Cancer Treatment and the Heart – Cardio-Oncology

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- 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
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
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)

- Antibody beneficial in patients with HER2 (Human Epidermal Growth Factor Receptor 2)
- Prevents HER2 from interacting with HER4 Receptor
- Can have toxic effect on the heart, but effects are not dose dependent and are reversible.
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%
LVEF = 65%

After 3 months Herceptin

LVEF = 58%

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

Her treatment will be adjuvant TCH chemotherapy followed by radiation

Taxotere
Carboplatinum
Herceptin
LVEF = 65%
GLS = -22.18%
Taxotere and Carboplatinum (Q 3 weeks for 6 cycles)

Herceptin (Q week, and after 3 months the dose increases)
Enter AVC time in Cardiac Phases

G.L. Strain = -13 \%
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
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
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