Sažetak sa skupa / Meeting abstract

Ispitivanje varijabilnosti srčanog ritma zasnovano na analizi nelinearne dinamike kod bolesnika sa stres-induciranom kardiomiopatijom

Heart rate variability based on nonlinear dynamic analysis in patients with stress-induced cardiomyopathy

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Uvod

Tehnike dinamičke analize mogu kvantificirati poremećaj varijabilnosti srčanog ritma (VSR) zasnovano na nelinearnoj analizi.

Cilj

Istraživanje kliničke i prognostičke značajnosti dinamičkih promjena VSR kod bolesnika sa stres-induciranom kardiomiopatijom (Takotsubo sindrom /TS/).

Metode

Bolesnici sa TS su uključeni u studiju nakon kompletne neinvazivne i invazivne dijagnostičke kardiovaskularne obrade usporedivo po spolu i dobi sa kontrolnom skupinom zdravih ispitanika. Vremenska serija R-R intervala (RRI) je izolirana iz 24-satnog EKG snimanja nakon digitalnog uzorkovanja. Hurstov eksponent je određivan metodom "reskalirane" analize. Za određivanje svojstva dugo dosežne korelacije VSR, uporabljena je metoda pomaknute fluktuacijske analize. Aproksimativna entropija je primijenjena za određivanje re-

Background

Dynamic analysis techniques may quantify abnormalities in heart rate variability (HRV) based on non-linear analysis.

Aim

Aim of this study was to investigate the clinical and prognostic significance of dynamic HRV changes in patients with stress-induced cardiomyopathy (Takotsubo Syndrome /TS/).

Methods

Subjects with TS were included in this study after complete non-invasive and invasive cardiovascular diagnostic evaluation compared to an age and gender matched control group of healthy subjects. Series of R-R interval (RRI) values were obtained from 24-hour ECG recordings after digital sampling. The "range rescaled analysis" method determined the Hurst exponent of RRI values. To quantify fractal long-range correlation properties of HRV, the detrended fluctuation analysis technique was used. Approximate entropy was

gularnosti i kompleksnosti, kao i predvidljivosti fluktuacija u vremenskoj seriji.

Rezultati

Kratko-dosežni i dugo-dosežni fraktalni skalarni eksponenti (α1 i α2) su bili značajno povišeni kod bolesnika sa TS u akutnoj fazi nego u kontrolnoj skupini, dok su aproksimativna entropija i Hurstov eksponent bili sniženi, no sve se normaliziralo kroz nekoliko tjedana.

Zaključci

Analiza zasnovana na kompleksnosti odražava poremećene neuroanatomske interreakcije koji mogu doprinijeti razvoju stres kardiomiopatije. Dinamička nelinearna analiza VSR omogućava procjenu fraktalnosti vremenske serije kod TS bolesnika koji su već izgubili normalne fraktalne karakteristike i nelinearne obrasce VSR i može poslužiti za nadopunu tradicionalnih elektrokardiografskih ispitivanja i kliničkoj prosudbi.

Ključne riječi: varijabilnost srčanog ritma, nelinearna dinamika, teorija kaosa, stres-inducirana kardiomiopatija, Takotsubo sindrom.

applied to quantify the regularity and complexity, as well as unpredictability of fluctuations in time series.

Results

Short-term and long-term fractal scaling exponent (α1 and α2) were significantly higher in patients with TS in acute phases than in controls as well as lower approximate entropy and Hurst exponent, but those variables has been normalized in a few weeks.

Conclusion

Complexity based analysis may reflect altered neuroanatomic interactions that may predispose to severe stress cardiomyopathy. Dynamic non-linear HRV analysis allows assessing fractal time series in TS patients who already lost normal fractal characteristics and nonlinear patterns in HRV, and may thus complement traditional ECG and clinically analysis.

Keywords: heart rate variability, nonlinear dynamics, chaos theory, stress-induced cardiomyopathy, Takotsubo syndrome.

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