CARDIAC POWER OUTPUT AS A PREDICTOR OF DISEASE SEVERITY IN PATIENTS WITH SEPTIC SHOCK

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Introduction

Sepsis is a life-threatening condition from a dysregulated immune response to infection, potentially leading to organ failure and death. Common causes include bacterial infections in the lungs, abdomen, and urinary tract, with risk factors like age, chronic illness, and immune suppression. Septic shock cause multi-organ failure, dangerously low blood pressure and high mortality, marked by fever, tachycardia, and hypo perfusion. Complicated by ARDS , AKI, and encephalopathy. Survivors often face long-term health issues, frequent readmissions, and reduced quality of life. Severity of septic shock can be predicted using scores like APACHE II and SOFA. Cardiac Power Output, a marker of heart function, shows promise in predicting mortality, especially in cardiogenic shock, and may aid in risk assessment for septic shock.

Aim of the work

detect the reliability of cardiac power output measured by Echocardiogram as a predictor of disease severity in patients with septic shock by comparing it with other prognostic scores (SOFA SCORE and APACHE II SCORE).

Patients

60 patients diagnosed with septic shock, admitted to critical care units at Alexandria university hospitals , assessed by traditional prognostic scores compared to cardiac power output measured by Echo. Patients were assigned into two groups according to mortality Group (A): patients who died Group (B): patients who survived.

Methods

a prospective observational cohort study was conducted: The following data were collected from every patient after enrollment and during the period of the study: Age , sex, past medical history , Laboratory investigations including lactate level, Vital signs ,echocardiographic data include ejection fraction, cardiac power output .and baseline disease severity assessed by SOFA and APACHE II scores

Results

Table (1): comaprison between both groups regarding SOFA and APACHE II scores

	Group A (n = 27)	Group B (n = 33)	U	p
SOFA				
Min – Max.	5.0 – 12.0	4.0 – 10.0		
Mean ± SD.	10.67 ± 2.24	6.48 ± 2.08	88.50*	<0.001*
Median (IQR)	12.0 (10.0 – 12.0)	6.0 (5.0 – 7.0)		
APACHE II				
Min – Max.	14.0 – 35.0	10.0 – 28.0		
Mean ± SD.	27.78 ± 7.01	15.67 ± 4.85	102.50*	<0.001*
Median (IQR)	30.0 (26.50 – 32.50)	15.0 (12.0 – 16.0)		

Table (2): Comparison between both groups regards echocardiographic parameters

|	Group A (n = 27)	Group B (n = 33)	Test of Sig.	P
LVOT Diameter (cm)				
Min – Max.	1.70 – 2.10	1.73 – 2.20		
Mean ± SD.	1.88 ± 0.12	1.88 ± 0.14	t= 0.112	0.911
Median (IQR)	1.88 (1.76 – 2.0)	1.83 (1.75 – 1.98)		
LVOT velocity time integral (VTI) (cm)				
Min – Max.	10.0 – 16.0	12.0 – 20.0		
Mean ± SD.	13.04 ± 1.70	16.42 ± 1.98	t= 7.011*	<0.001*
Median (IQR)	13.0 (12.0 – 14.0)	16.0 (15.0 – 18.0)		
Strock volume (SV) (ml)				
Min – Max.	24.05 – 47.12	33.67 – 69.27		
Mean ± SD.	36.21 ± 5.94	44.73 ± 9.28	t= 4.129*	<0.001*
Median (IQR)	35.83 (32.42 – 40.46)	42.31 (38.17 – 48.34)		
Ejection Fraction by simpson method (%)				
<50%	15 (55.6%)	14 (42.4%)	χ²= 1.025	0.311
≥50%	12 (44.4%)	19 (57.6%)		
Min – Max.	42 –60.0	42.0 –63.0		
Mean ± SD.	49.15 ± 4.47	50.70 ± 4.86	t= 1.272	0.208
Median (IQR)	49.0 (45.0 – 51.50)	50.0 (48.0 – 54.0)		
Cardiac output (ml\ min)				
Min – Max.	2.56 – 5.70	3.27 – 6.80		
Mean ± SD.	3.85 ± 0.80	4.58 ± 0.90	t= 3.260*	0.002*
Median (IQR)	3.65 (3.33 – 4.29)	4.47 (3.95 – 5.22)		
Cardiac power output (watt)				
Min – Max.	0.32 – 0.72	0.41 – 0.87		
Mean ± SD.	0.46 ± 0.09	0.59 ± 0.11	t= 4.895*	<0.001*
Median (IQR)	0.44 (0.40 – 0.51)	0.58 (0.51 – 0.66)		
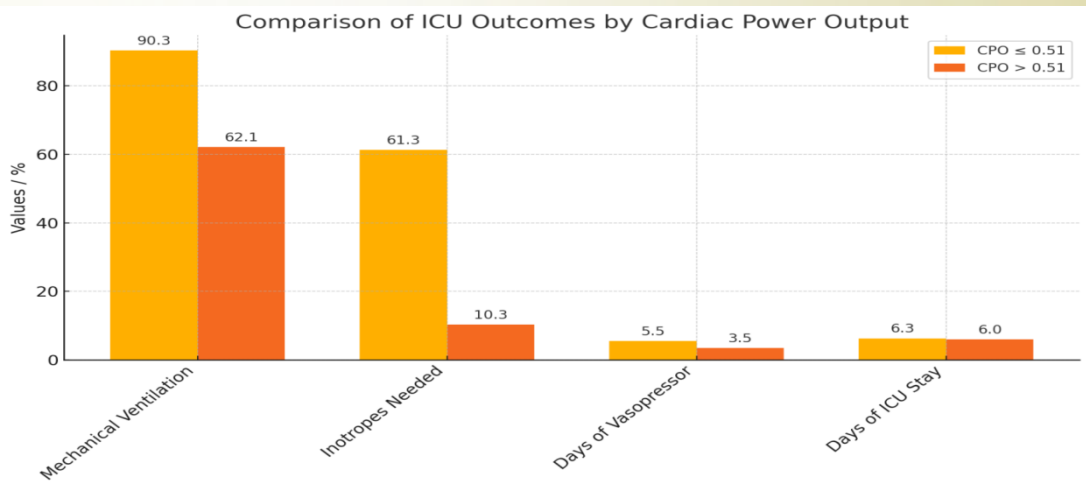
Figure (1): Comparison between both groups regards outcomes by cardiac power output
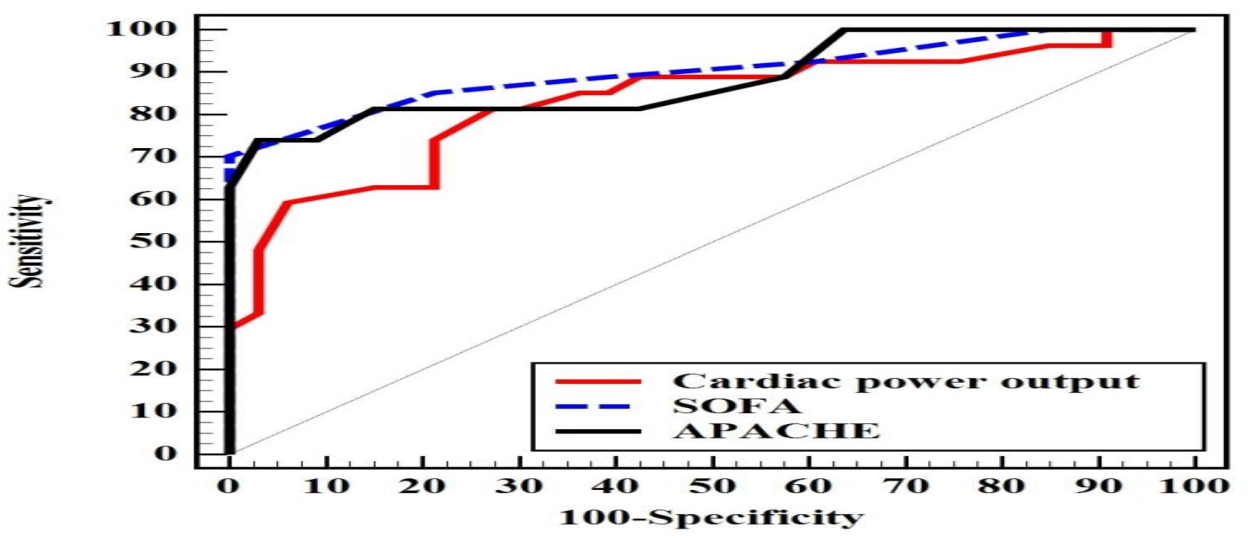

Figure (2):ROC curve for cardiac power output, SOFA and APAECH II scores to predict mortality

Conclusion

Cardiac power output can be considered a non-invasive and reliable indicator for the mortality rate in septic shock
It shows a prognostic performance comparable to the global scoring systems, including SOFA and APACHE II.