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## New indices of arterial stiffness correlates with disease severity and mid-term prognosis in acute decompensated heart failure

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**Background:** Arterial stiffness has been implicated in pathophysiology of heart failure (HF) since it is involved in the ventricular-vascular coupling. Recently, new indices obtained by a cuff oscillometric technique, the arterial velocity-pulse index (AVI) for the stiffness of central arteries and the arterial pressure-volume index (API) for the stiffness of peripheral arteries have been developed and validated. However, the AVI and API measurement has not been attempted in HF population.

**Purpose:** This study aimed to investigate the relationship between the AVI, API and clinical outcomes in HF patients.

**Methods:** A prospective cohort of patients with acute decompensated HF were enrolled within 6 months, who were admitted to a tertiary referral hospital in China. Measurement of the AVI and API (AVE-1500, Shisei Datum, Tokyo, Japan) was performed on the day of admission and discharge. Patients were followed up to 6 months for the composite endpoint of all-cause death and HF rehospitalization.

**Results:** A Total of 127 patients were recruited for analysis (60±15 years, 70% male). 80% of the patients were in New York Heart Association (NYHA) Class III or above at admission, who presented a mean left ventricular ejection fraction (LVEF) of 34±9%. During hospitalization, all patients received guideline directed medical therapy if not contraindicated. The AVI

(27.3±5.2 vs. 28.6±6.7,  $p=0.002$ ) and API (24.9±4.9 vs. 26.0±6.5,  $p=0.05$ ) were lower at discharge than at admission. By dividing the patients into tertiles according to the amino-terminal pro-brain natriuretic peptide (NT-proBNP), LVEF, transmitral E velocity over mitral annular e' velocity (E/e' ratio) and systolic blood pressure (SBP) at admission, it was observed that the AVI increased with a higher level of NT-proBNP ( $p$  for trend  $<0.001$ ), a larger E/e' ( $p<0.001$ ) and a lower LVEF ( $p=0.001$ ), while the API increased as the SBP became higher ( $p=0.005$ ). The improvement in AVI at discharge was correlated with that in LVEF ( $R=-0.3024$ ,  $p<0.05$ ) and NT-proBNP ( $R=0.3118$ ,  $p<0.05$ ), while the change in API was positively correlated with that in SBP ( $R=0.3897$ ,  $p<0.001$ ). In 6 months after discharge, there were 52 predefined events including 15 deaths and 44 HF rehospitalization. Apart from the level of NT-proBNP, the AVI at discharge of  $\geq 26$  showed a trend of being associated with the composite outcome (2.747, 1.411–5.349,  $p<0.001$  for univariate analysis; 1.8648, 0.8928–3.8949,  $p=0.0973$  for multivariate analysis).

**Conclusions:** New noninvasive arterial stiffness indices as the AVI and API reflected severity of illness and mid-term prognosis in admitted HF patients. Further studies are warranted for understanding its mechanisms and developing clinical applications.