Myocardial work in ventricular preexcitation

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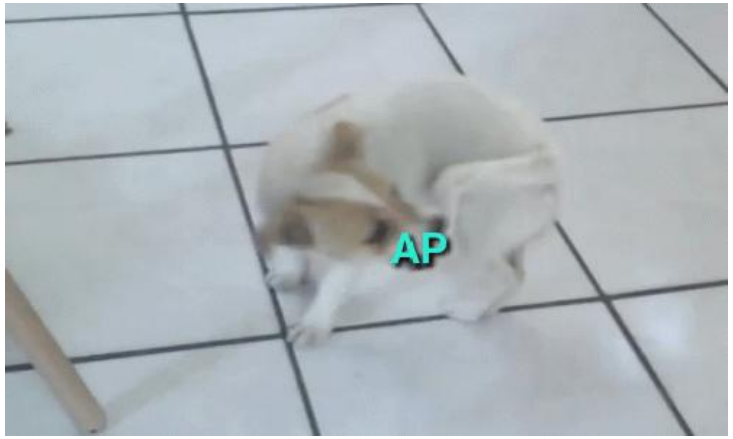
Background and Aim

- Ventricular preexcitation alters electromechanical activation sequence
  - Left ventricular (LV) contractile discoordination
  - Pathologic remodelling in selected cases



- Aim: To evaluate left ventricular myocardial work before and after accessory pathway (AP) ablation in patients with WPW preexcitation and compare them to normal controls

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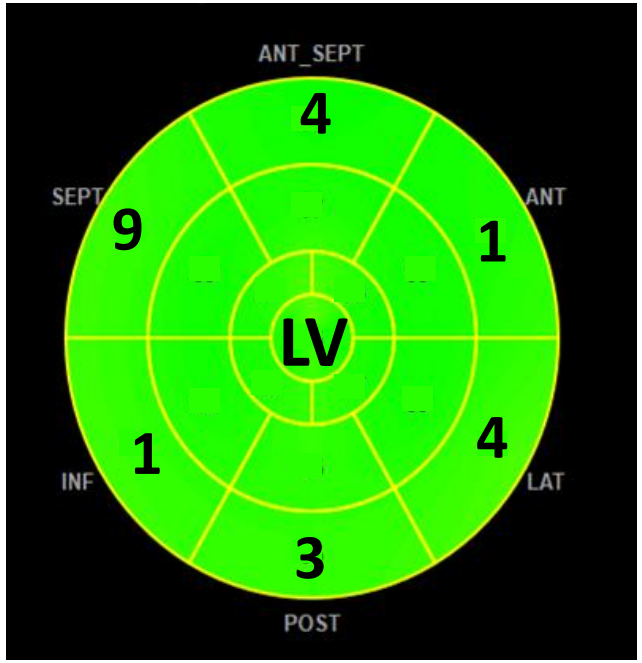
Patients

	WPW patients*	Normal controls	P
N	20	20	
M/F	12/8	13/7	NS
Age [yrs] (median, IQR)	14.0 (11.8-16.3)	15.6 (8.7-17.2)	NS
Weight [kg] (median, IQR)	60.5 (44.0-64.0)	55.5 (32.0-66.0)	NS
QRS duration [ms] (median, IQR)	123 (111-145)	87 (82-93)	**<0.001**
LV EF [%] (mean, SD)	53.8 (6.2)	59.2 (4.9)	**=0.002**
No of APs*	22	-	-
Successful ablation	17/20 pts.	-	-

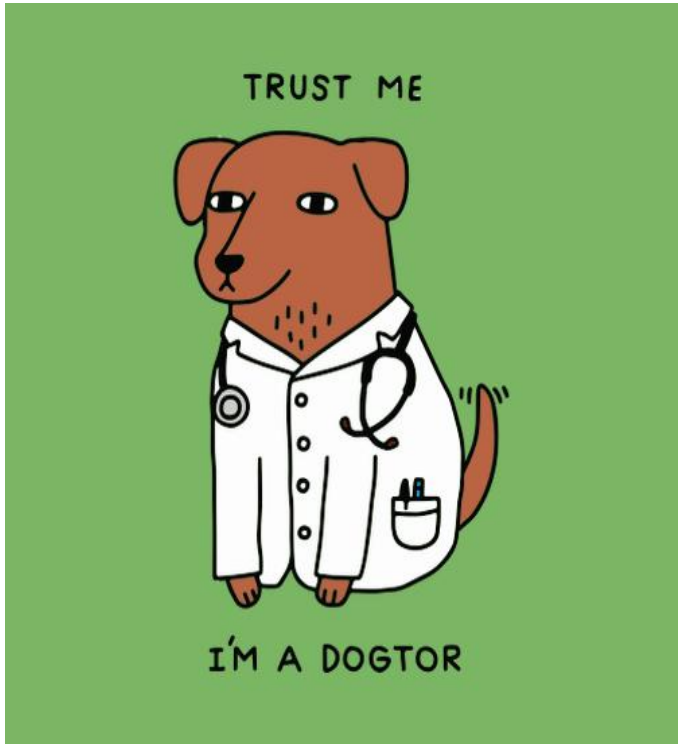
*2 different APs in 2 patients

AP distribution



Methods

- Evaluation before and 24 hours after ablation of AP
- Echocardiography with built-in myocardial work module
  (EchoPAC™ GE Version 204)
  - Calculation of LV global/segmental myocardial work efficiency (MWE) from speckle tracking analysis
  - Standardized myocardial segmentation into 18 LV segments
- Noninvasively acquired blood pressure
- 3D electroanatomical mapping (EnSite Precision™)
  - AP localization
- 12-lead ECG



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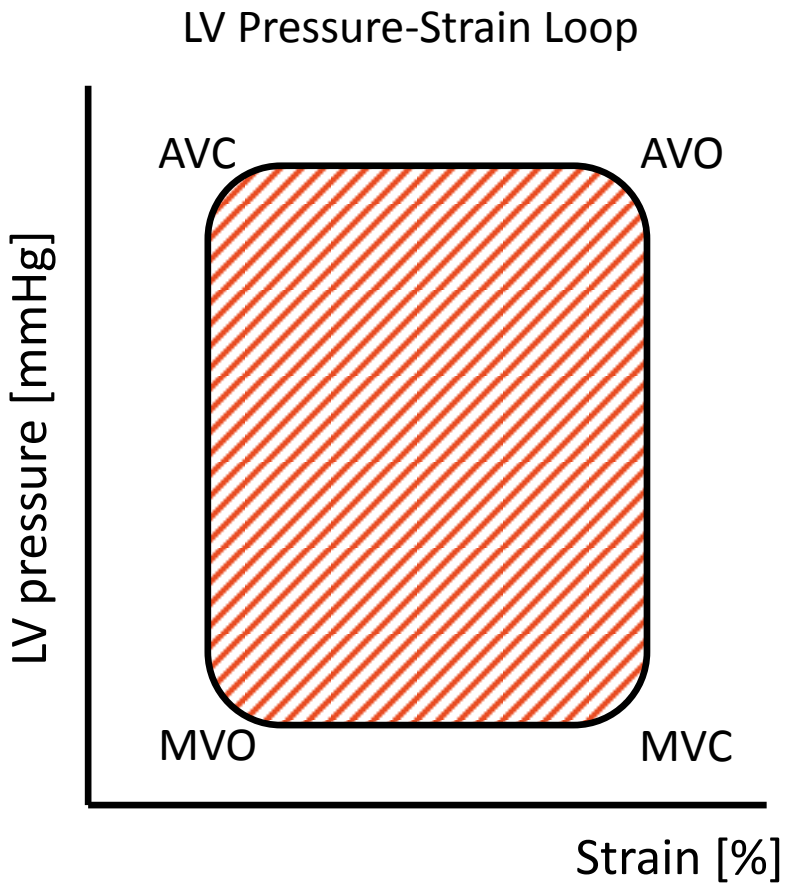
Methods

- **<u>Myocardial work analysis – calculated variables</u>**
  - **global constructive work** *(GCW; %mmHg)*
    - Total work **contributing** to pump function - shortening of the myocytes during systole and lengthening during isovolumic relaxation
  - **global wasted work** *(GWW; %mmHg)*
    - Work that does **not contribute** to ejection - elongation of myocytes during systole and shortening against a closed aortic valve
  - **global work efficiency** *(GWE; %)*
    - GWE = (GCW / [GCW + GWW])*100
  - -> all calculated both globally and segmentally

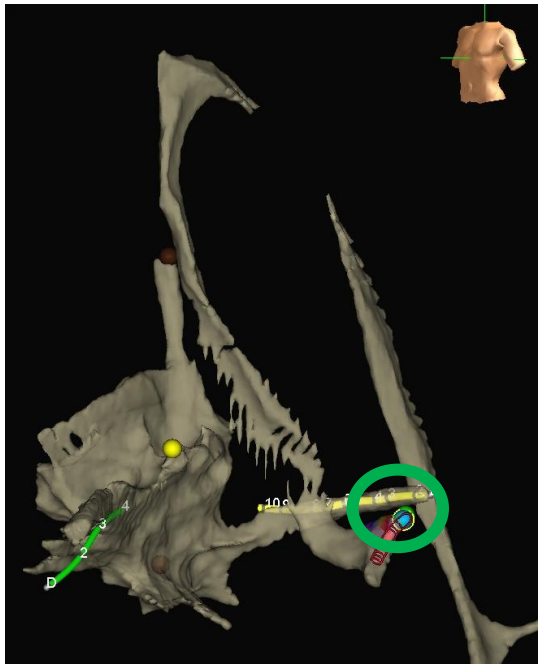


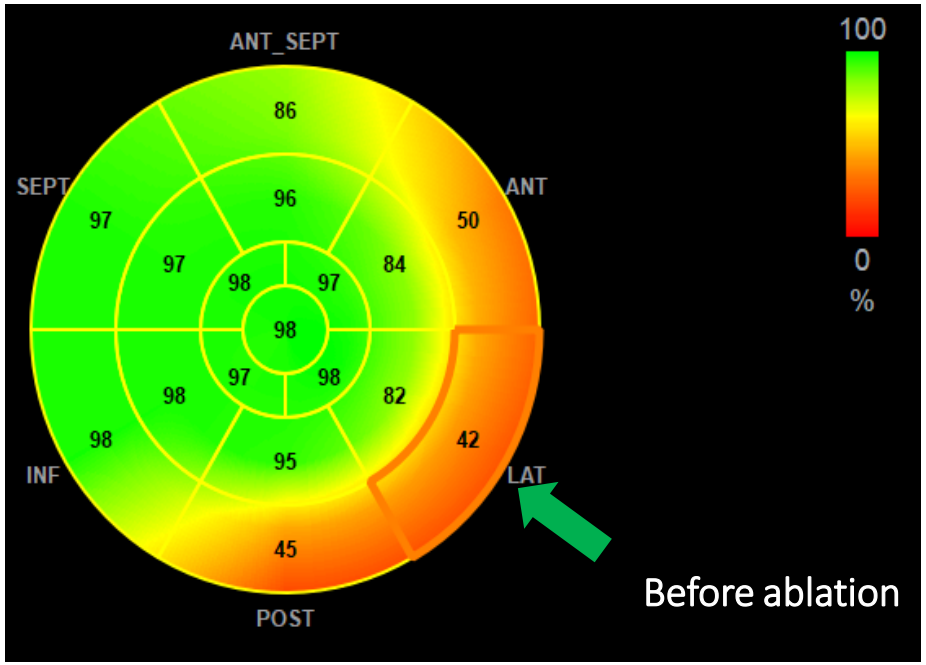
PAPADOPOULOS, Konstantinos, Özge, ÖZDENTOK, Konstantina MITROUSI, Ignatios IKONOMIDIS, 2021. Myocardial Work: Methodology and Clinical Applications. Diagnostics. 11, 573. Available at: https://doi.org/10.3390/diagnostics11030573

Results

- Segmental LV myocardial work efficiency

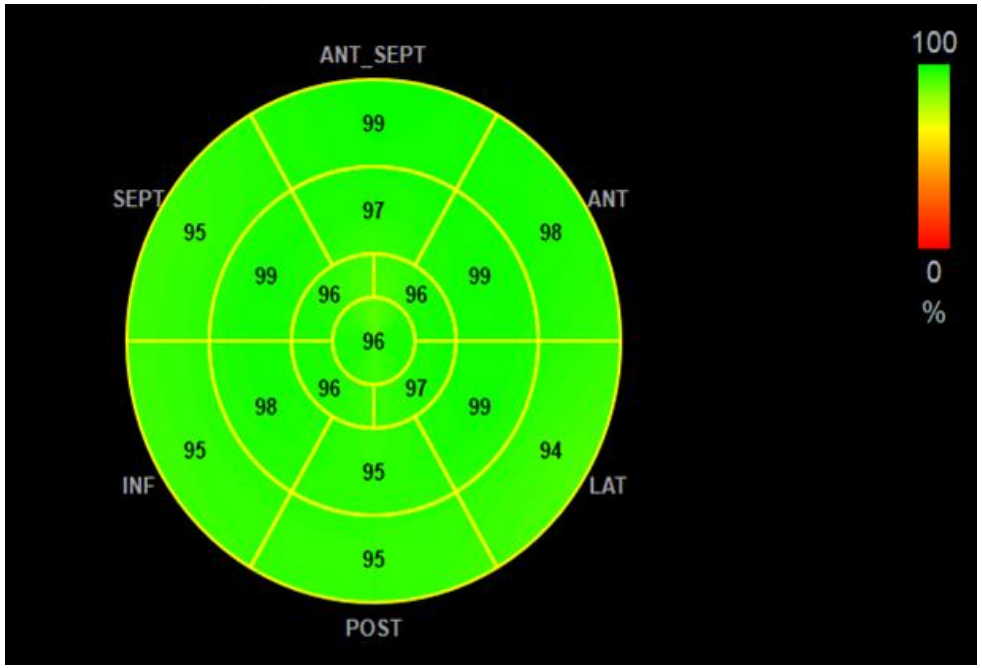
WPW, left lateral AP





Segmental LV myocardial work efficiency

Healthy individual



Segmental LV myocardial work efficiency

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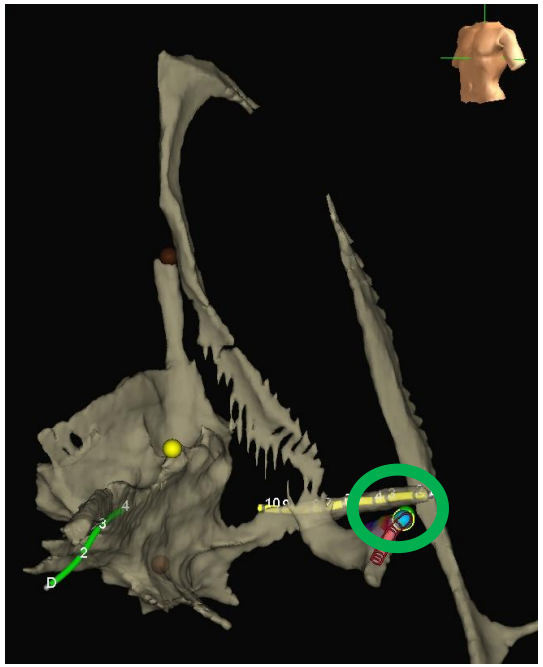

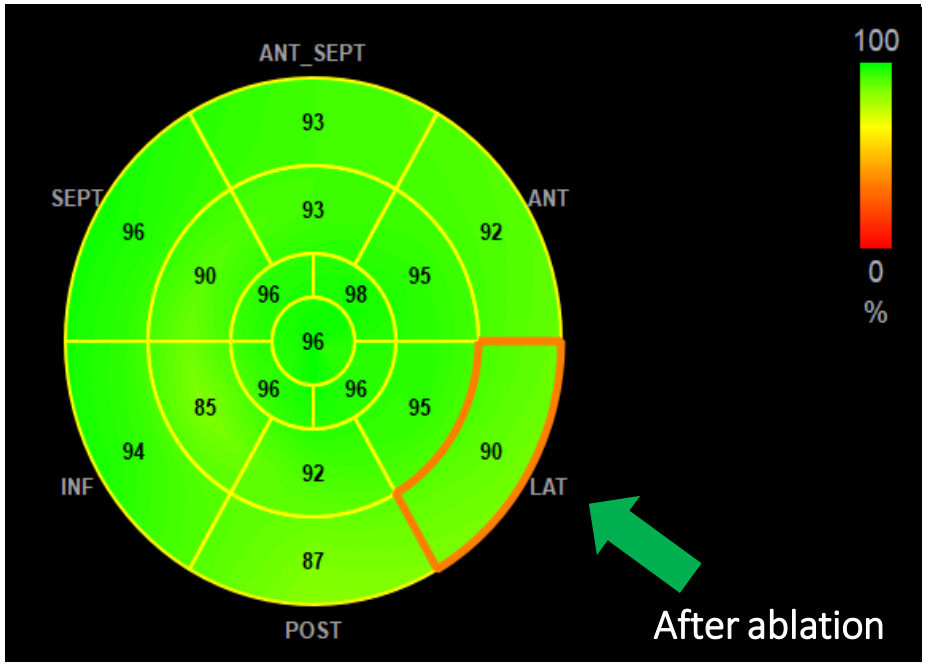

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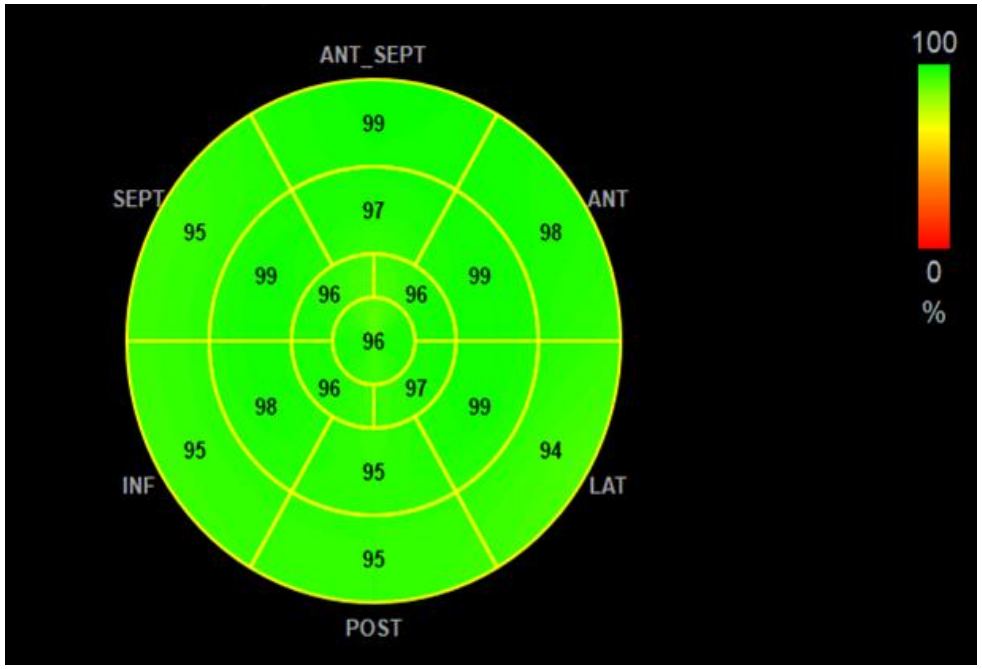

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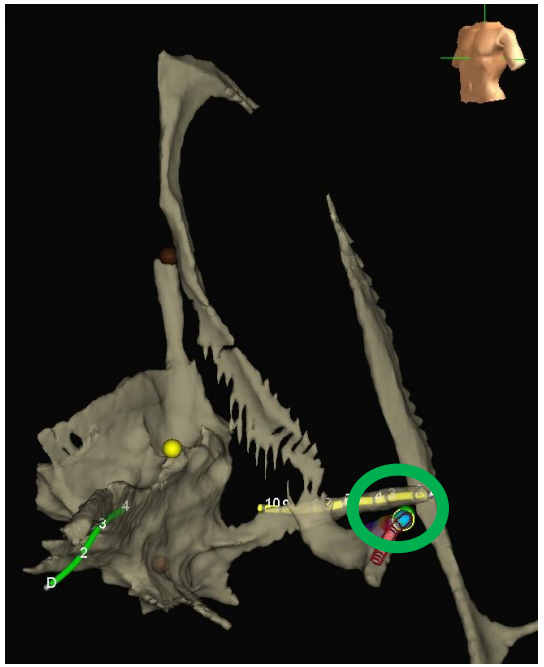

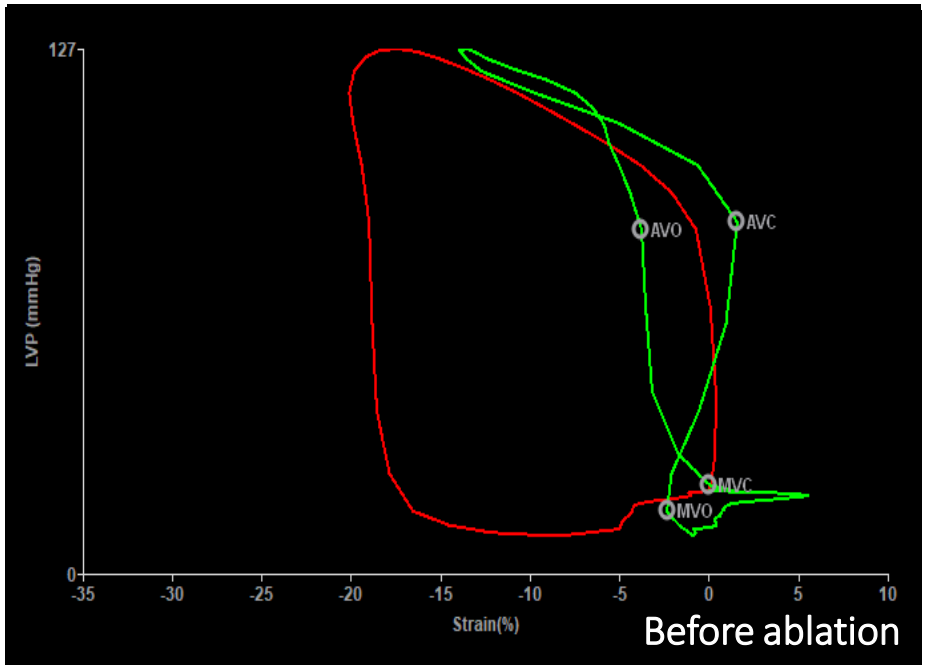

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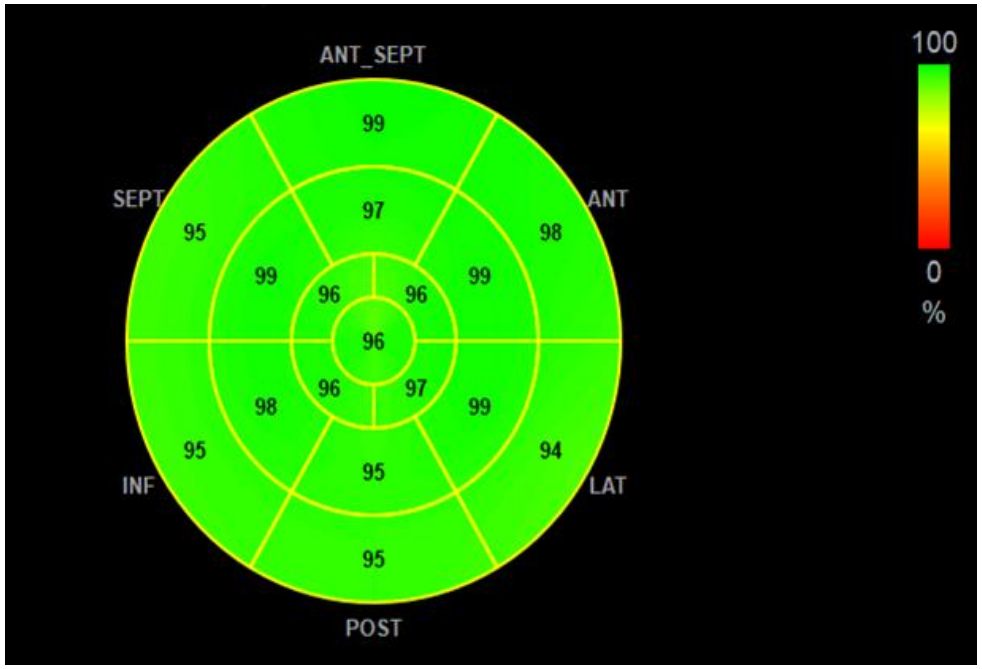
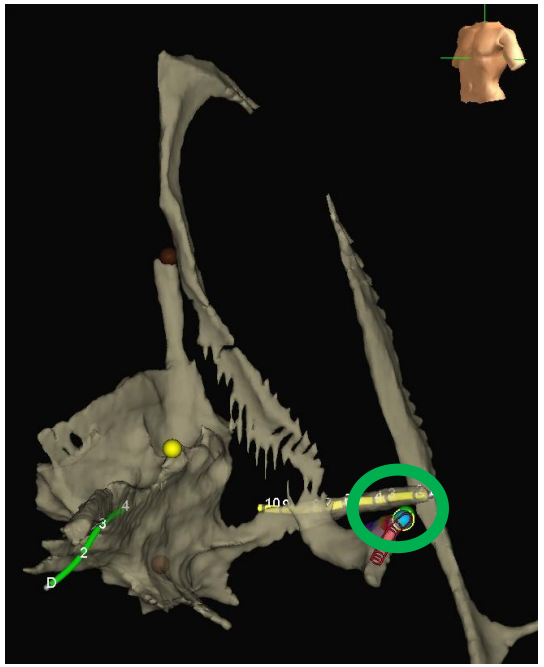


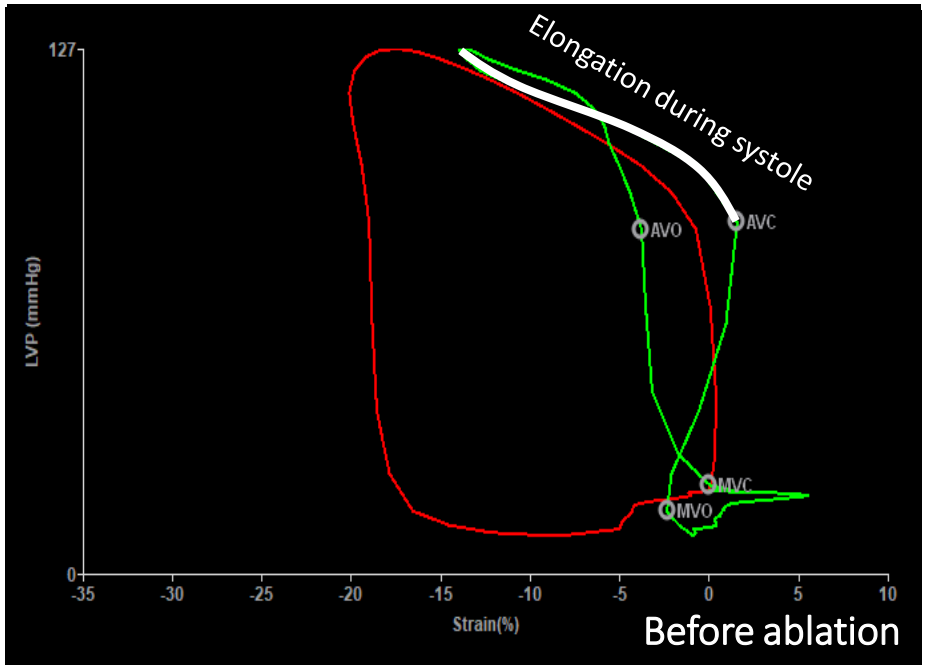
All segments **Segment of choice** **Segmental LV myocardial work efficiency**

Results

- Segmental LV myocardial work efficiency

WPW, left lateral AP





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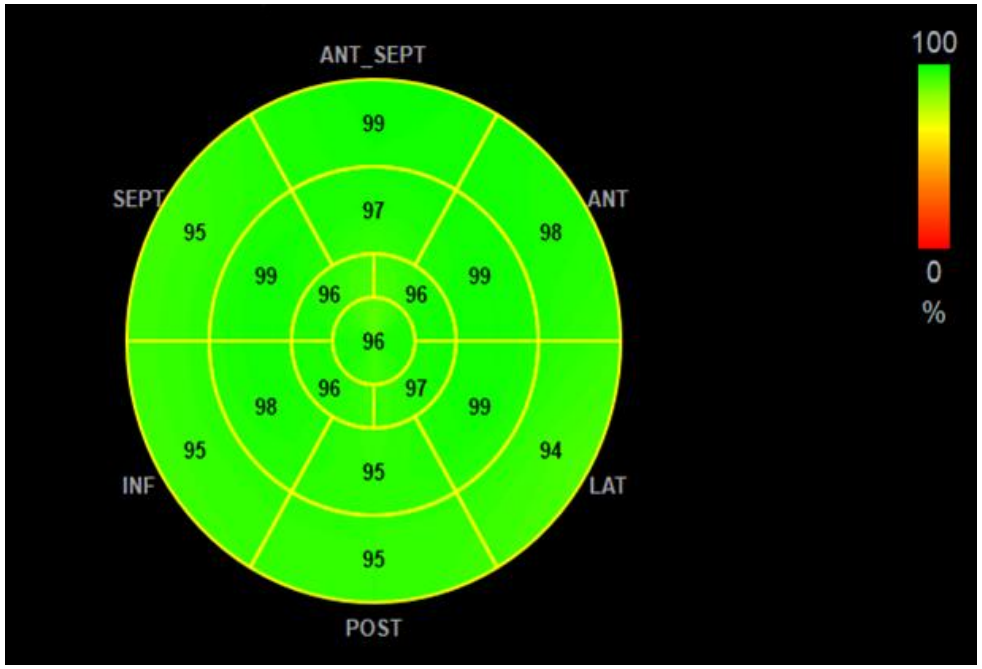

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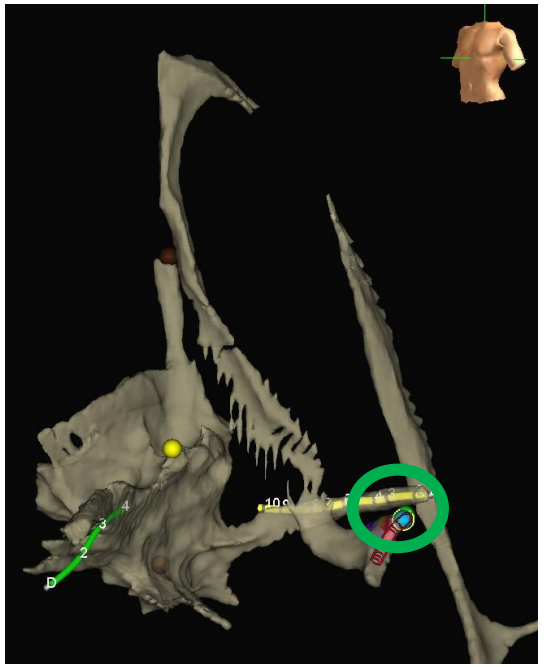

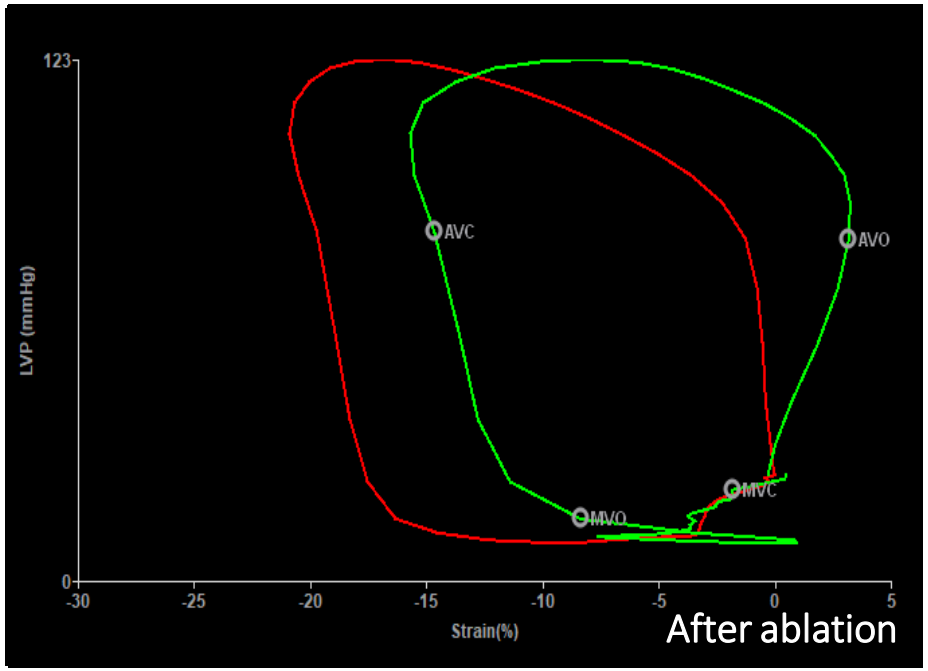

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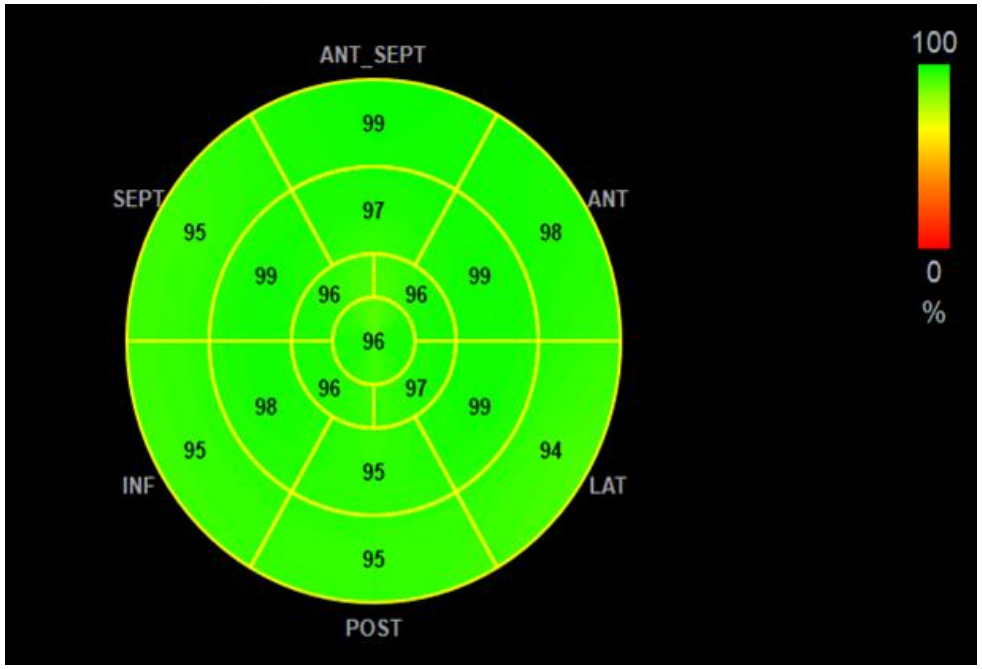

All segments **Segment of choice** **Segmental LV myocardial work efficiency**

Results

- WPW patients vs controls

P = 0.055

P < 0.001

Time to peak segmental strain *(TTP) = the time in which a specific segment of LV myocardium reaches its peak deformation (shortening)*

TTP of preexcited segment **<** **TTP of other segments**

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Results

- WPW patients vs controls

P = 0.055

P < 0.001

Results

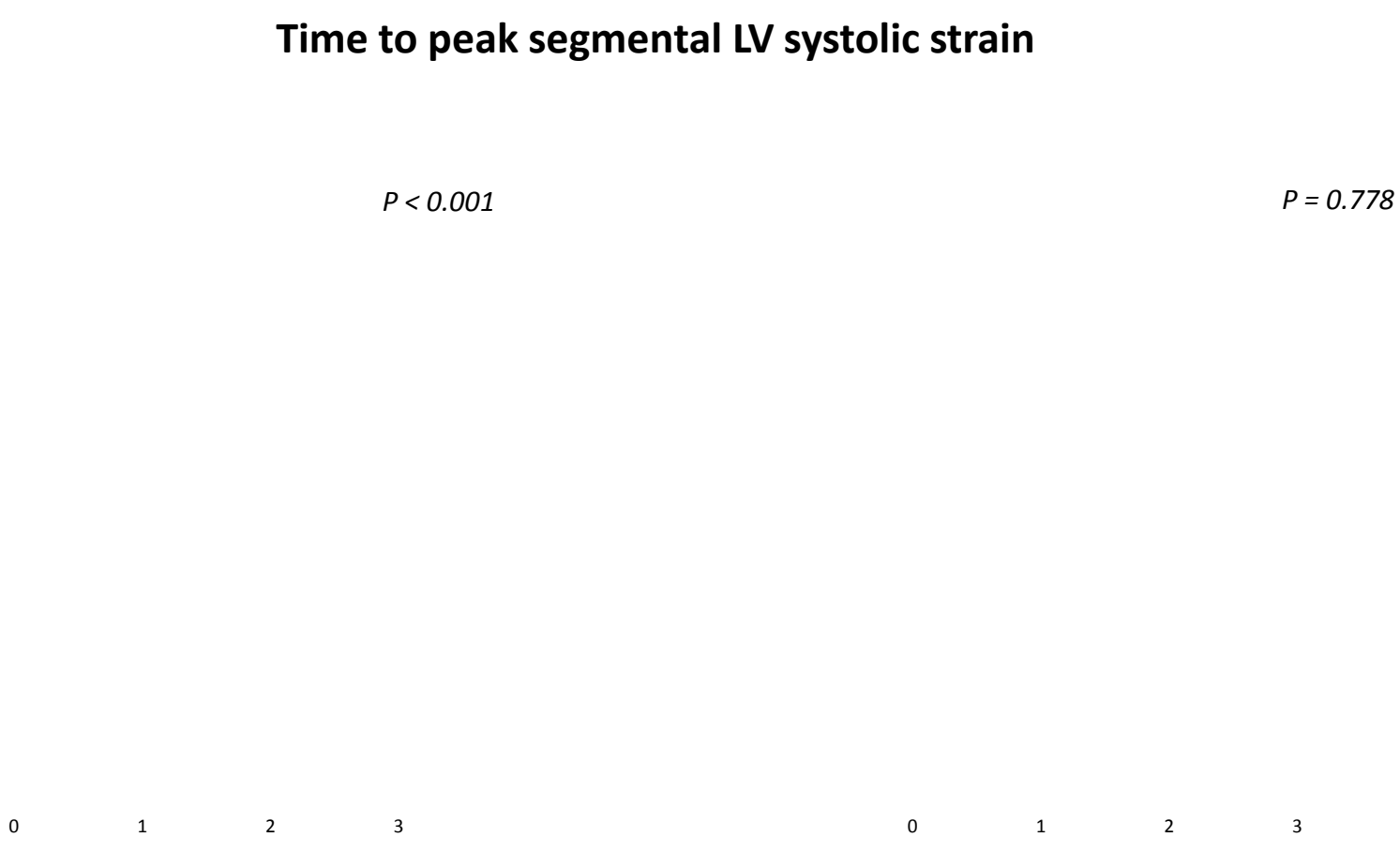
- WPW before and after ablation

P = 0.052

P = 0.101

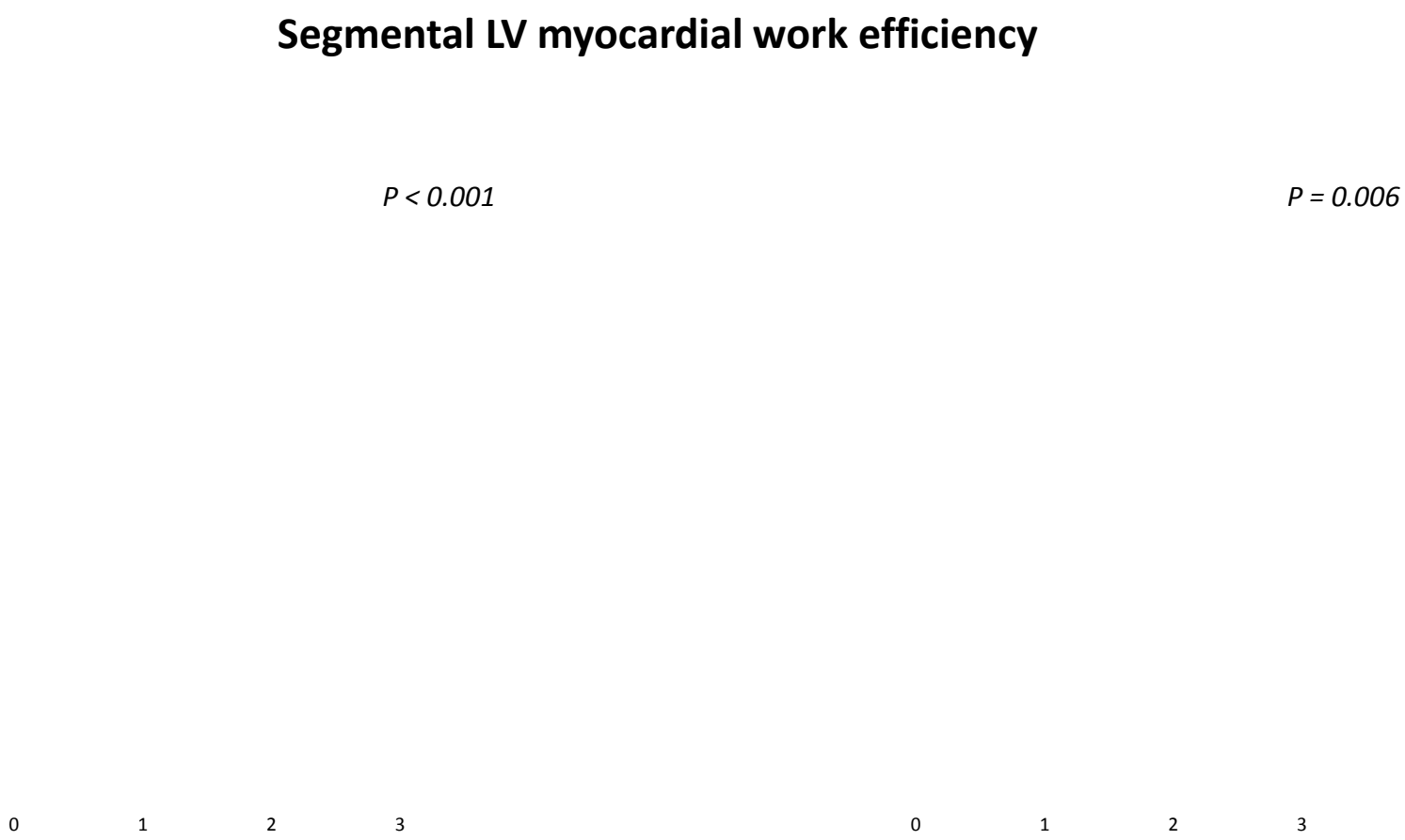
Results

- WPW before and after ablation



Results

- WPW before and after ablation



Results

- Global LV work efficiency

R = 0.467
P = 0.028

R = 0.626
P = 0.002

Conclusions

- Ventricular preexcitation is associated with **mildly decreased LV ejection fraction** due to significant LV contractile discoordination
- Segments adjacent to AP display variable degree of **myocardial work inefficiency**
  - Correlates with the **degree of preexcitation**
  - Significantly **diminished 24 hours after ablation**
    - Longer time needed for complete reverse mechanical remodeling
- The amount of wasted work in asymptomatic preexcitation may be considered
  - When assessing **the potential for pathologic LV remodelling**
  - Discussing the **indication for prophylactic ablation**

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