tissue perfusion. Some studies found no significant difference between norepinephrine and dopamine in septic shock as regarding primary outcome. While few studies found different results opposite to our results. In the other side some studies compared multiple vasopressors including dopamine and norepinephrine to deduce which one is superior over than the other in improving tissue perfusion in patients with septic shock. Further more, one large study have been done to compare the clinical effect of dopamine versus norepinephrine globally in shock (septic, cardiogenic, hypovolemic). [(7)].

Yuming and his colleagues [(8)] have compared the clinical effect of dopamine and norepinephrine in the treatment of septic shock. Fifty cases with septic shock were randomly divided into two groups. As regarding primary outcome, they found that after 6 hours of treatment that CVP, MAP, urine volume and Scvo2 of group norepinephrine were higher than group dopamine. In addition they found after 12 hours and 24 hours of treatment that blood lacticacid clearance of group norepinephrine was superior than group dopamine. The study suggested that both dopamine and norepinephrine are beneficial to improve microcirculation and tissue oxygen metabolism in the treatment of septic shock, and the clinical effect of norepinephrine was distinctly better than dopamine [(8)].

Vasu and his colleagues [(6)] have compared the effect of norepinephrine versus dopamine in critically ill patients with septic shock in a systemic review. The aim of this systematic review was to evaluate randomized clinical trials which compared norepinephrine versus dopamine in critically ill patients with septic shock or in a population of criticallyill patients with shock predominantly secondary to sepsis. They retrieved six studies which metinclusion

criteria. The studies included a total of 2043 participants, with 995 in the norepinephrine and 1048 in the dopamine groups. As regarding heart rate they found a statistically significant decrease in the rate of cardiac arrhythmias in the norepinephrine group as compared to the dopamine group as. They also found statistically significant superiority of norepinephrine over dopamine for the outcome of in- hospital or 28-day mortality [(6)].

De backer and his colleagues [(9)] have conducted a meta-analysis to evaluate the effects of norepinephrine and dopamine on outcome and adverse events in patients with septic shock. They retrieved five observationalstudyandsixrandomizedtrials, totaling2768 (1,474 who received norepinephrine and 1,294 who received dopamine). As regarding heart rate they found that dopamine compared to norepinephrine is associated with a higher incidence of arrhythmias and also associated with increased risk of death in patients with septic shock.

Agrawal and his colleagues [(10)] have compared the effects of dopamine and norepinephrine infusion in treatment of septic shock on fifty consecutive patients presenting with septic shock and divided randomly into two groups with 25 patients in each group, aiming to compare the ability of norepinephrine and dopamine in reversing the hemodynamic and metabolic abnormalities of hyperdynamic septic shock. They found that norepinephrine was more effective and reliableth and opamine as regarding the mean arterial blood pressure, urine output, decreasing heart rate, improving tissue perfusion and oxygen utilization. In addition they found that dopamine is associated with increasing heart rate. They also found as regarding the etiology of sepsis that Pneumonia, peritonitis and urinary tract infections were the major causes of sepsis in patients (74 %). Others were pancreatitis, soft tissue infections, and venous catheter-associated infections [(10)].

Mathur and his colleagues [(11)] have compared the effects of dopamine and norepinephrine in the treatment of septic shock using impedance cardiography on fifty consecutive patients presenting with septic shock and divided randomly into two groups with 25 patients in each group. The post-treatment parameters were statistically significant showing the superiority of norepinephrine over dopamine in optimization of hemodynamics and patient survival. Significant improvement in systolic blood pressure, heart rate, cardiac index, SVRI, index of oxygen uptake (IVO 2) and urine output were found in norepinephrine group than the dopamine group. The hemodynamic parameters were preserved in norepinephrine group with better preservation of organ perfusion and oxygen utilization with maintenance of splanchnicandrenal blood flow as evidenced by significant increase in O2 uptake and urine flow. It was concluded that norepinephrine was more useful in reversing the hemodynamic and metabolic abnormalities of septic shock compared to dopamine at the doses tested [(11)].

Jaime and hiscolleagues [(12)] have compared the safety of dopamine versus norepinephrine as a vasopressor therapy in septic shock. The study included 60 patients, 35 patients in dopamine and 31 patients in norepinephrine group. As regarding heart rate they found a significant increase in cardiac

dysrhythmia associated with dopamine group in comparison to norepinephrine treatment of septic shock as. In addition they found no significant difference between two groups in mortality rate.

However, some studies found that there is no significant difference between the effect of dopamine and norepinephrine infusion in septic shock as regarding primary outcome.

Shenoy and his colleagues [13] have conducted a meta-analysis to compare the changes in hemodynamic parameters among patients with septic shock who have received either of the two agents in their management and try to deduce the superiority of one over the other. As regarding urine output, oxygen delivery, mean pulmonary artery pressure (MPAP) and oxygen consumption were not significantly different between the two groups. They were also found no significant difference in mortality between the two groups and the heart rate was higher in dopamine group.

However, some studies found a different results opposite our results on comparing the clinical effect of dopamine and norepinephrine infusion in septic shock as regarding primary outcome.

Yin and his colleagues [14] have compared the effectiveness of norepinephrine, dopamine, and other vasopressors in sepsis patients via a meta-analysis of published studies. Eight eligible studies out of 697.

Publications in the electronic databases were included in this study. They found that dopamine therapy had greater effectiveness and ability to change DO2, HR, CI, and SVRI than norepinephrine and other vasopressors (terlipressin, vasopressin). Based on these findings, dopamine should be recommended for the treatment of severe sepsis and septic shock in adults [14].

Wu and his colleagues [15] have compared the effect of dopamine and norepinephrine on hemodynamics and tissue oxygenation of patients with septic shock. The study conducted on sixteen patients with septic shock were assigned to the groups of dopamine and norepinephrine randomly. As regarding primary outcome, urine output in the group of dopamine was significantly higher than that in the group of norepinephrine at different time point and creatinine clearance at the end of the 4th hour in dopamine group was significant higher than that in norepinephrine group. The results suggested that both dopamine and norepinephrine had good effect on raising blood pressure, dopamine was more effective than norepinephrine in increasing oxygen delivery (DO2), but its use was confined to certain extent due to its effect of accelerating heart rate.

Guérin and his colleagues [16] have compared the effect of dopamine and norepinephrine on systemic and hepato-splanchnic hemodynamics, oxygen exchange and energy balance in vasoplegic septic patients. The study conducted on twelve patients, seven patients received norepinephrine treatment while five patients received dopamine treatment. As regarding hemodynamic state, they found that mean arterial pressure and cardiac output, systemic oxygen delivery and uptake werehigher with dopamine than with norepinephrine. In addition despite these differences, both treatments maintained a similar level of hepato-splanchnic perfusion of macro-circulatory oxygenation, but norepinephrine induced a redistribution of fractional splanchnic blood flow to cardiac output.

Furthermore, alargestudyhavebeendonein2010by **Debacker et al** [7] to compare clinical effect of norepinephrine and dopamine globally in all types of shock.

De backer and his colleagues [7] have conducted a large randomized multicenter trial study in eight centers on 1679 patients, of whom 858 were assigned todopamineand821tonorepinephrine. Patientswithshock (septic, cardiogenic, or hypovolemic) were randomized to receive either dopamine or norepinephrine to restore and maintain blood pressure. The primary endpoint was rate of death from any cause at 28 days after randomization. Secondary endpoints included the occurrence of adverse events, most notably arrhythmia. The study included 1044 patients diagnosed with septic shock 502 received norepinephrine and 542 received dopamine. They found no significant difference in the outcome between patients treated with dopamine and those treated with norepinephrine. Overall, there was no significant difference in mortality rates at 28 days between the treatment groups. However, as regarding heart rate there were more arrhythmic events, most notably atrial fibrillation, among patients who received dopamine compared with those who received norepinephrine. They revealed that lung infections were the major source of sepsis followed by abdominal infections and these results are consistent with our results [7].

Some studies also compared multiple vasopressors and inotropes including dopamine and norepinephrine on patients with septic shock.

Collingand hiscolleagues [17] have compared the effect of vasopressors (Dopamine, norepinephrine, epinephrine and vasopressin) in patients with sepsis. They recommended that norepinephrine is the first-line vasopressor in septic shock and is associated with a lower mortality rate as well as fewer adverse effects. Dopamine has similar actions but is associated with significantly more tachy-dysrhythmias and should bereserved for patients with bradycardia.

Gamper and his colleagues [18] in his randomized controlled trials compared various

vasopressor regimens for hypotensive shock. Six different vasopressors, given alone or in combination. They found no evidence of substantial differences in total mortality between several vasopressors. Compared to norepinephrine, dopamine increases the risk of arrhythmia and might increase mortality. Otherwise they found identified low risk of bias and high-quality evidence for the comparison of norepinephrine versus dopamine and moderate to verylow- quality evidence for all other comparisons.

Zhou and his colleagues [19] have conducted a systemic review and a Bayesian network meta-analysis to compare the effects among different types of vasopressor agents. Which compared eleven vasopressor agents or vasopressor combinations (norepinephrine [NE], dopamine [DA], vasopressin [VP], epinephrine [EN], terlipressin [TP], phenylephrine [PE], TP+NE, TP + dobutamine [DB], NE+DB, NE+EN, and NE +dopexamine [DX]). Except for the superiority of NE over DA, the mortality of patients treated with any vasopressor agent or vasopressor combination was not significantly different. Compared to Dopamine, norepinephrine was found to be associated with decreased cardiac adverse events, heart rate and cardiac index and increased systemic vascular resistance index (SVRI). This Bayesian meta-analysis revealed a possible rank of probability of mortality among the eleven vasopressor agents or vasopressor combinations; from lowest to highest, they are NE+DB, EN, TP, NE+EN, TP+NE, VP, TP+DB, NE, PE, NE+DX, and DA.

Avniandhiscolleagues [20] have compared the effects of vasopressors in a systemic review and meta-analysis. Thirty-one trials included, 866 patients received dopamine treatment, while 832 patients received norepinephrine treatment while the others received different vasopressors. They found that the hemodynamic profile of norepinephrine was also more favorable than the other vasopressors, resulting in decreased lactate levels, increased CVP and urine output in comparison to the other vasopressors. Further benefits of norepinephrine included reduced cardiac index and heart rate, elevated SVRI and reduced oxygende livery index (VIO2) andsplanchnic CO2 difference. In addition, they reported that dopamine increase in the risk for cardiac arrhythmias.

Our study is summarized and compared the effectiveness of norepinephrine and dopamine in sepsis patients via a prospective controlled study. Our results indicated that norepinephrine therapy had greater effectiveness and ability to change systolic blood pressure, mean urine output and CVP than dopamine therapy. Based on these findings, norepinephrine should be recommended as the first line for the treatment of severe sepsis and septic shock in adults.

5. Conclusion

It is concluded that norepinephrine was more effective and reliable than dopamine in achieving the goal. Moreover, norepinephrine showed no adverse effects on peripheral blood flow or on renal blood flow, as was evidenced by normalization of urine output in patients on norepinephrine infusion.

References

1. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, et al. (2016): The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA.2016 23; 315: 801-810.
2. Sakr Y, Reinhart K, Vincent JL, Sprung CL, Moreno R, Ranieri VM, et al. (2006): Does dopamine administration in shock influence outcome? Results of the Sepsis Occurrence in Acutely Ill Patients (SOAP) Study. Crit Care Med 2006; 34:589-597.
3. Finfer S, Vincent JL, De Backer D (2013): Circulatory Shock. N Engl J Med. 2013; 369: 1726-34.
4. Tabaee A, Givertz MM (2003): Pharmacologic Management of the Hypotensive Patient In: Irwin and Rippe's Intensive Care Medicine, 5th Ed., edited by Irwin RS, Rippe JM, Philadelphia, Lippincott Williams & Wilkins,2003, pp295–302.
5. Annane D, Vignon P, Renault A, Bollaert PE, Charpentier C, Martin C, et al. (2007): Norepinephrine plus dobutamine versus epinephrine alone form anagement of septic shock: a randomized trial. Lancet; 370(9588):676–684.
6. Vasu TS, Cavallazzi R, Hirani A, Kaplan G., Leiby B., & Marik P. E. (2012): Norepinephrine or dopamine for septic shock: systematic review ofrand omized clinical trials. Journal of intensive care medicine, 27(3), 172- 178.
7. De Backer D, Biston P, Devriendt J, Madl C, Chochrad D, Aldecoa C. (2010): Comparison of dopamine and norepinephrine in the treatment of shock. New England Journal of Medicine, 362(9),779-789.
8. Yuming Du, Lirui Wang, Huijuan Shi, Min Gao. (2015). Comparison of clinical effect of dopamine and norepinephrine in the treatment of septic shock. Pakistan Journal of Pharmaceutical Sciences. Vol. 28, p1461-1464.4p. 2 Charts, 1 Graph.
9. De Backer D, Aldecoa C, Njimi H, Vincent JL. (2012): Dopamine versus norepinephrine in the treatment of septic shock: a meta-analysis.

Critical care medicine, 40(3), 725-730.
10. Agrawal A1, Gupta A, Consul S, Shastri P (2011). Comparative study of dopamine and norepinephrine in the management of septic shock. Saudi J Anaesth. Apr;5(2):162-6.
11. Mathur SK, Dhunna R, Chakraborty A (2007): Comparison of norepinephrine and dopamine in the management of septic shock using impedance cardiography. Indian Journal of Critical Care Medicine, 11(4), 186.
12. Jaime J. Simon Grahe, DO Gourang P. Patel, Pharm D Ellen Elpern, RN Robert A. Balk, MD (2005). The safety of dopamine versus norepinephrine as vasopressor therapy in septic shock. Chest journal. Volume 128, Issue 4, Supplement, Page 219S.
13. Shenoy S, Ganesh A, Rishi A, Doshi V., Lankala S., Molnar J, et al., (2011): Dopamine versus norepinephrine in septic shock: a meta- analysis. Critical Care, 15(1), P89.
14. Yin LB, Hou L, Liu RY, Wang J. L., Hu Y. Q., Hu S. Y, et al., (2018): Efficacy of norepinephrine, dopamine or vasopressor in the management of septic shock and severe sepsis: a meta-analysis. International journal of clinical and experimental medicine, 11(11),11383-11395.
15. Wu LJ, He QY, Li G, Chen DS, Yi L, Huang X, Duan J. (2008). Effect of dopamine and norepinephrine on Hemodynamics and tissue oxygenation of patients with septic shock. Zhongguo Wei Zhong Bing Ji Jiu Yi.
16. Guérin JP1, Levraut J, Samat-Long C, Leverve X, Grimaud D, Ichai C (2005). Effects of dopamine and norepinephrine on systemic and hepatosplanchnic hemodynamics, oxygen exchange, and energy balance in vasoplegic septic patients. Shock. Jan;23(1):18-24.
17. Colling KP, Banton KL, Beilman GJ (2018). Vasopressors in Sepsis. Surg Infect (Larchmt). Feb/Mar;19(2):202- 207.
18. Gamper G, Havel C, Arrich J, Losert H, Pace NL, Müllner M, et al. (2016): Vasopressors for hypotensive shock. Cochrane Database Syst Rev. 2016; 2: CD003709.
19. Zhou F, Mao Z, Zeng X, Kang H., Liu H., Pan L., et al., (2015). Vasopressors in septic shock: a systematic review and network meta- analysis. Therapeutics and clinical risk management, 11, 1047.
20. Avni T, Lador A, Lev S, Leibovici L, Paul M, Grossman A. Vasopressors for the treatment of septic shock: systematic review and meta-analysis. PloS one. 2015;10(8): e0129305.

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