

Poster presentation

## Cardiac magnetic resonance predictors of mitral regurgitation and papillary muscle fibrosis in mitral valve prolapse

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### Introduction

Compared to extensive studies in echocardiography, cardiac magnetic resonance (CMR) predictors of mitral regurgitation (MR) in mitral valve prolapse (MVP) have yet to be defined. Characterization of the mitral valve may be important for prognosis of progression of MVP-related MR and facilitating surgical decision making. In addition, papillary muscle (PM) fibrosis has been observed in pathological studies of MVP and in vivo by late gadolinium enhancement (LGE) and attributed to PM "stretch" by displaced mitral valve leaflets.

### Purpose

We aimed at evaluating the correlation between mitral valve characteristics and MVP-related MR, and in a subgroup of patients with LGE imaging, PM fibrosis.

### Methods

CMR studies were performed on a 1.5 T Philips Achieva MR scanner (Philips HealthCare, Best, NL), equipped with a 5-element cardiac coil. We prospectively enrolled 68 MVP patients (age  $54 \pm 10$  years, 58% males, left ventricular ejection fraction  $65 \pm 5\%$ ). In a breath hold cine SSFP 3-chamber view (Figure 1A), we measured annular dimension (Ann), anterior and posterior leaflet displacement (AD, PD), and PM distance to coaptation point and prolapsed leaflets at end-systole (PMC, PMA, PMP). In the same view, we measured anterior and posterior leaflet thickness and length in diastole (AT, PT, AL, PL, Figure 1B and 1C). LGE images were obtained in 51 patients using a

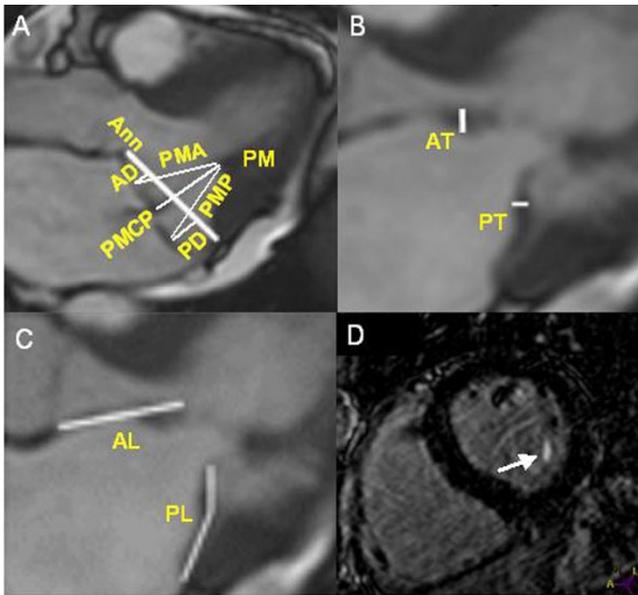
3D ECG-gated, respiratory navigator-gated inversion recovery TFE acquisition with spectral fat saturation prepulses obtained 20 minutes after injection of a total of 0.2 mmol/kg gadopentetate dimeglumine. MR volume was calculated by left ventricular stroke volume - velocity encoded aortic systolic flow.

### Results

By multivariate analysis, MR volume was correlated with posterior displacement ( $p = 0.002$ ), anterior length ( $p < 0.001$ ), and PM distance to coaptation point ( $p < 0.001$ ), with a model adjusted  $R^2 = 0.53$ . PM LGE (Figure 1D) was present in 30 patients (44%) and was associated with posterior leaflet thickness ( $p = 0.04$ ) by simple linear regression, but not leaflet displacement or any other parameter.

### Conclusion

Posterior leaflet displacement, anterior leaflet length, and PM distance to coaptation point are the best CMR valve determinants of MVP-related MR. PM fibrosis by LGE is related to posterior leaflet thickness, but not to leaflet displacement. These findings suggest that PM "stretch" may not always translate into PM fibrosis.



**Figure 1**  
**Three-chamber view** A) at end-systole with papillary muscle (PM) distance to anterior (PMA) and posterior (PMP) leaflet and to coaptation point (PMCP); anterior (AD) and posterior (PD) leaflet displacement, annular dimension (Ann); B) in diastasis with anterior (AT) and posterior (PT) leaflet thickness and C) length (AL, PL). D) short-axis view with PM LGE (arrow).

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