

# Cardio-Oncology

## 3D and Strain – Basics of the Techniques and Clinical Value

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# Outline

- Screening / diagnosing cardiotoxicity
- 2D versus 3D echocardiography?
- Why go beyond LVEF?
- Myocardial strain techniques
- Myocardial strain application
- Conclusions / Summary

# Diagnosing Cardiotoxicity

## Screening – ASE 2014

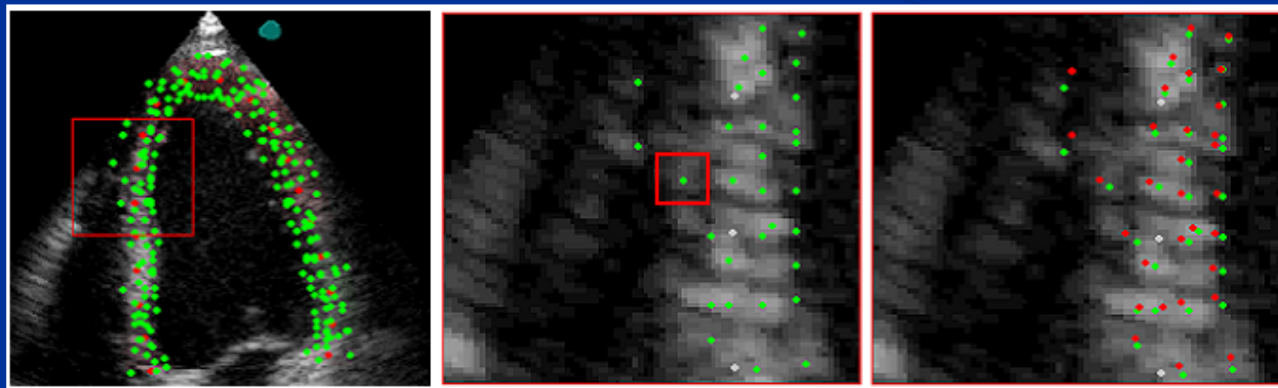
- If not in all, perform baseline in higher risk
  - Established cardiac disease or RFs
  - LV dysfunction history
  - Age >65
  - High dose Type I agent planned ( $>350\text{mg}/\text{m}^2$ )
  - Combination therapy with Type I and II

# Making the diagnosis

- Updated definition (Plana et al JASE 2014)
  - Any change in LVEF by  $>10\%$  to  $<53\%$  by echocardiography
    - Sub-classified as symptomatic or not
    - Reversible or not (return back to 5% of baseline)

# 2D strain by Speckle Tracking

- Speckles
  - Generated by constructive and destructive interference of ultrasound backscattered from structures smaller than the ultrasound wavelength
  - Speckles stable and move with myocardium
  - Blocks of these speckles identified / followed between frames



# Myocardial Strain

Studies/First Author (Ref. #)	Sensitivity	Specificity	PPV	NPV
<b>Fallah-Rad et al. (44)*</b>				
2% absolute (10.1% relative) decrease in LS	79%	82%	60%	92%
0.8% decrease in RS	86%	81%	60%	95%
<b>Sawaya et al. (41)†</b>				
10% decrease in GLS	78%	79%	50%	93%
Elevated hsTnl	67%	82%	50%	90%
10% decrease in GLS and elevated hsTnl	55%	97%	83%	89%
10% decrease in GLS or elevated hsTnl	89%	65%	40%	97%
<b>Sawaya et al. (40)†</b>				
GLS <19%	74%	73%	53%	87%
hsTnl >30 pg/ml	48%	73%	44%	77%
LS <19% and usTnl >30 pg/ml	35%	93%	67%	77%
LS <19% or usTnl >30 pg/ml	87%	53%	43%	91%
<b>Negishi et al. (42)‡</b>				
11% reduction in global GLS	65%	95%	—	—
3.6% reduction in global GLSR early diastole	82%	67%	—	—
6.4% reduction in global GLSR	73%	67%	—	—
Absolute GLS at 6 months <-20.5%	96%	66%	—	—
<b>Mornos et al. (39)§</b>				
71° × ° reduction in GLS × LV twist	90%	82%	—	—
2.77% absolute (~13% relative) reduction in GLS	79%	73%	—	—
1.75° absolute reduction in apical rotation	70%	78%	—	—
<b>Baratta et al. (37)  </b>				
≥15% decrease in GLS	86%	86%	—	—
≥10% decrease in GRS	86%	69%	—	—
≥15% decrease in GLS AND ≥10% decrease in GRS	71%	97%	—	—