

ASSESSMENT OF LEFT VENTRICULAR SYSTOLIC FUNCTION BY TISSUE DOPPLER IMAGING IN SEPTIC SHOCK AS A PREDICTOR OF MORTALITY

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Introduction

Sepsis is a life-threatening condition resulting from an uncontrolled immune response to infection, leading to multi-organ failure and high mortality. Despite advancements in early recognition and treatment, sepsis remains a major global health challenge, with over 11 million deaths annually. The Sepsis-3 definition highlights the role of organ dysfunction, assessed by the Sequential Organ Failure Assessment (SOFA) score, in identifying patients at risk. Septic cardiomyopathy (SCM) is a critical complication characterized by transient myocardial dysfunction, impacting both systolic and diastolic function. Traditional left ventricular ejection fraction (LVEF) may not fully capture sepsis-induced cardiac dysfunction, necessitating tissue Doppler imaging (TDI) and global longitudinal strain (GLS) for a more sensitive assessment. This study explores the role of TDI in evaluating left ventricular systolic function in septic shock patients, aiming to establish its predictive value for mortality and guide early interventions in sepsis management.

Aim of the work

This study aims to assess the prognostic significance of left ventricular (LV) systolic dysfunction, as assessed by echocardiographic tissue Doppler imaging, in non-cardiac patients suffering from septic shock.

Patients

This study included 46 patients with septic shock, admitted to the Critical Care Medicine Department at Alexandria Main University Hospital from April 2023 to June 2024. Ethical approval was obtained, and informed consent was secured from next of kin.
Inclusion criteria:
•Age 18-80 years
•Septic shock diagnosis (Sepsis-3 criteria): persistent hypotension requiring vasopressors (MAP ≥ 65 mmHg) and lactate >2 mmol/L despite fluid resuscitation.

Exclusion criteria:

- Pregnancy
- Unexplained lung infiltrates
- Pre-existing cardiac disease (heart failure, ischemic heart disease, valvular disease, cardiomegaly)
- Poor echocardiographic imaging

Methods

Baseline assessments: SOFA, APACHE II, GCS, vitals, blood tests, ECG, ABG.
Echocardiography (within 24h): **LVEF** (expert evaluation), **S' velocity** (pwTDI).
Outcome measure: ICU mortality.
Treatment: Standard **Surviving Sepsis Campaign 2021** protocol.

Results

Table (1): Comparison between the two evaluated groups based on norepinephrine dose

Norepinephrine dose (ug/kg/min)	Total (n = 46)	Non-Survivors (n = 23)	Survivors (n = 23)	U	p
Min – Max.	0.10 – 0.60	0.30 – 0.60	0.10 – 0.40	57.000*	<0.001*
Mean ± SD.	0.34 ± 0.17	0.46 ± 0.13	0.23 ± 0.11		
Median (IQR)	0.30(0.20 – 0.50)	0.50(0.30 – 0.60)	0.20(0.10 – 0.30)		

Table (2): Comparison between the two evaluated groups based on echocardiographic assessment

Echocardiographi c assessment	Total (n = 46)	Non-Survivors (n = 23)	Survivors (n = 23)	t	p
LVEF %				0.081	0.936
Min – Max.	42.0 – 72.0	42.0 – 72.0	45.0 – 70.0		
Mean ± SD.	57.33 ± 8.97	57.43 ± 10.45	57.22 ± 7.45		
Median (IQR)	56.0 (49.0 – 65.0)	55.0 (48.50 – 68.0)	56.0 (51.50 – 63.50)	0.014	0.989
Lateral S` (cm/s)					
Min – Max.	8.10 – 15.70	8.10 – 15.70	9.80 – 15.0		
Mean ± SD.	12.35 ± 2.10	12.35 ± 2.52	12.34 ± 1.62	1.252	0.218
Median (IQR)	12.35(10.40 – 14.20)	11.70 (9.85 – 14.70)	12.50(11.20 – 13.80)		
Septal S` (cm/s)				0.693	0.492
Min – Max.	5.80 – 13.20	6.10 – 13.0	5.80 – 13.20		
Mean ± SD.	10.12 ± 2.66	9.63 ± 2.94	10.60 ± 2.29		
Median (IQR)	11.25 (7.10 – 12.50)	7.50 (6.85 – 12.50)	11.30 (9.25 – 12.45)	0.693	0.492
Mean S` (cm/s)					
Min – Max.	7.40 – 14.50	7.40 – 14.30	7.80 – 14.50		
Mean ± SD.	11.25 ± 2.35	11.01 ± 2.71	11.50 ± 1.96	0.693	0.492
Median (IQR)	11.80 (8.90 – 13.50)	9.40 (8.60 – 13.70)	11.90(10.10 – 13.05)		

Conclusion

-The study underscores the complex prognostic landscape of sepsis and septic shock, where a combination of clinical, hemodynamic, and laboratory parameters, such as age, SOFA and APACHE II scores, MAP, urine output, and ABG, provides a more comprehensive mortality risk assessment. - Although TDI measurements of LV systolic function were obtainable, they did not independently predict outcomes. However, norepinephrine dosing emerged as a critical factor, with ROC curve analysis indicating a high discriminatory capacity.