

Tethering symmetry, anterior mitral leaflet angle and papillary muscle systolic dyssynchrony are powerful tools to identify advanced LV dysfunction in patients with ischemic dilated cardiomyopathy (IDCM)

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Background

Two-Dimensional (2D) speckle-tracking imaging enables the angle-independent assessment of multidirectional LV strain and differentiates myocardial segments with active contraction from segments which are passively tethered

Aim

We investigated the impact of papillary muscle (PM) dyssynchrony in predicting recurrent mitral regurgitation in patients with IDCM undergoing UMRA

We explored the correlation of PM dyssynchrony with tethering pattern and tethering angles

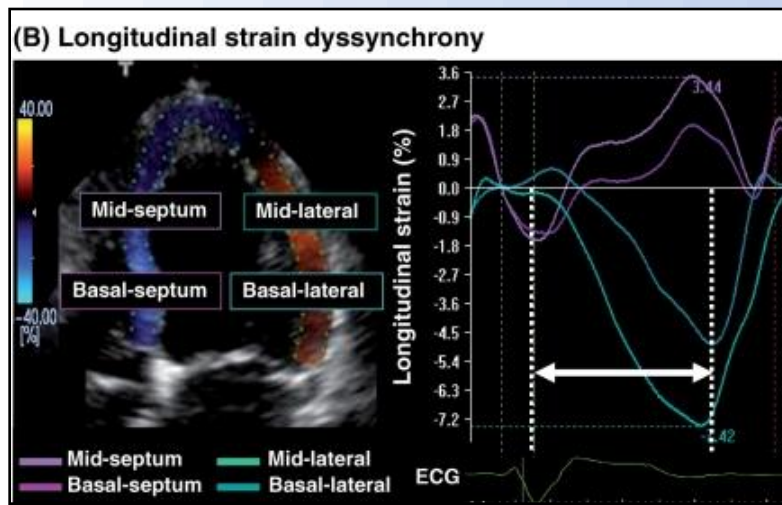
Methods and data analysis

The systolic strain was measured at level of both papillary muscles (PMs)

* Apical 4-chamber AL PM

* Apical long-axis or short axis view for PM PM

The time from the beginning of the QRS complex to the peak systolic longitudinal strain (**Ts-PAP**) was quantified for the AL PM and the PM PM and the difference was defined as papillary muscle systolic dyssynchrony (**DYS-PAP**)



- Data Base Excelera (PMSD View Excelera) , stored in DICOM Format and examined off-line
- Standard Echocardiographic Evaluation Tethering Angles Measurements (Philips DICOM Viewer)
- ECHO+ Q-Lab TOMTEC Imaging system

Patient population and groups

2001 - 2010

144 consecutive patients

IDCM (LVEF<35%)

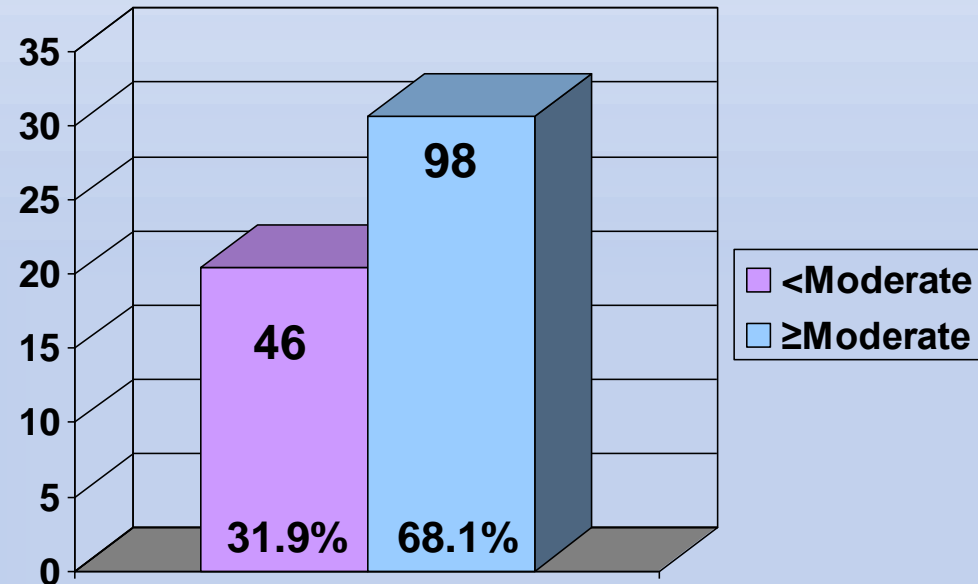
CABG+UMRA

Sex (M/F) 64.6 / 35.4 %

Mean age 64±6 years

Median FU 39.3 months

Recurrent MR at the end of follow up
Two population groups



MR- RV < 30 ml

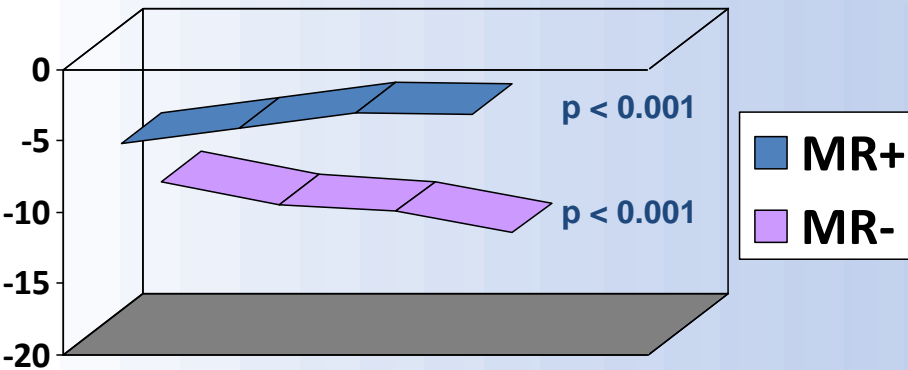
MR+ RV ≥ 30 ml

Baseline echocardiographic characteristics for both groups

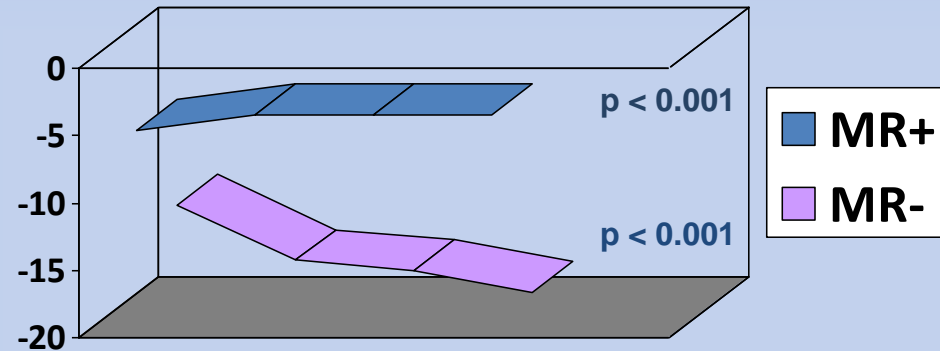
	MR-	MR+	p
CH(mm)	8.9 ± 2	13.4 ± 6	<0.001
α (°)	32.6 ± 4.9	45.2 ± 7.0	<0.001
α/β	0.61 ± 0.08	0.89 ± 0.1	<0.001
DYS-PAP (ms)	25.9 ± 1.2	65.4 ± 4.2	<0.001
ALP (%)	-12.4 ± 0.2	-4.6 ± 0.3	<0.001
PMP (%)	-9.7 ± 0.2	-5.2 ± 0.5	0.03
β (°)	52.3 ± 5.9	50.4 ± 6.1	ns

Evolution longitudinal strain PMP and ALP over time

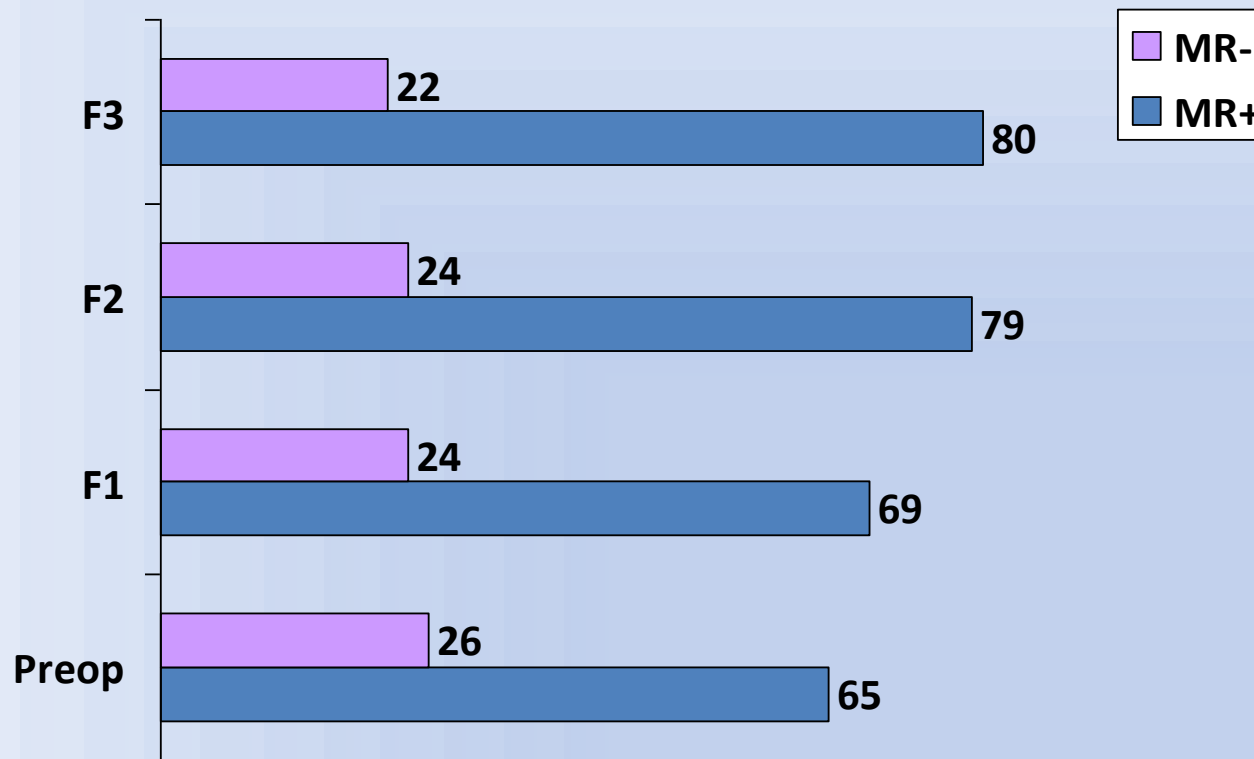
PMP (%)



ALP (%)



DYS-PAP (ms)



MR+ vs MR -
MR+ Over time
MR- Over time

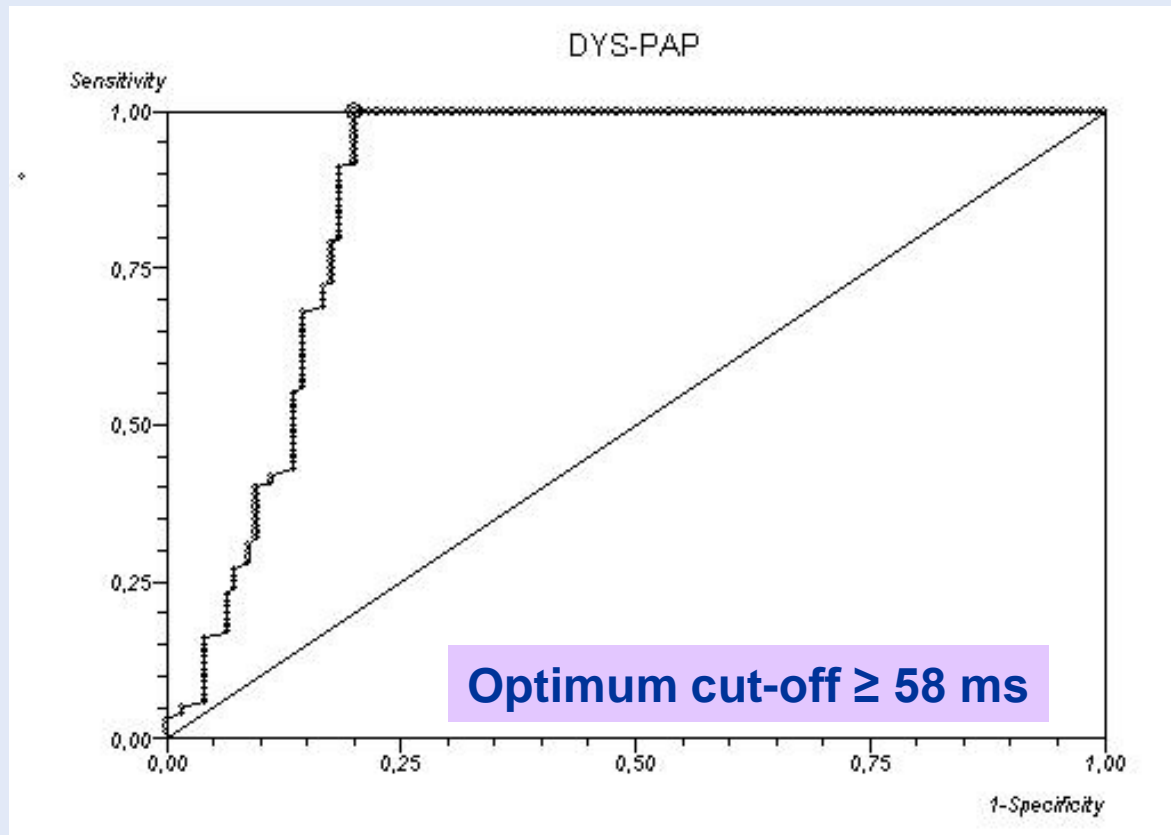
p <0.001
p <0.001
p= 0.8

Statistical analysis

Predictors of recurrent MR \geq Moderate

	Univariate		Multivariate		
	R	p	OR	95%CI	P
$\alpha(^{\circ})$	0.78	<0.001	5.0	2.6-6.7	<0.001
α/β	0.72	<0.001	3.9	2.5-5.7	<0.001
DYS-PAP (ms)	0.84	<0.001	5.4	3.1-7.7	<0.001

ROC



Area under ROC curve (95% CI) = 0.9 (0.72 to 1)
Sensitivity (95% CI) = 1 (0.96 to 1 [97.5% one-sided CI])
Specificity (95% CI) = 0.83 (0.71-0.86)

Correlation Analysis of DYS-PAP to leaflet angles and tethering pattern

	R	p
$\alpha(^{\circ})$	0.74	<0.001
α/β	0.54	0.001
$\beta(^{\circ})$	0.32	0.065

Conclusions

DYS-PAP is strongly correlated with recurrence of MR

A DYS-PAP cut-off value of 58 ms is an useful tool to identify patients with postoperative MR \geq Moderate

DYS-PAP is strongly correlated with AML tethering and symmetric pattern

Tethering pattern is a powerful and immediate tool to identify patients with advanced ischemic LV dysfunction who will not benefit from UMRA