Correlations between dP/dt measured from Left Ventricular and Radial Arterial Catheters

Background:
Cardiac contractility characterizes the heart's ability to eject a stroke volume in the context of a certain preload and given afterload (arterial pressure). The first derivative of systolic ventricular pressure (dP/dt) is measured by tracking left ventricular (LV) pressure during isovolumetric contraction. LV dP/dt is the gold standard for an objective measurement of contractility, but recent advancements now routinely measure dP/dt from an arterial catheter. This study evaluated the correlations between LV dP/dt and arterial dP/dt to clarify the clinical utility of arterial dP/dt.
Methods:
Records from patients who underwent TAVR procedures were gathered from 07/01/2021 to 05/08/2023 and had arterial catheter dP/dt data (Edwards Acumen IQ transducer) were included. The pre-aortic valve dP/dt deployment value was obtained from the cath report and the arterial dP/dt values (3 minute average before the same timestamp) were obtained from the anesthetic record. After valve replacement, another LV dP/dt value was paired with the concurrent average of three arterial dP/dt values recorded 3 minutes after deployment. Pearson's r test was used to assess correlations. In patients with paired measurements, concordance was graphed with percent change in LV dP/dt on the x-axis and percent change in arterial dP/dt on the y axis.
Results:
Data from 38 patients were analyzed. The Pearson r coefficient for all values was -0.016. There was also poor concordance, with most data points clustered around a negative change in LV dP/dt paired with a positive change in arterial dP/dt. Separating the pre-TAVR and post-TAVR data did not improve the correlation between LV and arterial dP/dt. The pre-TAVR r coefficient was 0.193 and the post-TAVR r coefficient was 0.133. However, a line of best fit is shown in Figure 1 for both pre- and post-TAVR values and the post-TAVR line of best fit is nearly identical with the line of identity.
Conclusions:
There is poor overall correlation between LV and arterial dP/dt measurements. This may be explained by the stenotic aortic valve as the primary source of afterload before valve replacement. This may impact LV dP/dt measurements. The stenotic valve also alters the vascular filling state, which is known to compromise arterial dP/dt measurements. We expected the correlations to improve after valve replacement, but they did not, as characterized by the poor concordance as the LV dP/dt decreased and arterial dP/dt increased. After valve replacement the correlation remains poor with this small sample size, but there is some systematic improvement in the degree of agreement between the two measurements, as the best fit line approaches a line of identity. In conclusion, while arterial dP/dt has some clinical utility, it is limited in patients with severe aortic stenosis.