

IN VIVO FORCE MEASUREMENT ON MITRAL VALVE TRACTION SUTURE: LEFT VENTRICULAR FORCE BALANCE

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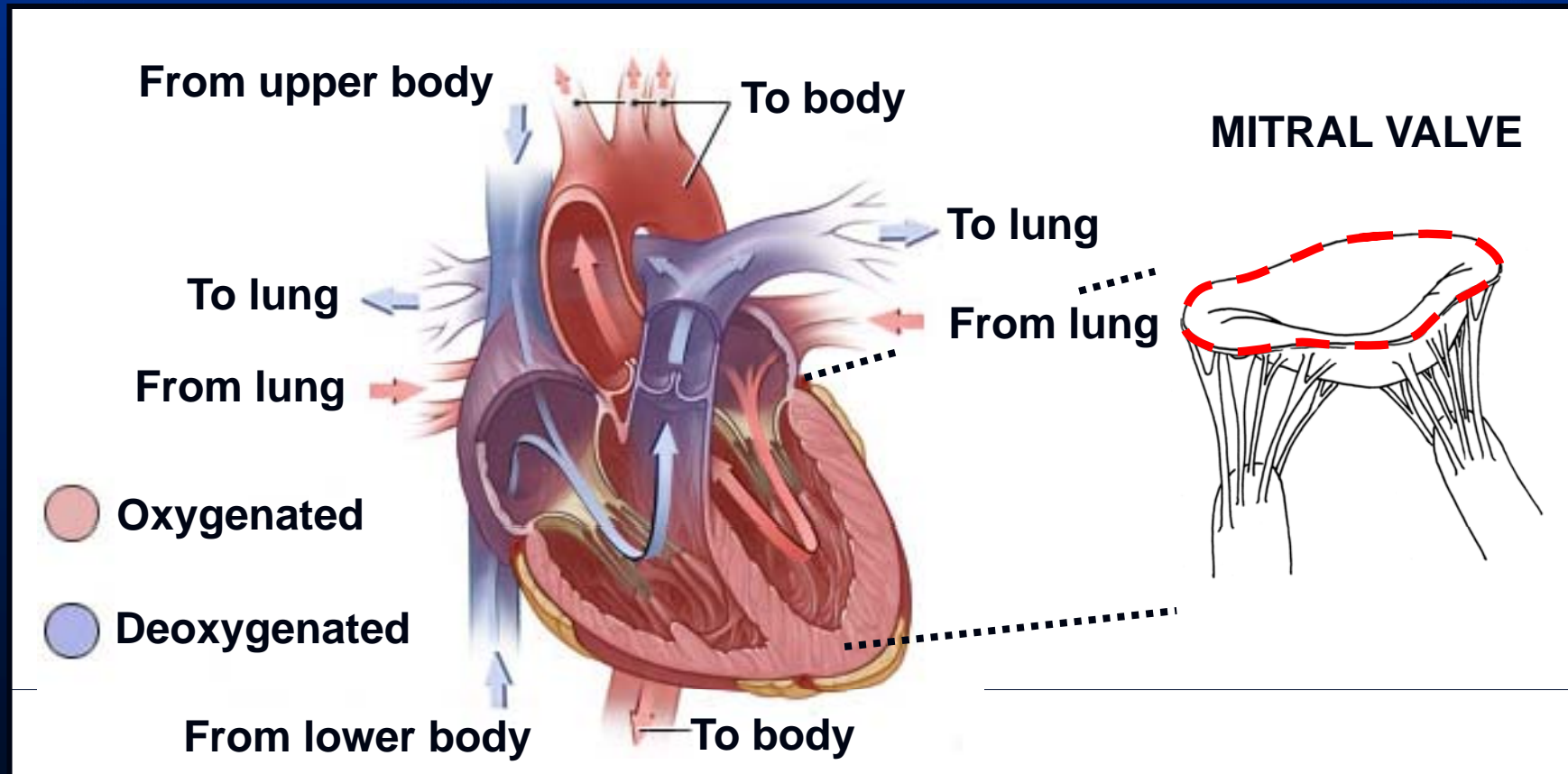
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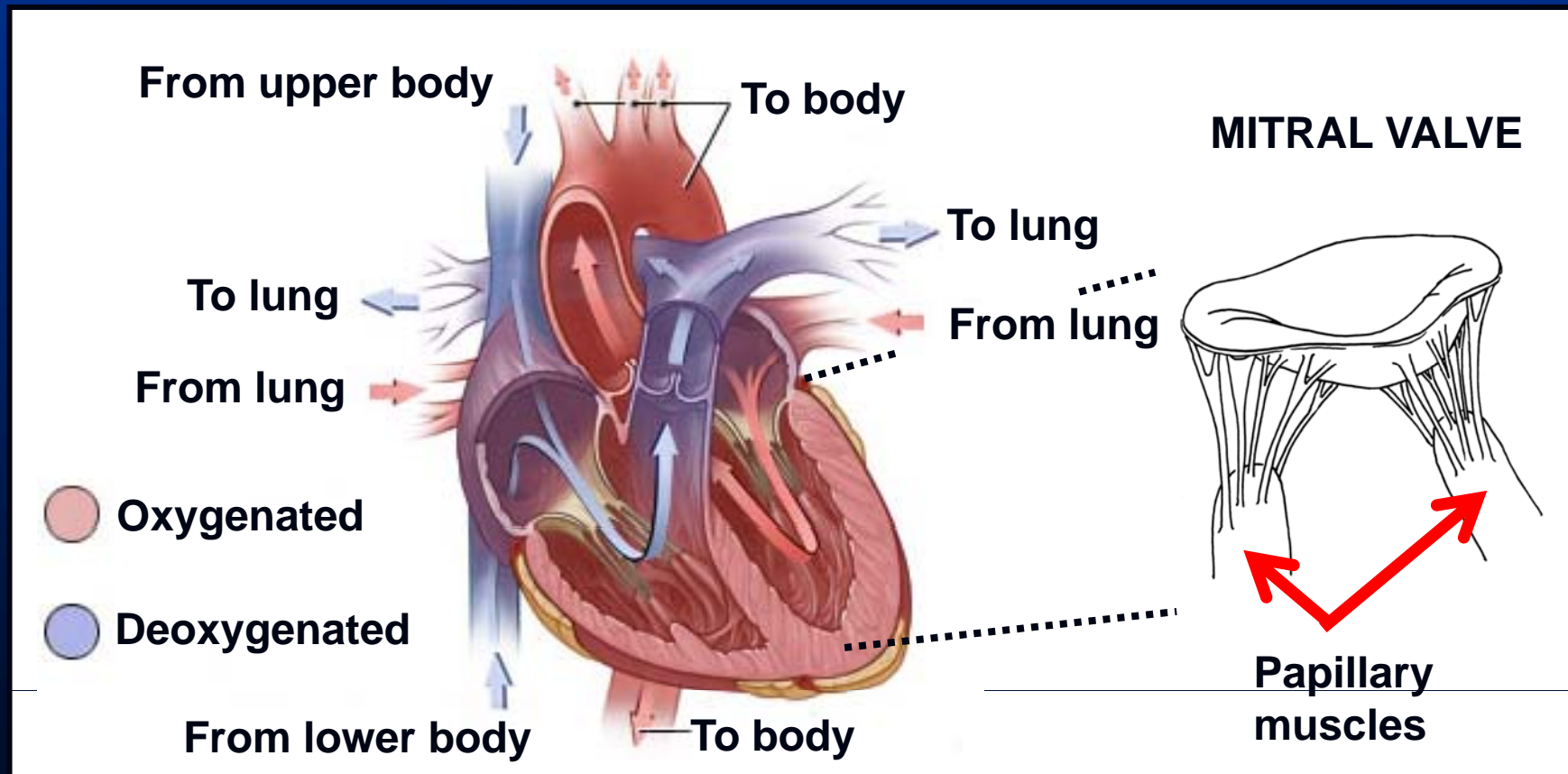
Background

- The Heart and the Mitral Valve



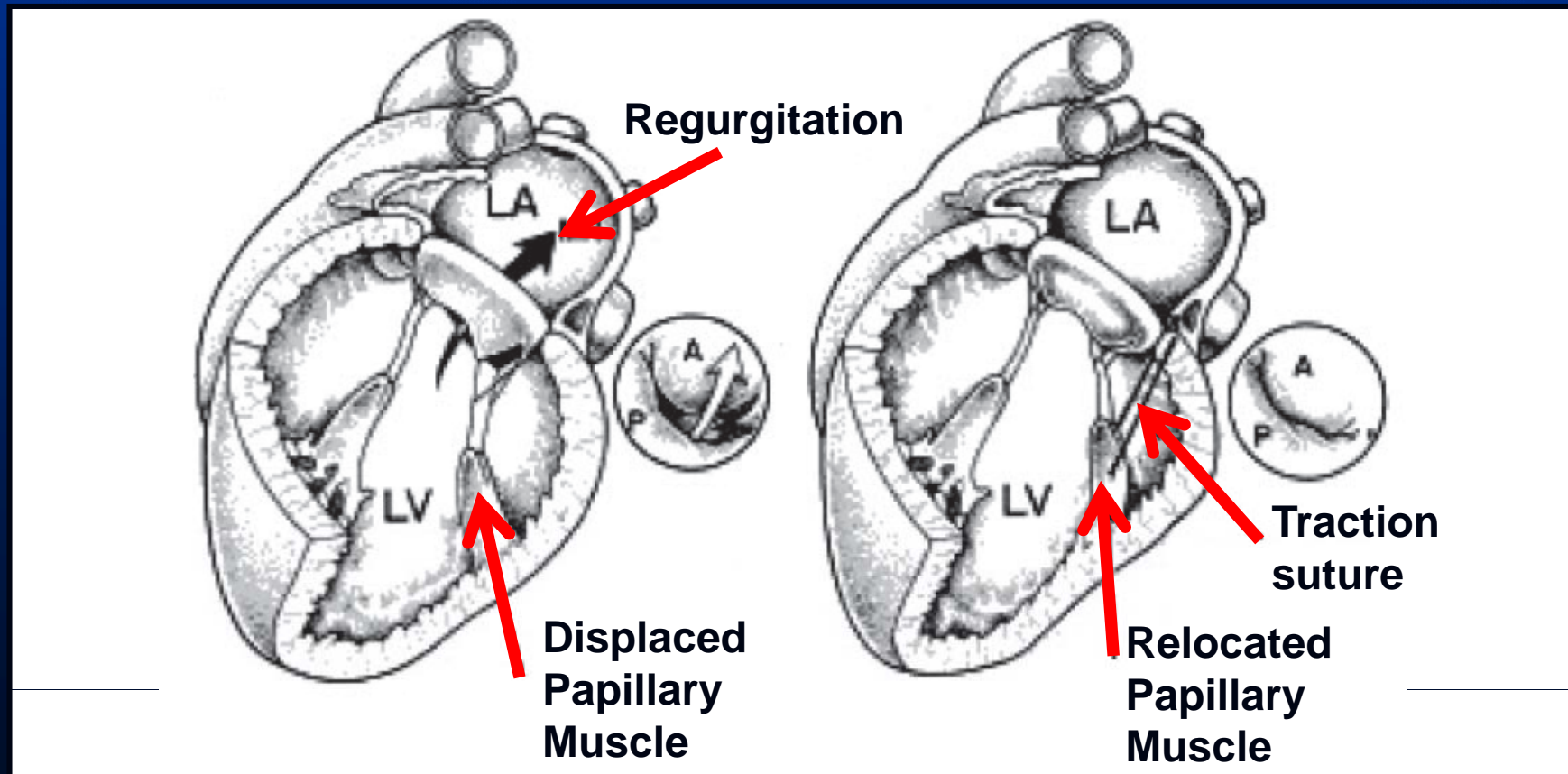
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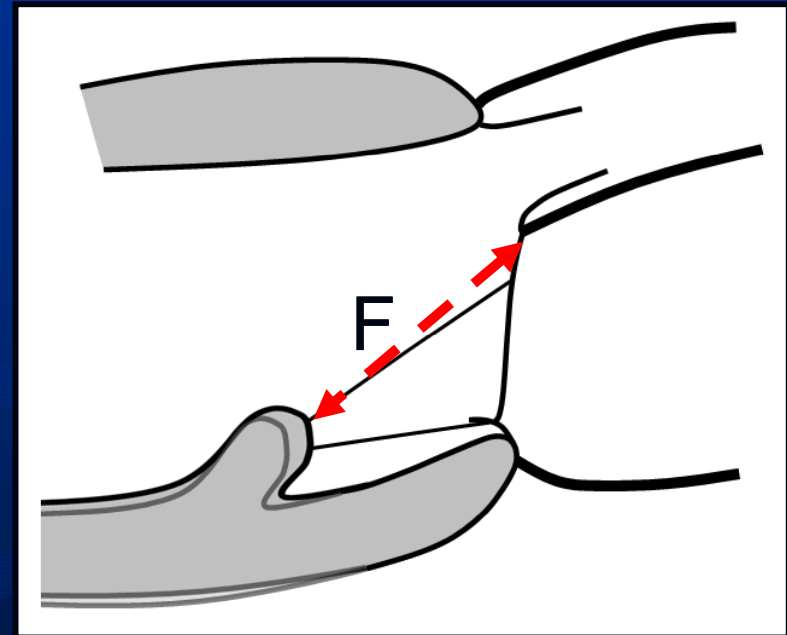
Background

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Background

- Traction suture force:
Important to quantify load on valvular and subvalvular apparatus



Hypothesis

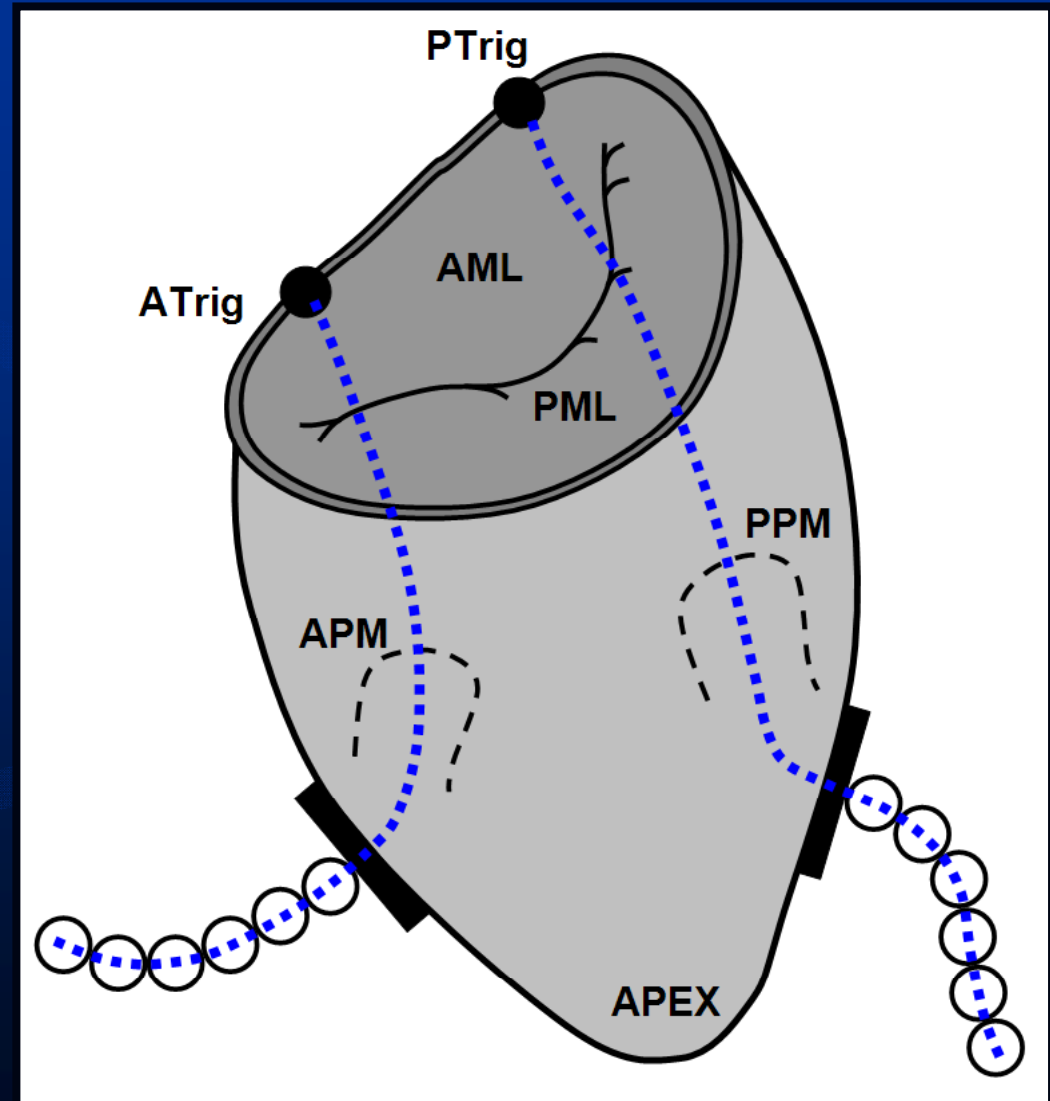
Forces generated on traction sutures are directed by the papillary muscle displacement

Aim

Determine the forces generated on traction sutures throughout the cardiac cycle

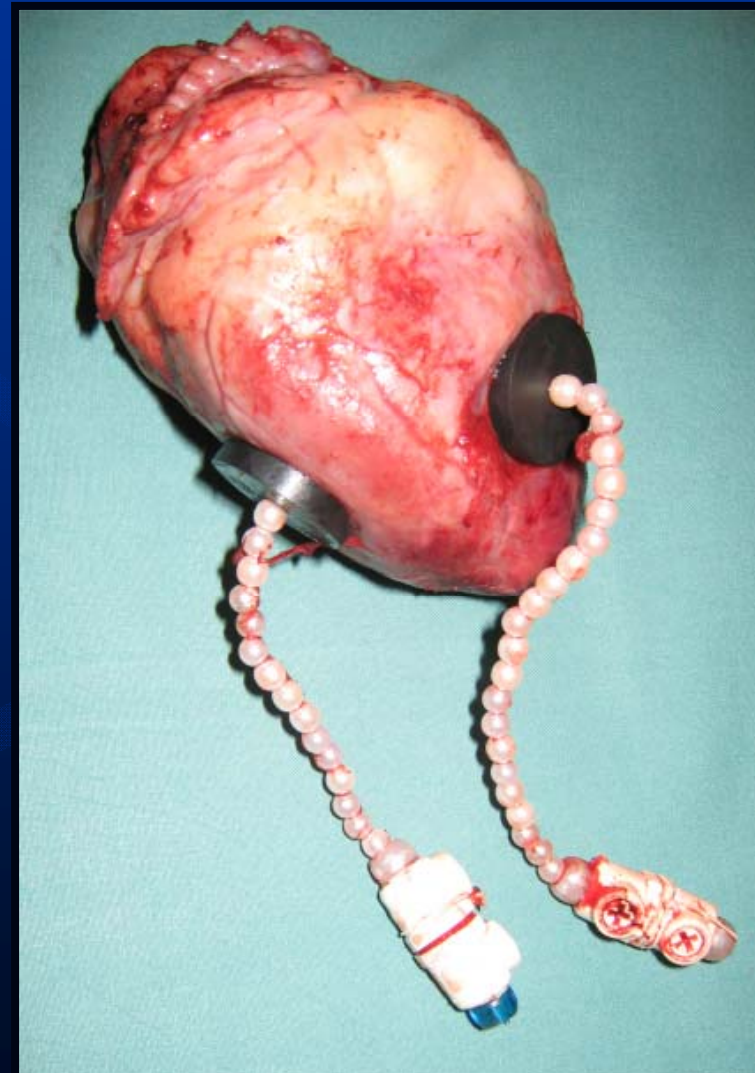
Methods

- Porcine in vivo model of mitral regurgitation
- GoreTex traction suture exteriorized
- Guided to transducer w/ force transmission



Methods

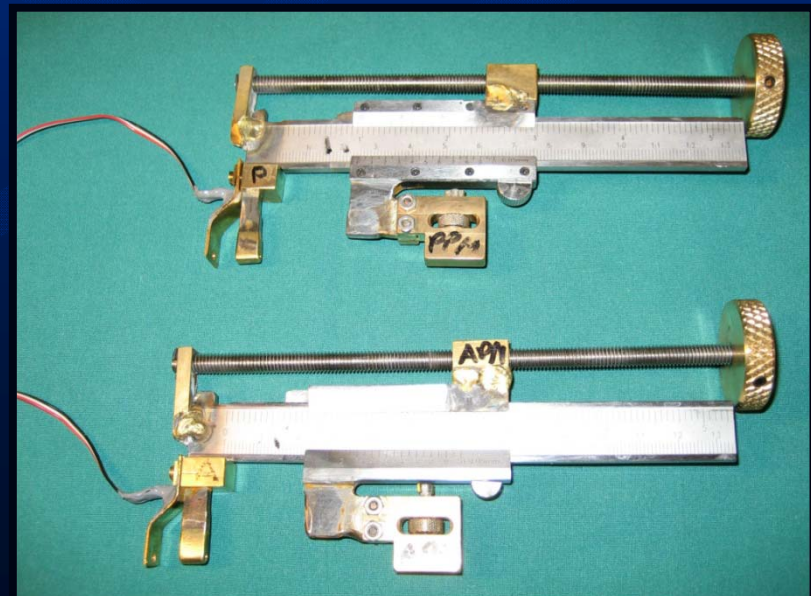
- Porcine in vivo model of mitral regurgitation
- GoreTex traction suture exteriorized
- Guided to transducer w/ force transmission



Methods

Multiple purpose device:

- Eliminate slack in traction suture
- Traction suture force
- Papillary muscle relocation quantification



Methods

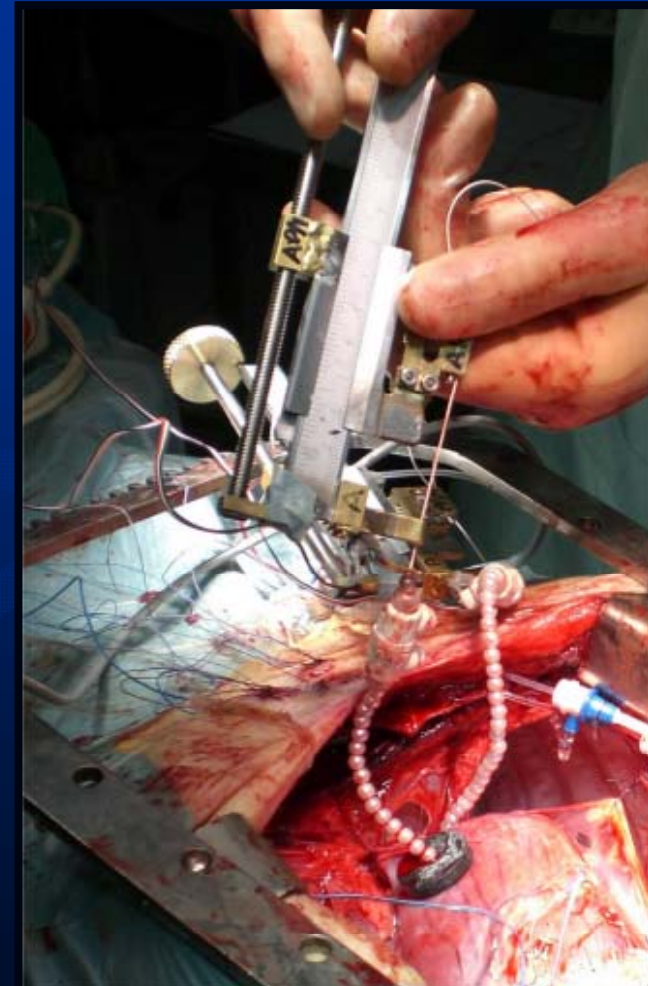
- Asymmetric papillary muscle displacement
→ asymmetric relocation:

Posterior
papillary
muscle:

- 5 mm
- 10 mm
- 15 mm

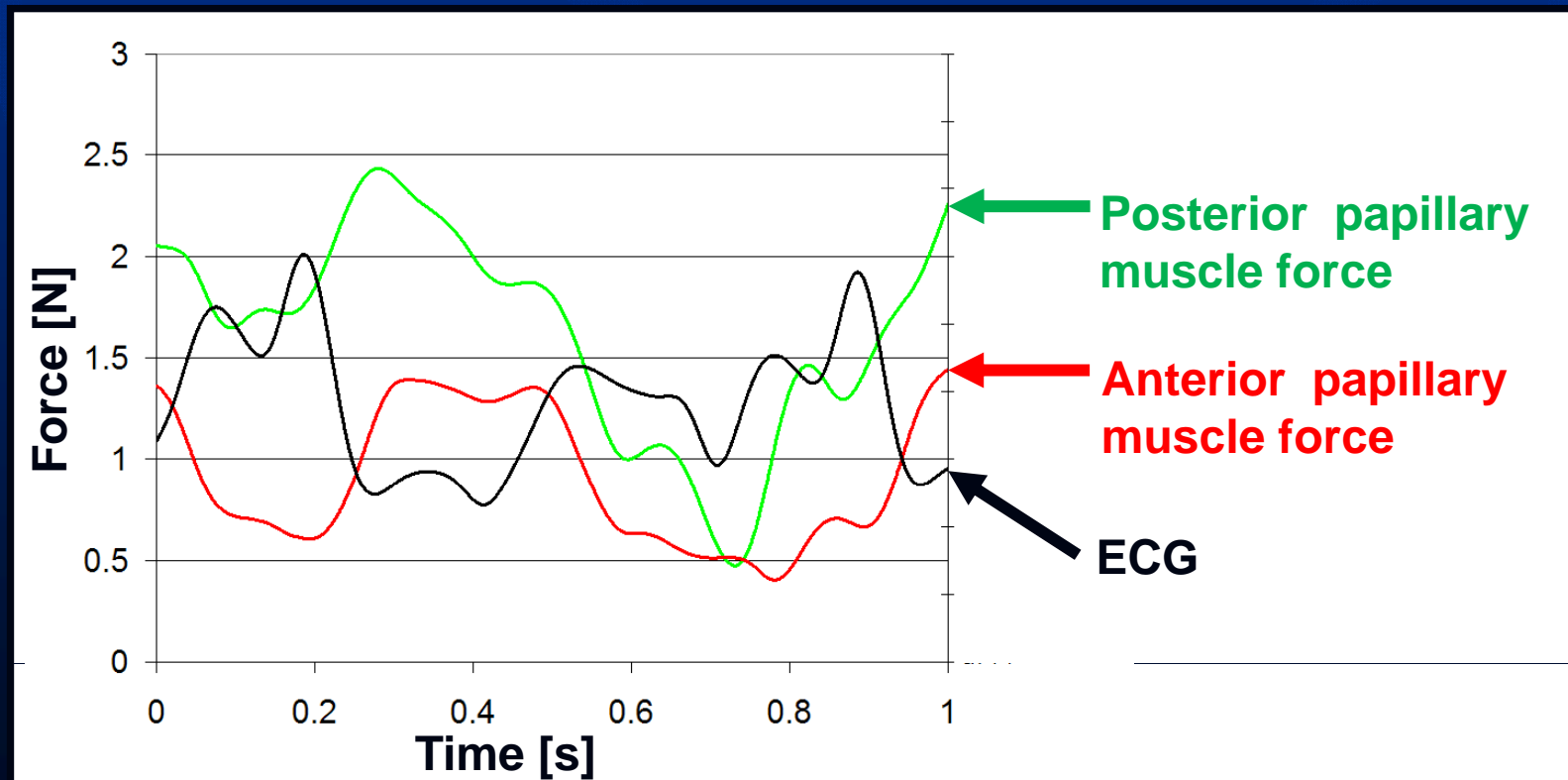
Anterior
papillary
muscle :

- 5 mm



Methods

- Force measurement synchronized with ECG
- Hemodynamic stabilization and mitral valve monitored with pressure, flow and Ultrasound



Results

- Peak force:

Displacement [mm]		Force [Newton]	
APM	PPM	APM	PPM
0	5	0.7 ± 0.2	0.8 ± 0.3
0	10	0.6 ± 0.2	0.8 ± 0.2
0	15	0.5 ± 0.4	1.1 ± 0.3
5	15	1.4 ± 0.3 (*)	1.1 ± 0.3

- (*): APM Force $p < 0.1$ for APM=0 \rightarrow APM=5

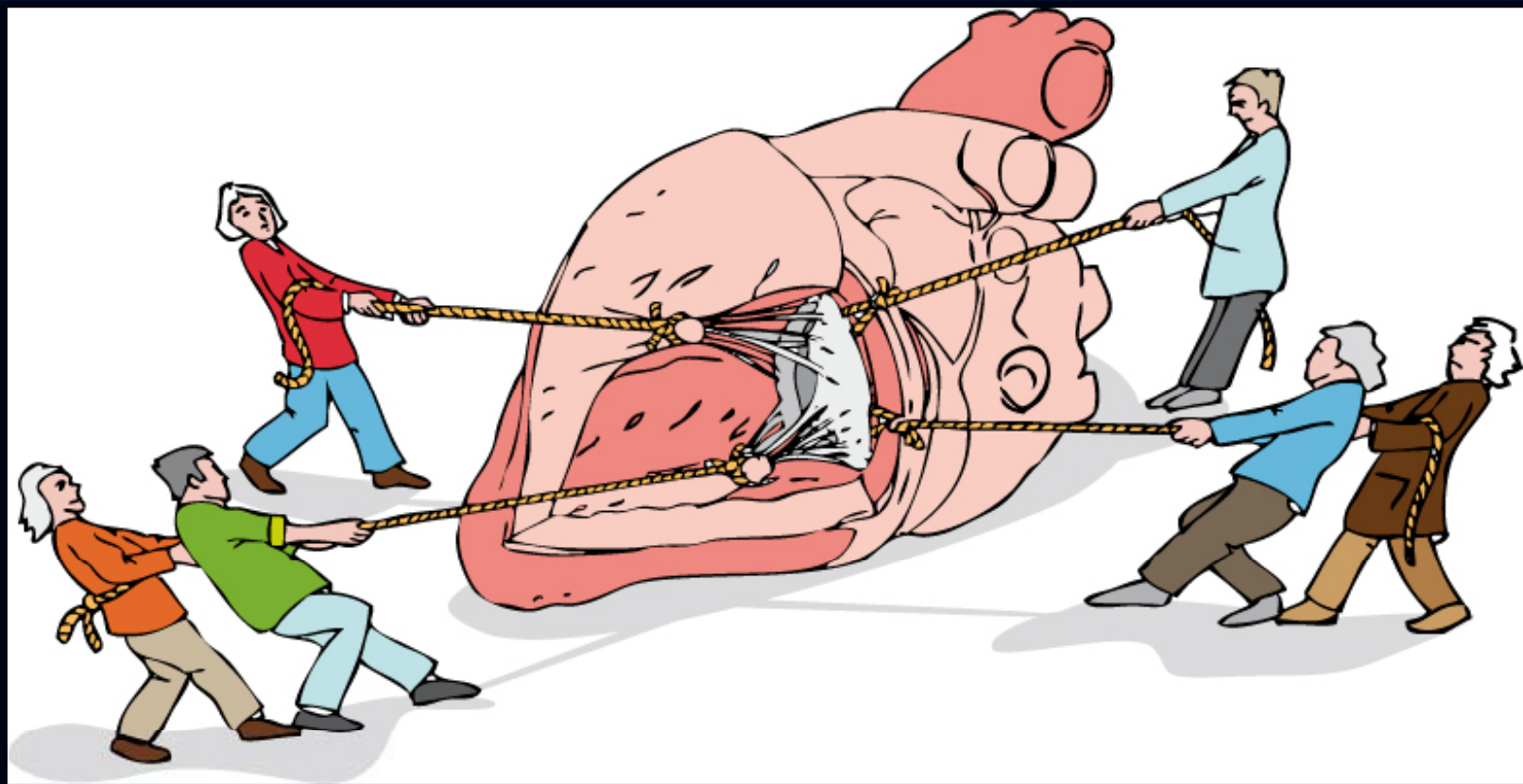
- Peak force @ onset of systolic myocardial contraction

Discussion / Conclusions

- Peak force @ isovolumic contraction
- Anterior papillary muscle force highest due to healthy myocardium (non-ischemic)
- Biomechanical requirements of papillary muscle relocation devices

Clinical Significance

- Solving the left heart “Tug of War”



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Thank You!

