

Cancer Treatment and the Heart – Cardio-Oncology

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Oncology

- Dramatic advances in both the diagnosis & treatment of cancers have occurred in our lifetime
- These advances ➡ have led to improved survivorship

Advances in Cancer Care

- U.S. National Cancer Institute estimates
 - 13.7 Million cancer survivors alive in 2012
 - This number will approach 18 Million by 2022
- 67% of adults diagnosed with cancer today will be alive in 5 years
- 75% of children diagnosed with cancer will be alive in 10 years

Cardio-Oncology

- With improved survivorship has come a startling fact:
 - After surviving cancer, patients are more likely to die of Heart Disease than recurrence of Cancer
- This has led to increasing awareness of potential damaging Cardiac effects associated with cancer therapies as well as development of traditional risk factor for CAD
- Renewed Emphasis on ways to diagnose and prevent these occurrences

Cancer and the Heart

- ▶ Cancer chemotherapy & radiation therapy can cause short & long-term cardiovascular complications
- ▶ The Cardiovascular complications from cancer chemotherapy & radiotherapy may become one of the chief threats to the cancer patient's survival



Cancer and the Heart

► Chemotherapy-induced cardiotoxicity is seen with:

- Anthracycline compounds (doxorubicin)
- Trastuzumab – Herceptin



► Radiation Therapy can damage Hearts Valves

Coronary arteries
Pericardium



Women – Very Special to me



Chemotherapy and The Heart – Value of Echocardiography

Can detect changes in global left ventricular function (LVEF & longitudinal strain); hence, can be used:

- Prior to instituting therapy
- For surveillance
- For detecting previously undiagnosed late onset cardiac problems

Cardiovascular Effects of Chemotherapy - Anthrocycline

- Anthrocycline – Doxorubicin – Commonly used to treat Leukemia, Lymphoma, cancers of the breast, uterus, ovary, and lung
- Can damage heart muscle
- The effects don't show up for years after therapy
- Potential toxicity associated with cumulative dose
- Patients develop ↓ in LV function (↓ in LVEF)
- Prominent once dose reaches 200 mg/m^2 – especially once dose reaches 650 mg/m^2 (when nearly 50% of the pts will develop CHF)

Trastuzumab - Herceptin

- 5-year survival in early Breast Cancer is currently about 98%
- Survival has improved dramatically in the last 30 years
- Trastuzumab (Herceptin) in HERS-2 + pts associated with 50% lower rates of recurrence & 30% improvement in survival

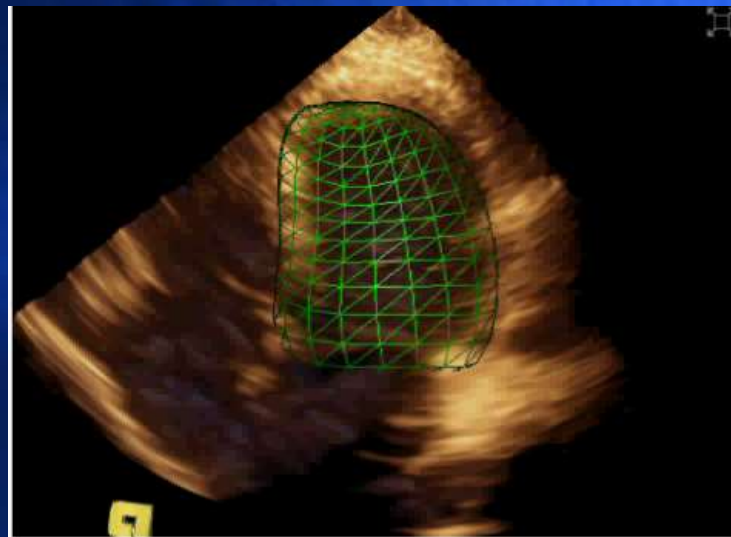
Trastuzumab - Herceptin

- Trastuzumab (Herceptin)
 - Antibody beneficial in patients with HERS-2 (Human Epidermal Growth Factor Receptor 2)
 - Prevents HERS-2 from interacting with HERS-4 Receptor
 - Can have toxic effect on the heart, but effects are not dose dependent and are reversible

Herceptin

- Surveillance & early detection of myocardial damage is critical
- Echocardiography is of value to:
 - Assess global left and right ventricular function and changes over time
 - Assess left ventricular longitudinal strain & changes over time
- Biomarkers, such as Troponin & MPO are of benefit

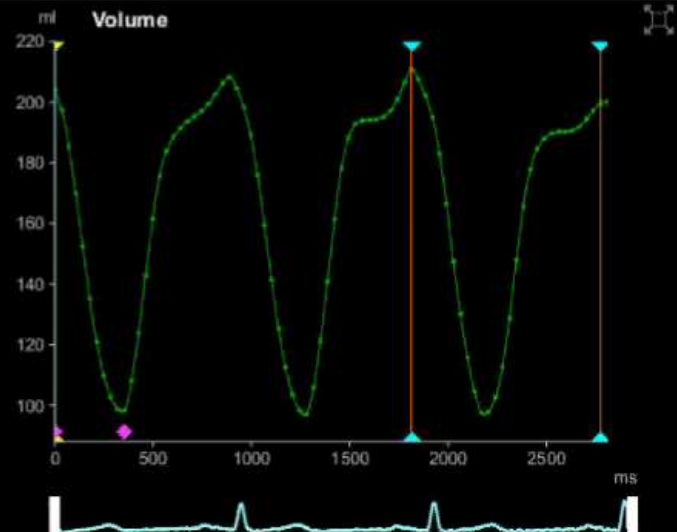
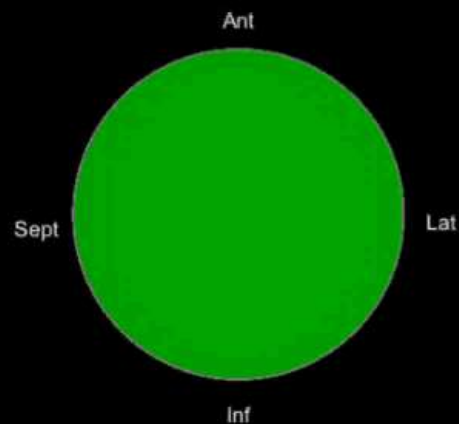
DB—LVEF=54%

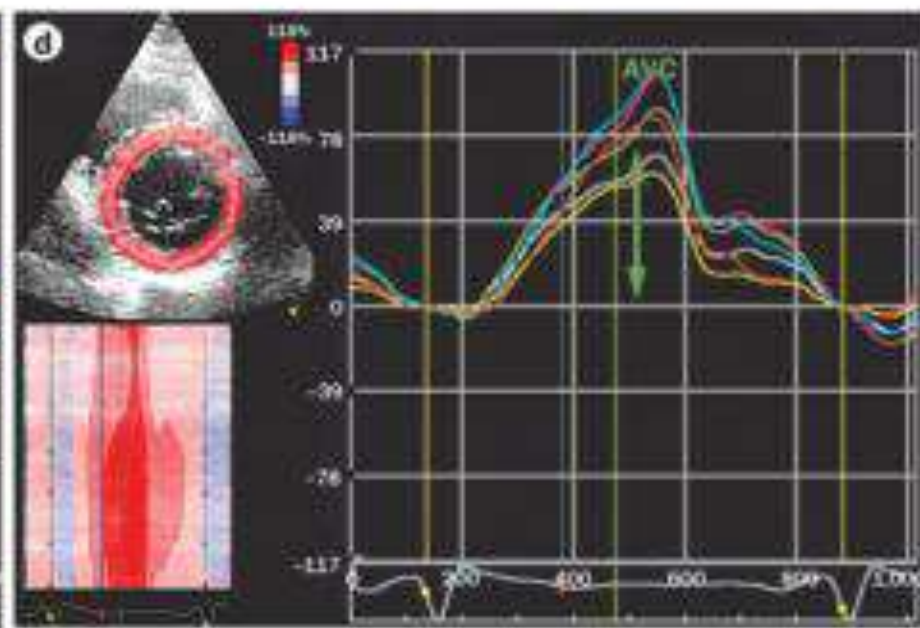
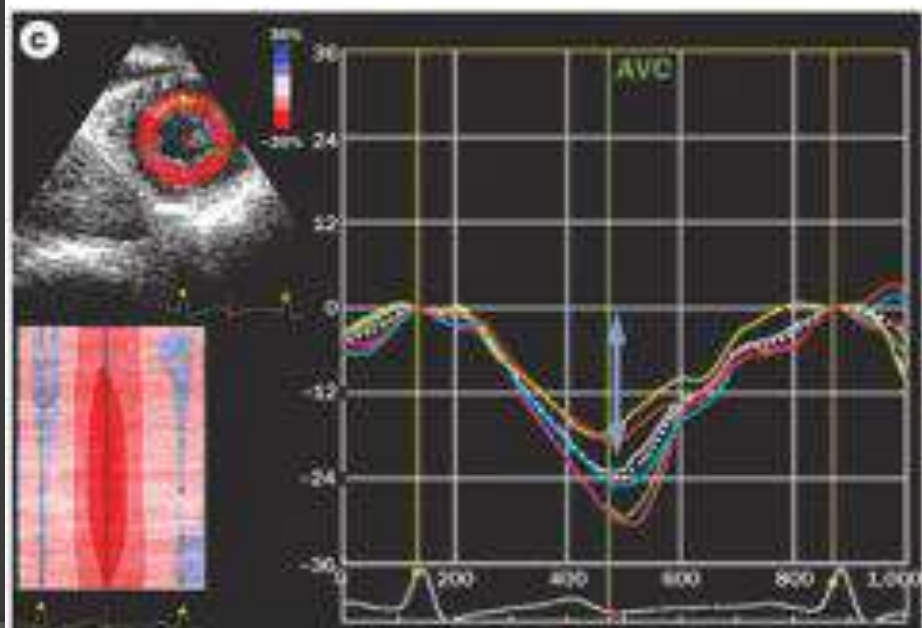
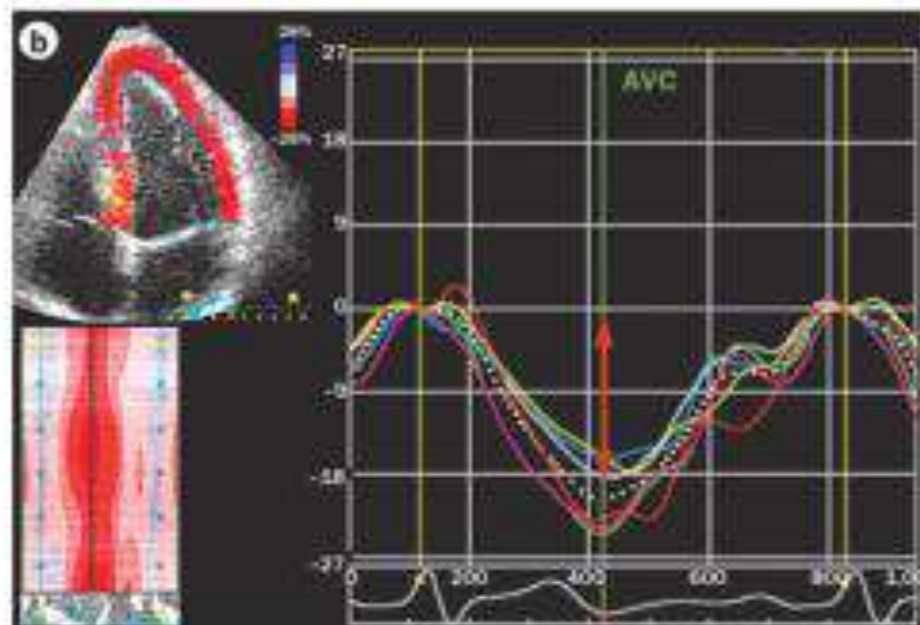
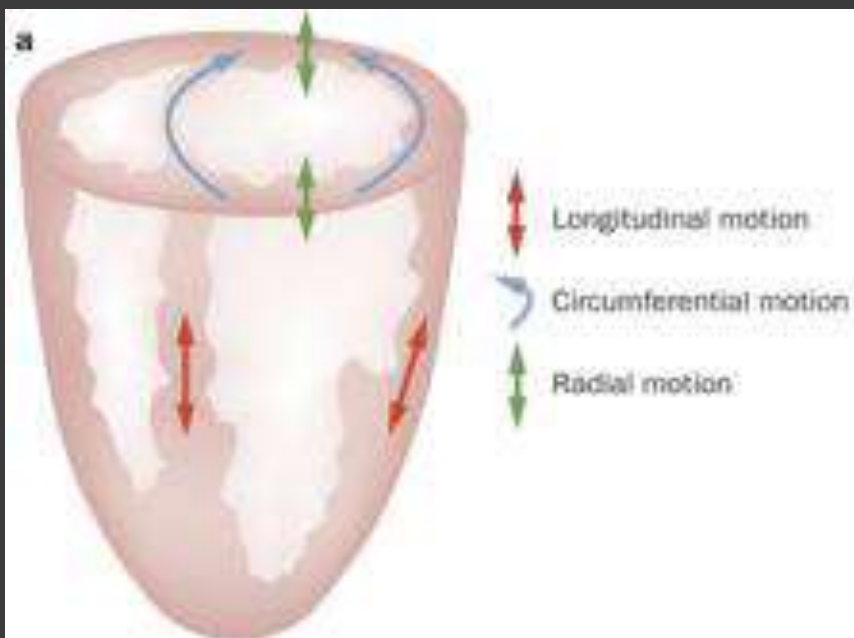


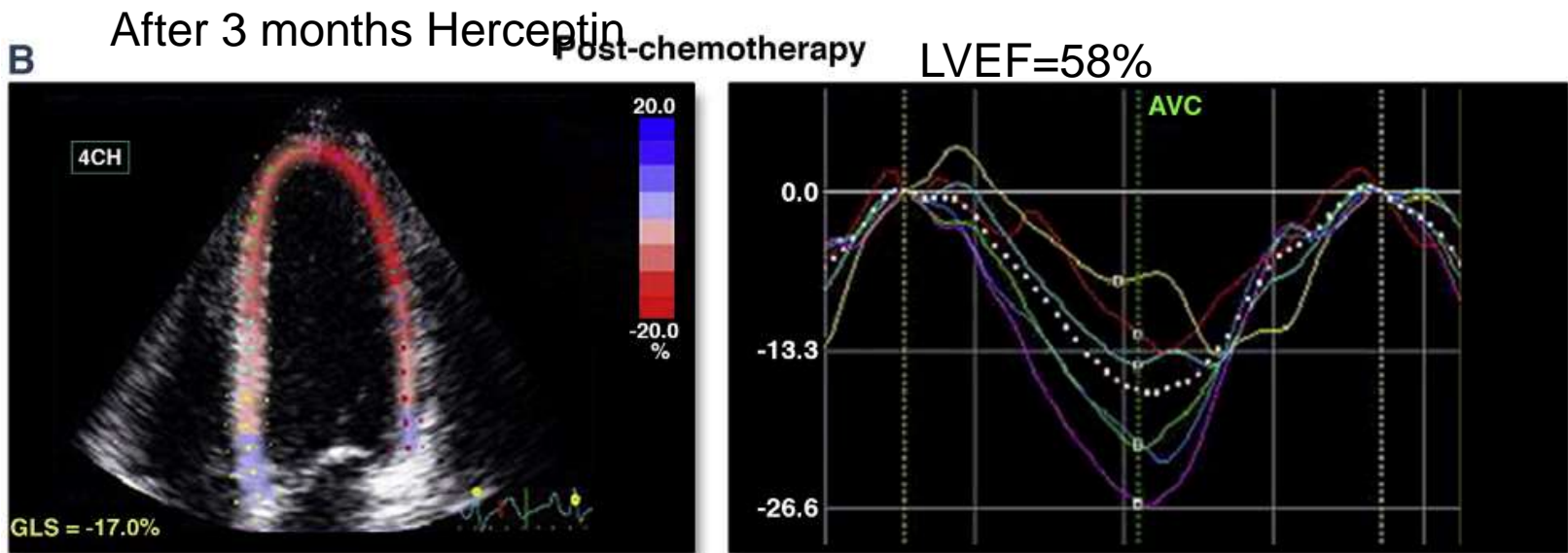
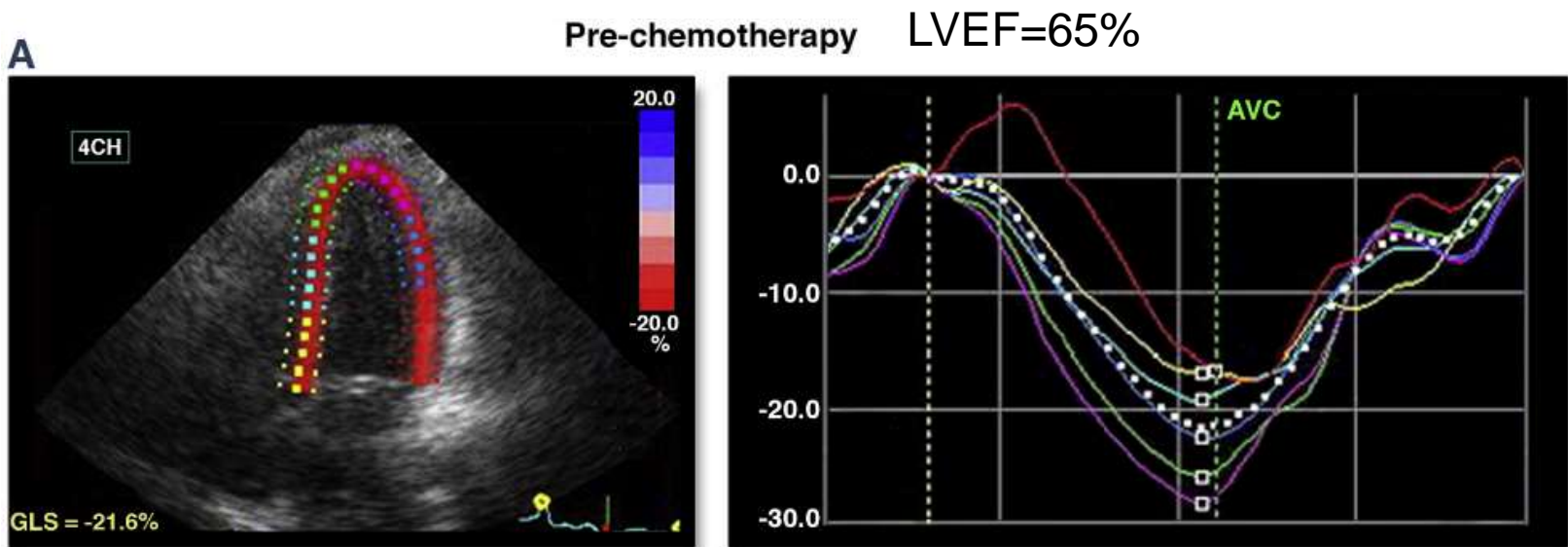
Beat : 3 / 3

EF	53.75 %
EDV	210.78 ml
ESV	97.49 ml
SV	113.29 ml

Global Model







From: Noninvasive Imaging of Cardiovascular Injury Related to the Treatment of Cancer

J Am Coll Cardiol Img. 2014;7(8):824-838. doi:10.1016/j.jcmg.2014.06.007

Case study

Patient is a 47 y/o female diagnosed with stage IIa (pT2, pN0, M0) Triple + grade III infiltrating ductal CA of right breast in March of 2013.

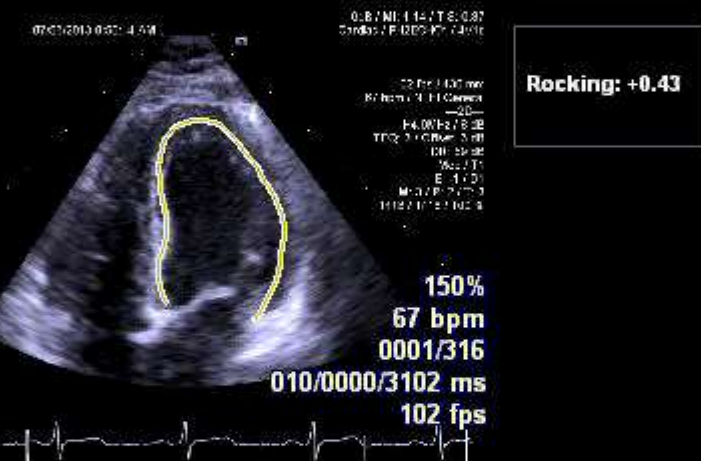
Her treatment will be adjuvant TCH chemotherapy followed by radiation

Taxotere

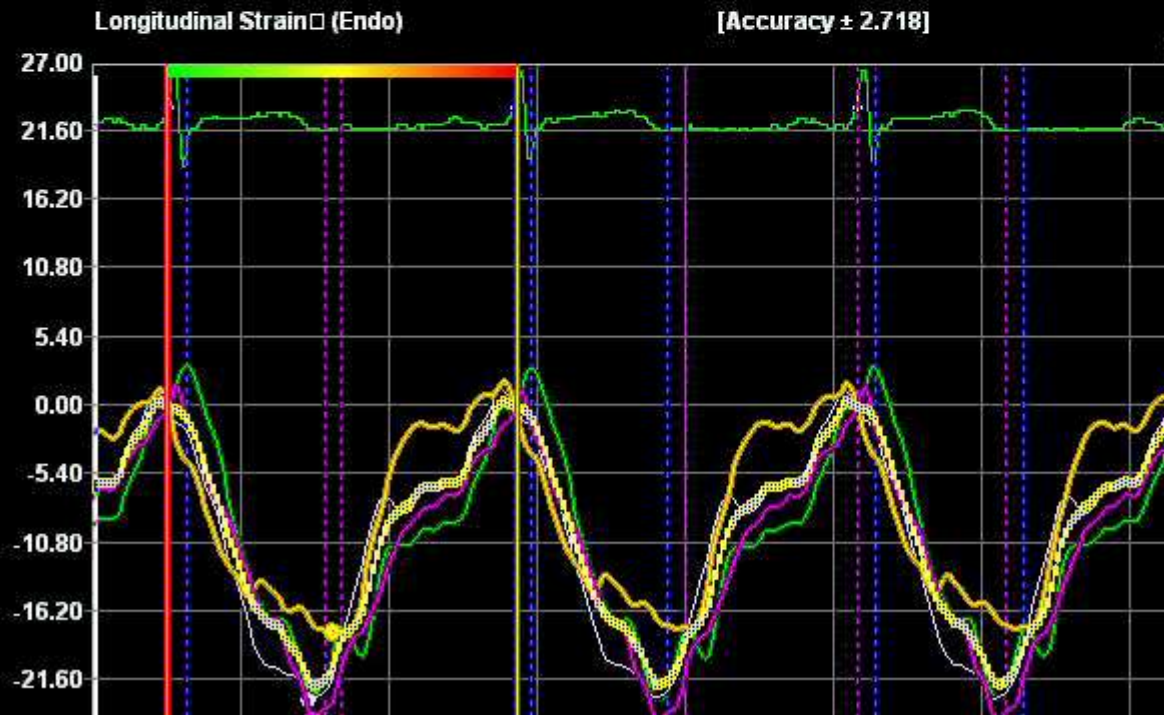
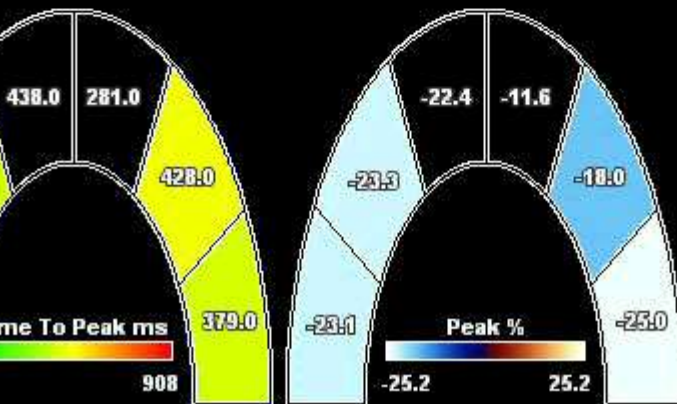
Carboplatinum

Herceptin

LVEF=65%
GLS=-22.18%

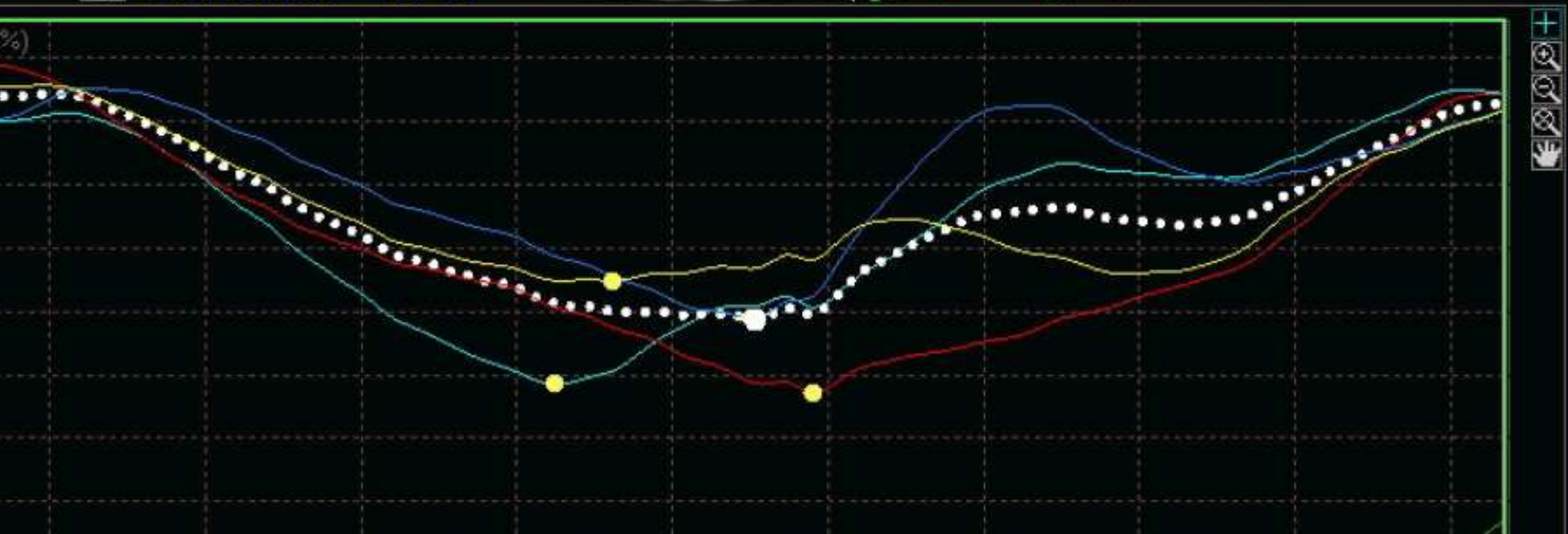
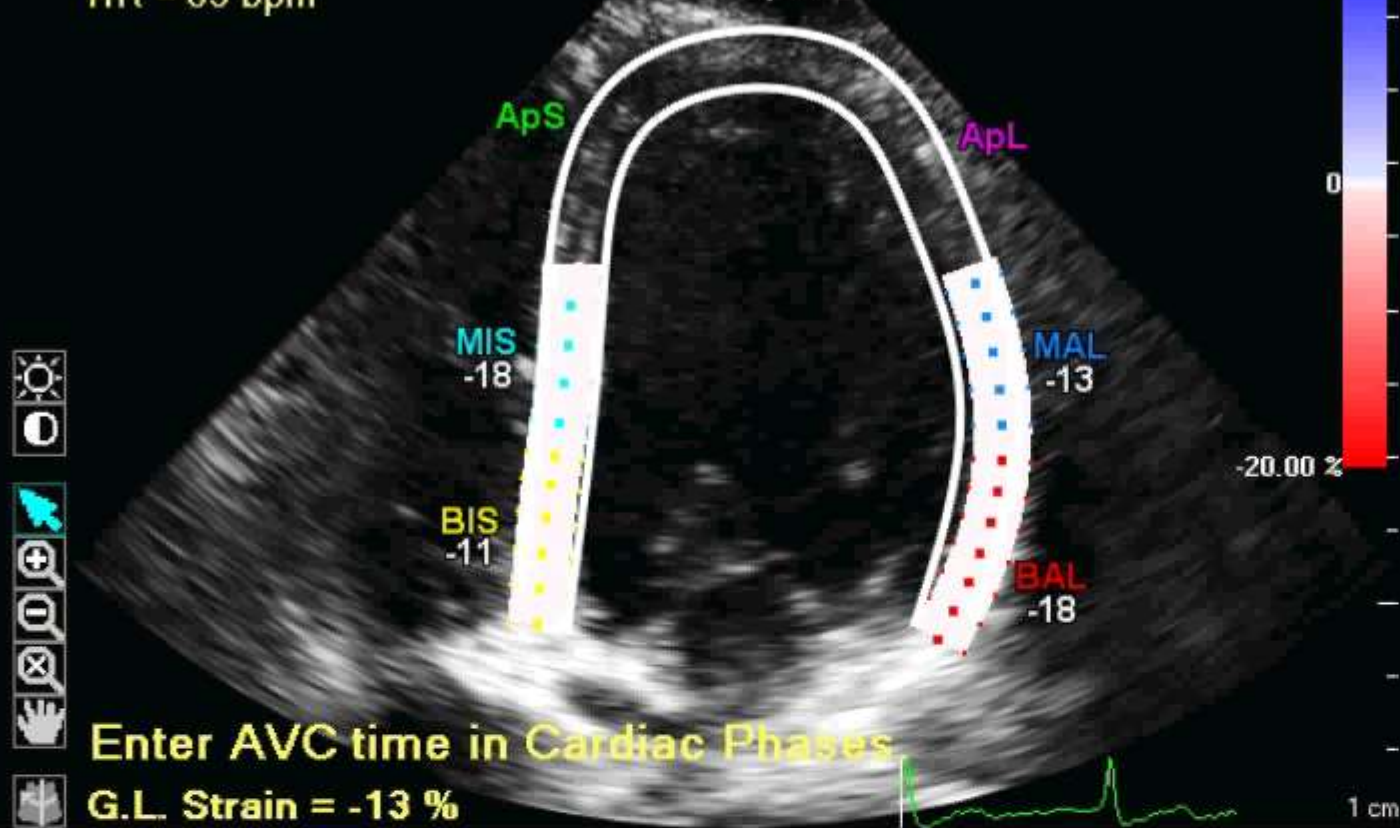


Wall Delay 59.0 ms Global Peak -22.18 %

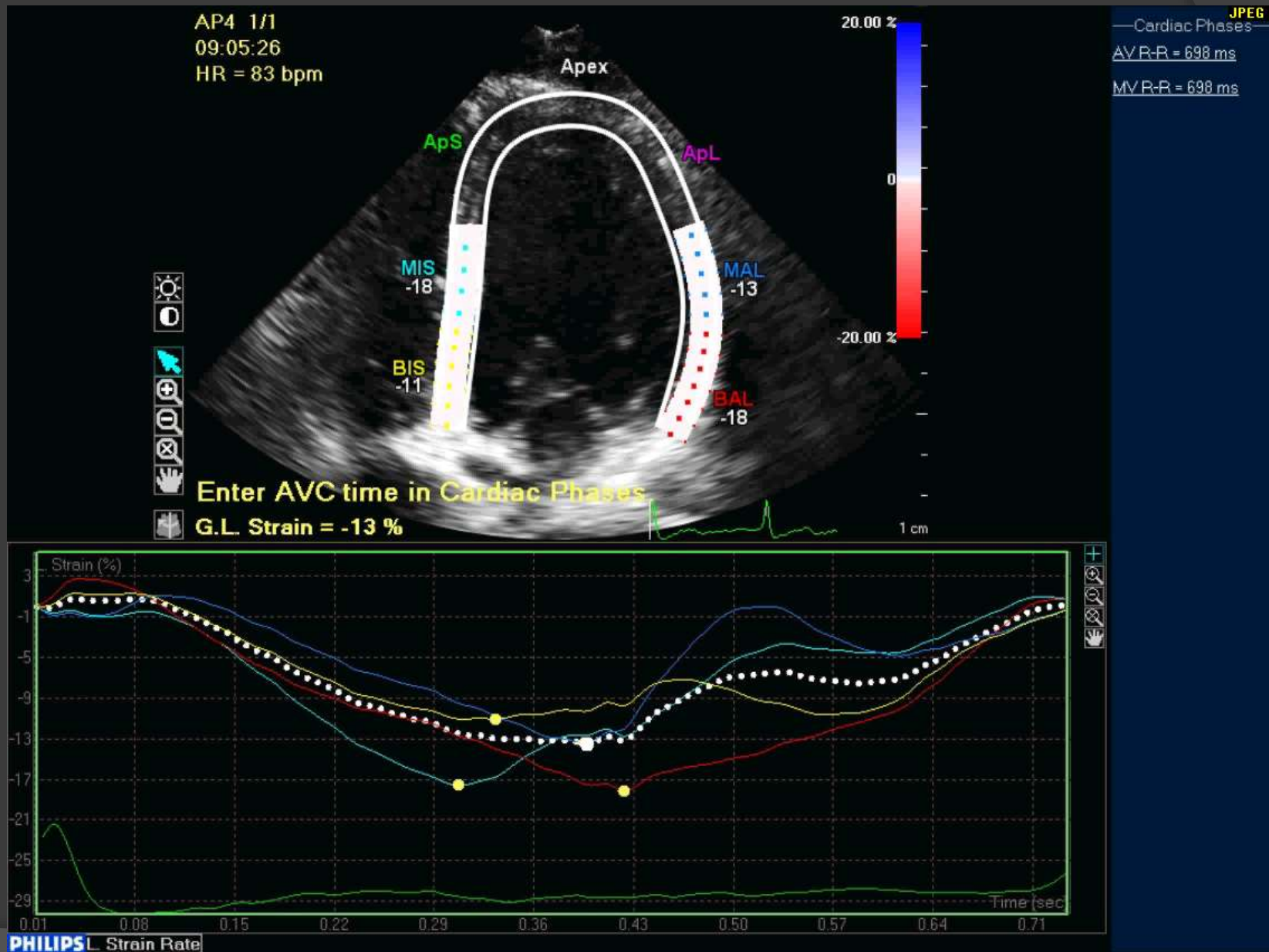


Taxotere and Carboplatinum(Q 3 weeks for 6 cycles)

Herceptin (Q week, and after 3 months the dose increases)



3 Months of Herceptin-LVEF=48% and GLS=-13%



Radiation Therapy



Radiation-Induced Heart Disease

- Most common in Lymphoma & Breast Carcinoma
 - Less common with modern cardiac shielding
- Cumulative dose
- Potentiated by simultaneous chemotherapy

Radiation-Induced Heart Disease

- Can affect the pericardium – causing constriction
- Can affect valves – leading to a Valvulopathy
- Can affect the coronary arteries – seen especially in left-sided Breast Cancer radiation
 - Increasing dose of radiation ↑ risk of coronary events in women undergoing radiation for Breast Cancer

- 59-year-old female
- With increasing DOE
- Mediastinal radiation for Hodgkin's
in 1975

TTE 2011

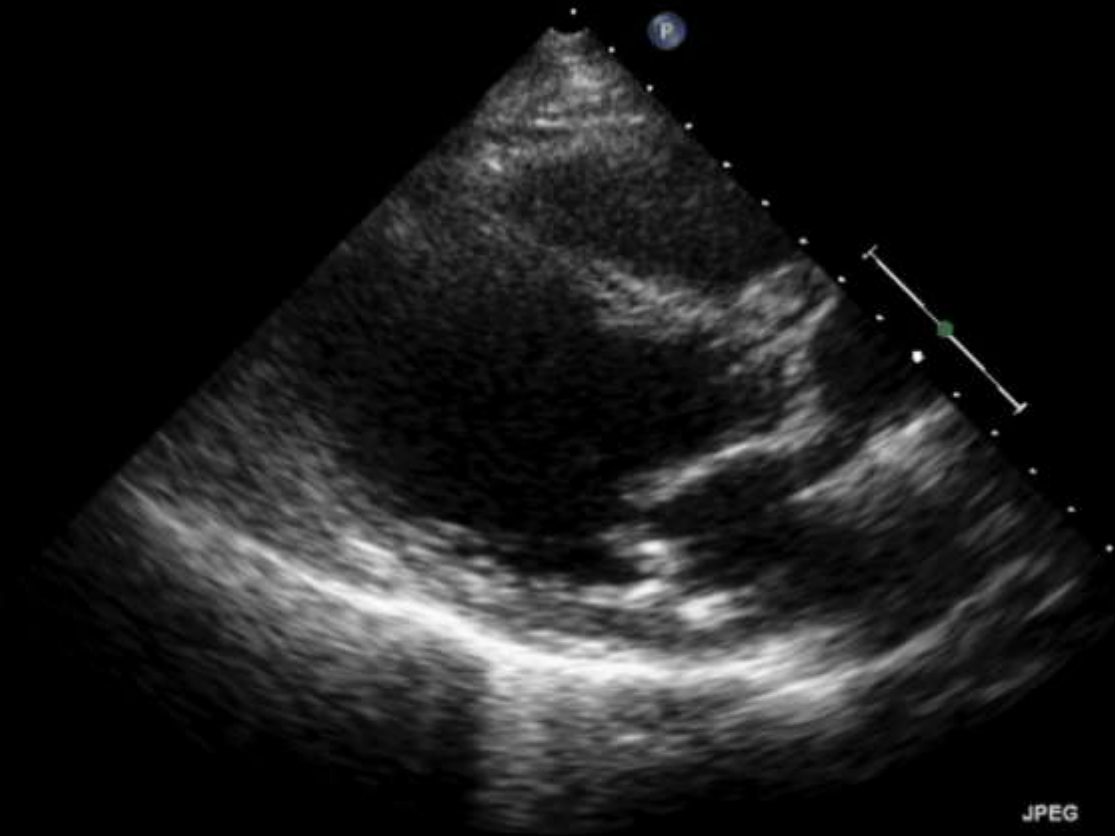
2012 10:26:22AM TIS0.8 MI 1.4
S5-1/Adult

JPE

FR 50Hz
15cm

M3

2D
54%
C 50
P Low
HGen



JPEG

76 bpm

10

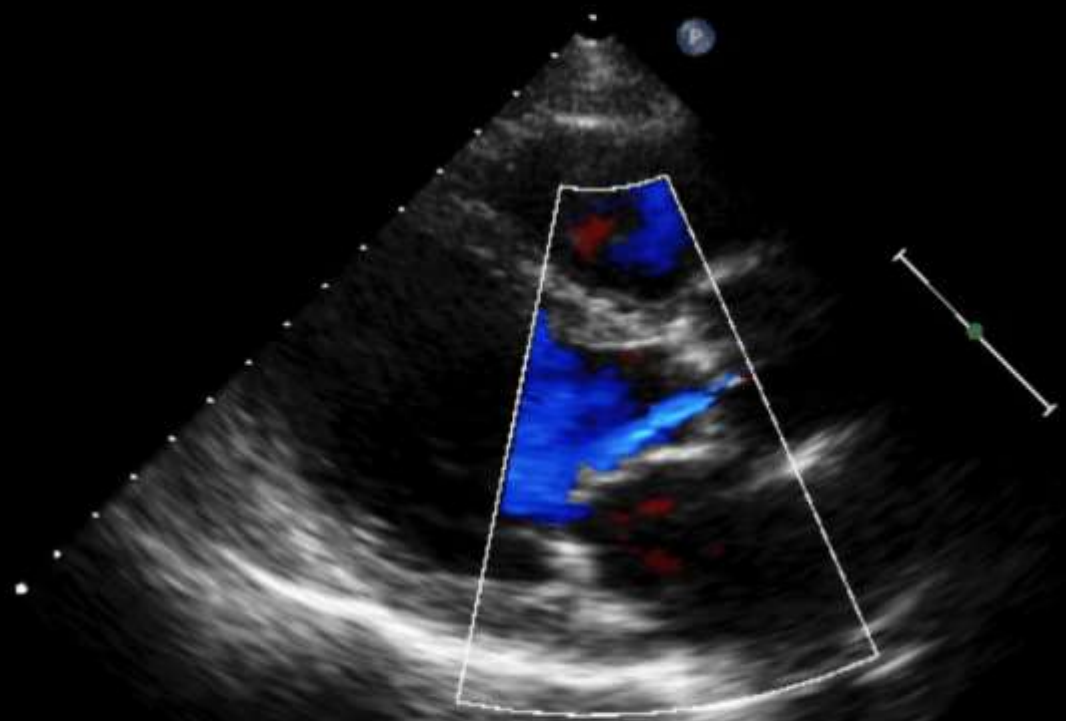
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S5-1/Adult

JPE

FR 16Hz
15cm

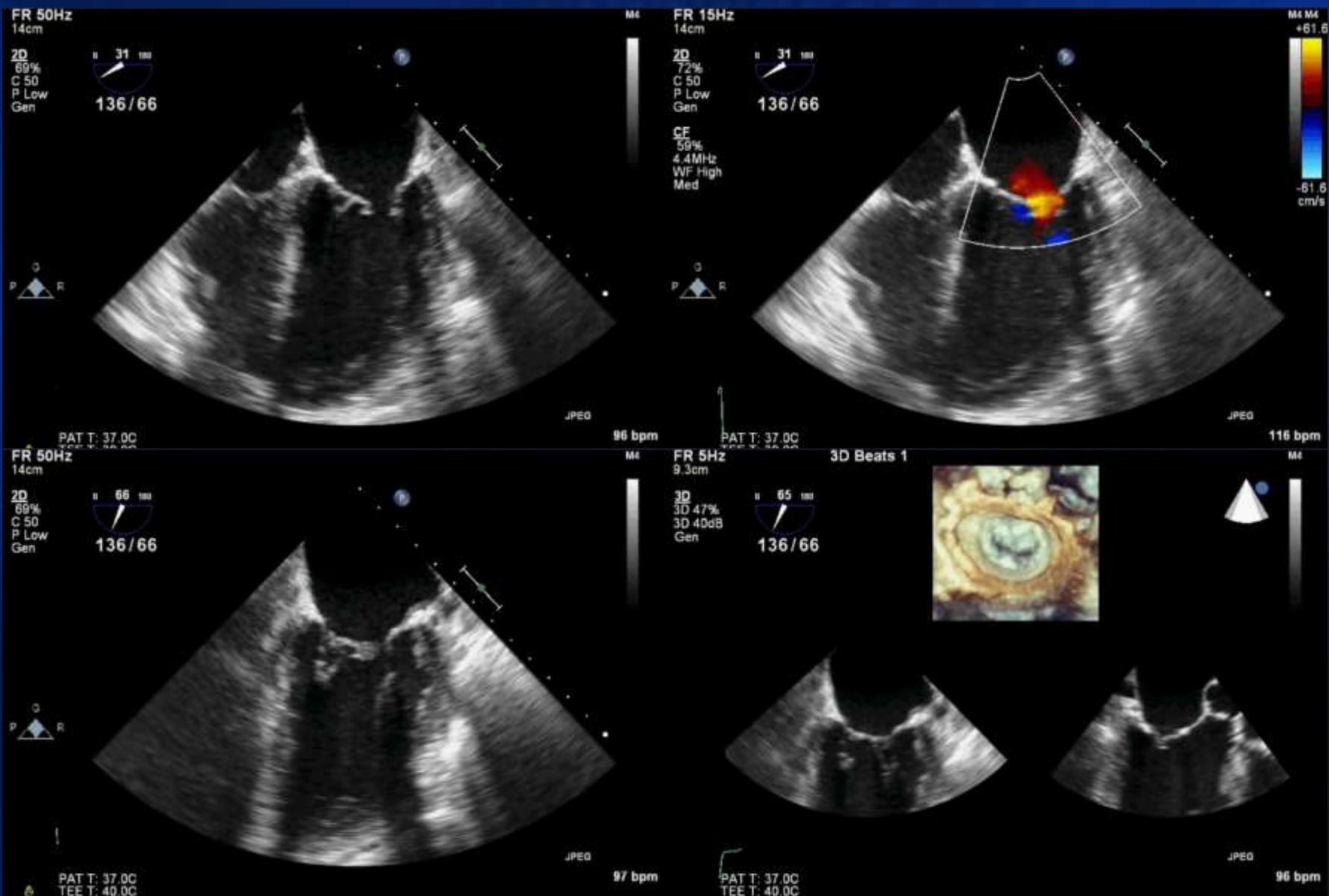
2D
52%
C 50
P Low
HGen
CF
66%
2.5MHz
WF High
Med

M3 M4
+61.6



JPEG

77 bpm



Radiation Therapy and The Heart – Value of Echocardiography

Can be used in pts receiving radiation,
to detect

- pericardial effects of radiation
- valvular abnormalities from radiation

Cancer Therapy and The Heart – Value of Echocardiography

Echo techniques valuable in patients
undergoing Chemotherapy

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ventricular function (LVEF & longitudinal
strain); hence, can be used:

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onset cardiac problems