Impact of left ventricular contractility on mitral annular motion in an acute animal model

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Funding Acknowledgement: Type of funding sources: Public Institution(s). Main funding source(s): Western Norway Regional Health Authority Research Grant

Background: We know that the ventricular function has a profound effect on the mitral valve in chronic disease with ventricular remodeling. However, acute effects of ventricular function on the mitral valve apparatus are not well understood.

Purpose: To investigate the effect of left ventricular (LV) contractility on all aspects of mitral annular motion.

Methods: Eight piezoelectric transducers were implanted equidistantly around the mitral annulus in ten pigs. Sonomicrometer array localization recorded transducer position after weaning from bypass. LV contractility was evaluated by the slope of the end-systolic pressure-volume relationship. Mitral annular area was calculated from cubic spline interpolation through the annular points. Circularity and non-planarity angle were calculated from principal component analysis. Mitral annular excursion was calculated as the projected distance from the annular geometric mean point to the least square plane of the mitral annulus in end diastolic configuration.

Results: LV contractility was strongly associated to change in mitral annular area and mitral annular excursion (r=0.88, p<0.001 and r=0.90, p<0.001, respectively). Change in non-planarity angle was only moderately associated with LV contractility (r=0.68, p<0.03), whereas circularity was not (r=0.05, p<0.089).

Conclusions: LV contractility was closely related to mitral annular size reduction and apicobasal annular excursion, and only moderately associated to folding of the mitral annular saddle shape. No associations were found with change in mitral annular circularity. This is to our knowledge the first detailed description of the acute relationship between LV contractility and mitral annular dynamics.

Figure 1