Time Interval Index from Tricuspid Annular Velocity Profile is Useful in Evaluating Pulmonary Artery Pressure in Secondary Pulmonary Hypertension

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Backgrounds: Tricuspid annular motion velocity profile derived from pulsed tissue Doppler imaging has been utilized for easy and quantitative evaluation of right ventricular function, however the effect of pulmonary hypertension (PH) on the annular velocity is unknown. We observed the serial changes of this velocity profile before and after treatment in patients with left-sided heart failure with secondary PH.

Methods: Subjects consisted of 34 patients (mean age: 72.3 ± 8.6 years old) with secondary PH concomitant with left-sided heart failure (15 with chronic myocardial infarction, 12 with dilated cardiomyopathy, 5 with hypertensive heart disease and 2 with hypertrophic cardiomyopathy). None of them had organic right-sided heart disease. Tricuspid annular motion at right ventricular free wall side were obtained from 4 chamber view by pulsed tissue Doppler imaging before treatment when they were presenting heart failure and after conventional treatment when they were about to discharge. The peak systolic (s'), early diastolic (e'), atrial systolic (a'), time from the onset of electrographic Q wave to the onset of s' (Q-s'$_{onset}$) and peak s' (Q-s'$_{peak}$) were measured from the velocity profile.

Results: Left ventricular ejection fraction and end-diastolic volume at heart failure in all subjects was 45 ± 16% and 106 ± 152ml, respectively. Estimated systolic pulmonary artery pressure (PAP) decreased from 53.7 ± 9.8 to 31.4 ± 5.1 mmHg by the treatment. The s', e' and a' did not change significantly, while the Q-s'$_{onset}$ and the Q-s'$_{peak}$ prolonged significantly after the treatment (94.8 ± 27.5 to 118.0 ± 22.0 msec, $p<0.0001$, and 173.8 ± 29.4 to 188.5 ± 23.5 msec, $p<0.005$, respectively). There was a linear negative relationship between the Q-s'$_{onset}$ and PAP ($r=0.400$, $p<0.01$) in all measurements.

Conclusions:
Time interval index from tricuspid annular motion velocity significantly changed by the heart failure treatment as the secondary PH improved. These time indices are not affected by the Doppler angle. The tricuspid annular velocity profile obtained by tissue Doppler imaging are a valuable, noninvasive tool for evaluating secondary PH in patients with left-sided heart failure.

三尖弁輪運動速波形を用いた二次性肺高血圧の評価

【背景】三尖弁逆流血流速波形を利用して得られる推定収縮期肺動脈圧は，肺高血圧の重症度評価に繁用されているが，三尖弁逆流がない場合やジェットが偏位している場合などすべての症例で利用できるわけではない．一方，三尖弁輪運動速波形はほとんどの例で記録可能である．本波形が肺高血圧の重症度評価に有用か否かを検討するため，左心不全に伴う二次性肺高血圧症例の治療前後における変化を検討した．

【方法】対象は左心不全に伴う二次性肺高血圧を認めた34例（陳旧性心筋梗塞15例，拡張型心筋症12例，高血圧性心5例，肥大型心筋症2例）．心尖部四腔断面で計測した三尖弁輪運動速波形から，収縮期 (s')，拡張早期(e')，心房収縮期 (a')の各ピーク速度，心電図のQ波からs'の開始までの時間 ($Q\text{-}s'_{onset}$) ，Q波からs'のピークまでの時間 ($Q\text{-}s'_{peak}$) を計測した．
【結果】左心不全の加療により，推定肺動脈圧は53.7±9.8mmHgから31.4±5.1mmHgに低下した. s', e', a' には有意な変化はなかった. $Q\text{-}s'_{onset}$ と $Q\text{-}s'_{peak}$ は治療後に延長した(94.8±27.5 to 118.0±22.0msec, $p<0.0001$, 173±29.4 to 188.5±23.5msec, $p<0.005$)． また，$Q\text{-}s'_{onset}$ と推定肺動脈圧の間には負の相関を認めた ($r=0.400$, $p<0.01$).
【結語】三尖弁輪運動速波形から得られる時間指標は，左心不全伴う二次性肺高血圧の評価に有用であると考えられた．