Tissue Doppler, Speckle Tracking and Strain Imaging

Non invasive ventilation and right ventricle function in cardiogenic pulmonary edema: an echocardiographic perspective to select the "right" ventilatory support

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Background: High-flow nasal cannulae oxygen therapy (HFNCOT) represents a better tolerated alternative to non-invasive pressure support ventilation (NIPSV) for acute cardiogenic pulmonary edema (ACPE) treatment. However, there are still few data on the effect of HFNCOT on cardiac function and hemodynamic.

Purpose: To assess and compare the effects of NIPSV and HFNCOT in ACPE setting on right ventricular (RV) systolic function and on indices of cardiac filling and output, as measured by echocardiography.

Methods: This is a cross-over controlled study, enrolling 15 consecutive patients admitted to our Cardiovascular Intensive Care Unit for ACPE and hypoxaemic, normo/hypocapnic acute respiratory failure, with P/F ratio < 200. Each patient received NIPSV, followed by HFNCOT. Full echocardiographic assessment and blood gas analysis (BGA) were performed 40 minutes from onset of each ventilation modality, respectively before NIPSV to HFNCOT switch and before HFNCOT interruption. In particular, RV function parameters, together with RV and atrial strain, were prospectively collected.

Results: In spite of not significant changes in BGA, RV function was significantly improved under HFNCOT, as compared to NIPSV, as assessed by the following parameters: tricuspid annular plane excursion (TAPSE) (P = 0.001), RV S' wave (P = 0.007), RV fractional area change (RVFAC) (P = 0.006). Strain analysis confirmed the significant improvement in RV function, with free wall global longitudinal strain (GLS) and free wall and septum GLS significantly higher under HFNCOT, as compared to NIPSV (-21% vs -18% P < 0.001, and -15% vs -19% P = 0.008, respectively,), and a significant increase in right atrial positive longitudinal strain (P < 0.001).

Conclusions:NIPSV significantly affect RV function making more complex the management of patients presenting with ACPE. In this setting, HFNCOT represents a valuable alternative, providing similar respiratory outcomes while preserving good right ventricle performance.