


# Echocardiographic assessment of systolic and diastolic myocardial function in patients with sepsis

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**Introduction:** Sepsis is defined as life-threatening organ dysfunction caused by an unregulated host response to infection.<sup>1</sup> Myocardial dysfunction is common in patients with sepsis and septic shock. Establishing the diagnosis of septic cardiomyopathy is a great challenge, and echocardiography as a key diagnostic tool provides several possibilities for the diagnosis of septic cardiomyopathy. Systolic and diastolic dysfunction of the left ventricle is present in 50-60% of patients with sepsis. Right ventricular dysfunction is present in 50-55% of cases, while isolated right ventricular dysfunction is present in 47% of cases.<sup>2,3</sup> Diastolic dysfunction of the left ventricle is very common in septic shock, and this represents an early biomarker and has prognostic significance.<sup>4</sup> *Aim:* To examine the influence of sepsis on systolic and diastolic myocardial function in patients with sepsis and septic shock using echocardiographic parameters.

**Patients and Methods:** The research included 20 adult patients with a diagnosis of sepsis and septic shock, the sequential organ failure assessment (SOFA) score  $\geq 2$ , hospitalized at the University Hospital Centre Osijek. Each patient underwent two echocardiographic evaluations: the first one on the second day of hospitalization, and the second between the seventh and tenth day of hospitalization for comparison. Key echocardiographic parameters were monitored, which included mitral annular plane systolic excursion (MAPSE), left ventricular ejection fraction according to Simpson biplane, tricuspid annular plane systolic excursion (TAPSE), systolic wave prime (S') for assessment of left and right ventricular systolic function, and for assessment of left ventricular diastolic function the early diastolic transmitral flow by Doppler (E wave), late diastolic transmitral flow by Doppler (A wave) E/A ratio, mitral annular velocity obtained by tissue Doppler (E'), E/E' ratio, and isovolumic relaxation time (IVRT).

**TABLE 1. Differences in echocardiography findings at the first and follow-up examination.**

	Median (interquartile range)		Difference	95% CI	P*
	First examination	Follow-up examination			
MAPSE	12.75 (10 – 15)	13.0 (10.5 – 14.5)	0	-1 do 1	0.82
TAPSE	22.5 (20 – 26)	24.5 (21.5 – 26.5)	1	-1 do 3.5	0.42
E wave	0.84 (0.7 – 1.05)	0.76 (0.60 – 0.90)	-0.08	-0.16 do 0.04	0.16
A wave	0.79 (0.6 – 0.89)	0.75 (0.67 – 0.89)	0.05	-0.09 do 0.17	0.51
E/A	1.31 (0.83 – 1.50)	0.9 (0.82 – 1.26)	-0.17	-0.37 do 0	0.06
E'	0.06 (0.043 – 0.085)	1.0 (0.06 – 108.0)	53.9	0.03 do 104.9	<b>0.01</b>
E/E'	11.55 (7.8 – 13.9)	11.0 (0.09 – 14.4)	-2.7	-5.65 do 1.31	0.17
IVRT	99 (90 – 112)	81 (9.9 – 96.8)	-44.05	-62.2 do -4.5	<b>0.01</b>
S'	15.0 (13 – 16.75)	16.0 (14.3 – 16)	0.75	-0.5 do 2.0	0.09
EF Simpson BP	58.7 (54 – 61.8)	58.0 (53.0 – 62.3)	-0.55	-3 do 2.2	0.60

\*Wilcoxon test (Hodges-Lehmann's difference of medians); MAPSE = mitral annular plane systolic excursion; TAPSE = tricuspid annular plane systolic excursion; E wave = early diastolic transmitral flow by Doppler; A wave = late transmitral flow by Doppler; E/A ratio, E' = mitral annular velocity by tissue Doppler; E/E' ratio; IVRT = isovolumic relaxation time; S' = systolic wave prime; EF Simpson BP = left ventricular ejection fraction according to Simpson Biplane

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**Results:** In the follow-up examination, compared to the first examination, the values of E' were significantly higher (median 1.0 vs. 0.06) (Wilcoxon test, P = 0.01), and IVRT values were significantly lower (median 81 vs. 99), while there were no other significant differences between measured values in two examinations (**Table 1**).

**Conclusion:** The results of this study suggest a reversible form of diastolic dysfunction caused by sepsis. It is a common phenomenon in septic cardiomyopathy, where cardiac function can be significantly compromised in the acute phase, but with appropriate treatment, function is restored within a few days.

#### LITERATURE

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