Abstract

BACKGROUND:

A proportion of septic patients exhibit LV systolic dysfunction which easily underdiagnosed by conventional echocardiography, Strain imaging by either tissue-Doppler imaging (TDI), or by digital 2-dimensional speckle tracking echocardiography (STE) analysis have been reported to assess abnormal left ventricular LV contractility in sepsis.

OBJECTIVE:

Assessment of LV Strain, Strain Rate in different grades of sepsis by TDI,ST&Comparison between both approaches in relation to the survival outcome in sepsis.

METHODS:

Thirtytwo patients, 13 pts.with sepsis (group I), 19 pts. with severe sepsis/septic shock (groupII) and a subset of 10 controls (groupIII) were included. APACHE II score was assessed on admission. In the first 24 hours, echocardiography-derived LV dimensions and ejection fraction (%EF) were recorded in sinus rhythm,Apical 4-chamber (4-CH), Apical2-chamber (2-CH)& Apical 3-chamber(3-CH) views were acquired in ECG-gated cine loops by two techniques, 2D and TDI for later off line analysis.STE& TDI were usedto acquire segmental strain& strain-rate during systole, which were averaged for the whole segments to obtain global results.

RESULTS:

Compared to controls, EF% of group I were comparable,68.4±5.2 vs.69±4but group II showedlower EF compared to groupI,and controls 63±5.63 but still preserved. GPSLS by STgroup I& controls were comparable (-20.19±2.43vs.-20.16±1.6, p 0.999)butgroup IIhad increased(less negative)GPSLS compared to group Iand controls(-15.36 ±1.45vs.-20.19±2.43,p 0.001)&(-15.36±1.45vs.20.16±1.6, p 0.001)respectively. GPSLSR by ST group I& controls were comparable(-1.43±0.13 vs. –1.61±0.11, p 0.062),but group II had increasedGPSLSR compared to group Iand controls (-1.25±0.22 vs. -1.43±0.13, p 0.025) &(-1.25±0.22 vs-1.61±0.11, p 0.001) .ByTDI,GPSLS ofgroup I and controls were comparable (-18.08±2.42vs.-19.7±1.87, p 0.312)butgroup II had

increased GPSLS compared to group Iand controls (-12.7 ±6.8vs.-18.08±2.42,p 0.001)&(-12.7±6.8vs -19.70±1.87,p 0.001)respectively.GPSLSR by TDI group I & controls were comparable(-1.16±0.67 vs. –1.62±0.076, p 0.937),but group II had increased GPSLSR compared to group I and controls (-1.06±0.18vs. -1.16±0.67, p 0.001) &(-1.06±0.18 vs-1.62±0.076, p 0.0 01)respectively .

Group I had lower APACHE II score compared to group II(10.2±2.2vs.20.5±5.3, p 0.001), group II had higher mortality compared to group I with no mortality(10 deaths, 52.6%vs. 0 death, 0%,P value 0.002), Nonsurvivors had increasedGPSLScompared to survivors by ST and TDI (-14.87±1.06 vs. -18.68 ± 2.76 , P =0.001) &(-13.45 ±1.15 vs. -15.54 ± 7.24, p 0.001)respectively. They also hadincreased GSLSR by ST and TDI (-1.18 ±0.23vs -1.39 ± 0.16, p =0.002)&(-0.955 ±0.157 vs. -1.162 ± 0.516, p 0.001) respectively.

Strong positive correlations were found between APACHE II score &GPSLS, GPSLSRby ST,but withTDI this correlation were weak.
Moderate negative correlations were found between EF &GPSLS,GPSLSR by STbut with TDI this correlation was poor.The area under the curve (AUC) of ST GPSLS to predict mortality was 0.92, with best cutoff value at -16.12 (sensitivity 86.4%, specificity 90%), AUC for ST GPSLSR was 0.75, with best cutoff value at -1.27 (sensitivity 77%, specificity 60%), AUC for TDI GPSLS was 0.91, with best cutoff value at -14.68 (sensitivity 81%, specificity 90%), and AUC for TDI GPSLSR was 0.90, with best cutoff value at -1.12(sensitivity 81%, specificity 90%).

CONCLUSION:

LV strain and strain rate by ST& TDI can be used to detect subtle LV systolic dysfunctionunrecognized with conventional echocardiography in patients with severe sepsis or septic shock.

LV strain and strain rate byST showed better correlation with both APACHE II and %EF than TDI. Both approaches canpredict mortality in sepsis, but GPSLS by ST more sensitive.

Key words:LV strain, LV strain rate, STE, TDI, sepsis.