講師：姜智耀 CHIH-YAO CHIANG

主題：

The Assessment of Left Ventricular Function by Pressure-Volume Loop and Global Longitudinal Strain by Transesophageal Echocardiography before Cardiac Surgery

摘要：

From a mechano-energetics perspective, analyzing the work of the left ventricular chamber using pressure-volume (PV) loops, rather than solely relying on differences in volume change, is more logical and in line with the principles of energy conservation. By analyzing the pressure-volume (PV) loop, stroke work can be identified as the comprehensive measure of left ventricular (LV) chamber work, encompassing the work performed by different segments of the myocardium. Left ventricular ejection fraction (LVEF) alone may not detect early signs of LV performance deterioration, as it can be compensated by circumferential radial contraction. Instead, the assessment of longitudinal strain and diastolic function can provide insights into the early deterioration of LV performance. Although the ejection function may appear normal, it is important to consider that it could be a compensatory mechanism at the expense of work efficiency and associated with harmful remodeling hypertrophy. The acute benefits of cardiac surgery involve the unloading of afterload and a decrease in wall stress of LV chamber, occurring prior to the remote mass regression and reverse remodeling.

These immediate benefits include improved stiffness and increased capacitance. As a result of these changes, there is improved compliance, reduced myocardial oxygen consumption (MVO2), decreased input work, enhanced output work, and ultimately, an overall improvement in mechanical efficiency.

Measurement of myocardial deformation using 2D speckle tracking echocardiography, specifically global longitudinal strain, serves as an independent predictor of all-cause mortality in heart failure. The relationship between impaired myocardial deformation and the severity of underlying diseases has been demonstrated in various cardiac pathologies. Additionally, circumferential strain rate has been found to be a reliable predictor of left ventricular remodeling. Mechanical dispersion has been identified as a predictor of arrhythmias in cases of ischemia and cardiomyopathy. The onset of changes in left ventricular function is characterized by a reduction in longitudinal shortening, accompanied by compensatory increased circumferential shortening, all while maintaining preserved left ventricular ejection fraction (LVEF). Notably, both reduced longitudinal and circumferential LV function, as assessed through speckle tracking, are independently associated with all-cause mortality.