Cardio-Oncology Today

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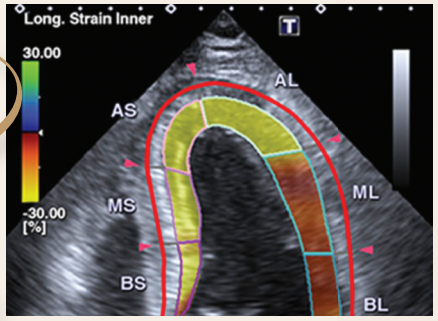
News from
Lourdes Health System



Strain echocardiography image courtesy *J. Am. Coll. Card.: Cardiovascular Imaging,* Volume 6, Issue 5, May 2013, Sarvari S., Haugaa K., Zahid W., et al.*

Monitoring and Protecting the Heart During Cancer Treatment

When cancer teams use conventional forms of treatment to aggressively destroy cancer cells, other tissues in the body may suffer. In particular, radiation therapy, and especially chemotherapy, can injure heart muscle. Combination therapies may pose cumulative risk. As a result, and with more than 15 million cancer survivors now in this country, the subspecialty of cardio-oncology is becoming an important component of care.

At Lourdes, cardiologists trained in in this field work with oncology colleagues, and see cancer patients and survivors to detect these side effects, and prevent and treat them. "We can evaluate patients for risk who are about to undergo treatment, based on their existing conditions, standard cardiac risk factors, and treatment regimen, in order to try to minimize effects on the heart," said Lourdes cardiologist Geoffrey Zarrella, DO, FACC.

Adjustments, Interventions to Safeguard Myocardium

The chemotherapy drugs that most often cause heart damage are anthracyclines (including doxorubicin and mitoxantrone), as well as paclitaxel and cyclophosphamide, and HER2 inhibitors such as trastuzumab. (Newer, targeted therapies such as Herceptin are thought to risk only temporary damage.) These important agents can induce or exacerbate arrhythmia, coronary artery disease, peripheral artery disease, valve damage, hypertension/hypotension, pericarditis or myocarditis—and thus impact ventricular function, increasing the risk of heart failure. Chemotherapy can also interfere with anticoagulant medications.

Standard cardiac risk factors are the same ones that put patients at greater risk for cardiotoxicity during cancer treatment. Baseline evaluation may include transthoracic echocardiography, nuclear imaging and cardiac MR. An increasingly useful screening tool that can detect early nonsymptomatic effects is three-dimensional echocardiography with global longitudinal strain (GLS, *see page 2*).

Cancer therapies can cause lasting damage to the heart, especially in patients who are at risk for heart disease.

"We evaluate patients intermittently during and after chemotherapy to assess for early signs or symptoms of cardiovascular disease," said Lourdes cardiologist Troy Randle, DO, FACC, FACOI. "Monitoring cardiac biomarkers such as troponin I is also useful."

For patients at high risk or demonstrating toxicity, the team may adjust or pause therapy, or use cardioprotective drugs (ACE inhibitors or angiotensin receptor blockers, beta blockers and/or a statin). These drugs may be indicated if the patient demonstrates a drop in ejection fraction of 10 percent or greater, and/or a drop in GLS of 15 percent or greater, or increased troponin levels.

Toward Smart, Informed Decisions, and Precautions

While significant cardiotoxicity remains uncommon, even patients without its signs or symptoms may need to be monitored after therapy. Some effects on the heart are reversible or partially reversible and some not, including heart damage from types of less-exacting radiation therapy delivered decades ago. Some patients may need care in Lourdes' highly respected heart failure program.

Therapies with cardiotoxic effects are more common for breast, lung and hematologic cancers. Last year, the American Heart Association warned breast cancer patients to weigh the benefits of particular treatments against the potential for damage to their heart.

"We want patients to discuss with their physicians the benefits and risks to their heart health of potential treatments and make an informed decision on the best option for them, so that we can maximize patient safety and augment disease-free survivorship," said Lourdes cardiologist Jay Rubenstone, DO, FACC.

Cardiotoxic Syndromes Associated with Chemo

AGENTS ASSOCIATED WITH LV DYSFUNCTION

- Anthracylines
- Mitoxanthrone
- Cyclophosphamide
- Trastuzumab
- Ifosfamide
- All-trans retinoic acid

AGENTS ASSOCIATED WITH ISCHEMIA

- 5-FU
- Cisplatin
- Capecitabine (Xeloda)
- IL-2

AGENTS ASSOCIATED WITH HYPERTENSION

- Bevacizumab (Avastin)
- Cisplatin
- IL-2

AGENTS ASSOCIATED WITH OTHER TOXIC EFFECTS

- Tamponade or endomyocardial fibrosis (Busulfan)
- Hemorrhagic Myocarditis (Cyclophosphamide)
- Bradycardia (Taxol, Thalidomide)
- Raynaud's (Vinblastine)
- Autonomic neurop (Vincristine)
- Long QT (Arsenic trioxide)
- Pulm fibrosis (Bleo)

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1600 Haddon Avenue
Camden, NJ 08103

Strain Detects Early Toxicity, Gives New Precision in Measuring Heart Injury

Even with three-dimensional echocardiography, the critical measure of regional left ventricular (LV) function has never been easy to assess with a high level of precision. But cardiac toxicity, whether from chemo- or radiation therapies, or both, typically manifests most profoundly in loss of LV ejection fraction (EF). A number of tests can indicate LVEF decline, or the risk for it, but a newer modality in echocardiography—strain echo—is proving most revealing and informative in providing this information.

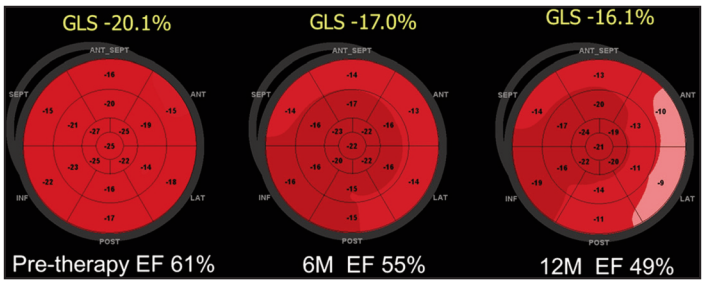
With the increased frame rates of current ultrasound equipment, the strain test can characterize the elastic properties of the heart, using myocardial deformation as a measure of strength of contraction. During systolic function, twisting mechanics of the heart create myocardial rotation. Thus, deformation of the ventricular wall takes place in various dimensions, principal of which are longitudinal, radial/circumferential and torsional. In this way, strain assesses lengthening, shortening and thickening of the heart muscle. The test can also quantify the velocity of deformation, or "strain rate."

Progressive myocardial conditions first affect the subendocardial fibers of the heart, those responsible for longitudinal motion. Subepicardial fibers, responsible for more rotational dynamics, temporarily compensate; but, as longitudinal and circumferential functions both degrade, patients become more symptomatic.

Strain measures change in dimension normalized to an initial length. Global longitudinal strain (GLS) turns out to be the best measure for detecting subclinical LV dysfunction and can identify patients who may be experiencing ventricular damage who do not have specific electro-cardiographic changes or myocardial enzyme abnormalities.

Peak GLS in the range of -18 percent is normal for a healthy person, and the lower the absolute value of strain below this number, the more likely LVEF is abnormal or at risk. Those with a reduction in absolute value of GLS to -16 percent or less are already demonstrating abnormal myocardial mechanics suggestive of damage. Strain is cost-efficient and is free of ionizing radiation.

"Strain is an especially important checkpoint for the patient at-risk going into therapy or who is experiencing subclinical myocardial damage during therapy." said Lourdes cardiologist Geoffrey Zarrella, DO, FACC. "Using this technology, we can identify individuals who need pre-treatment with medications or other care adjustments to prevent further heart damage."



Strain echocardiographic image courtesy *J. Am. Coll. Card.*, Volume 63, Issue 25 part A, July 2014, Thavendiranathan P., Poulin F., Lim K., et al.

Change in global longitudinal strain (GLS) tracks with loss of EF for a patient in this "bull's eye" plot of strain values for each of the 17 myocardial segments. The patient receiving cytotoxic chemotherapy had normalbaseline strain and LVEF, but by 12 months met the criteria for cardiotoxicity.

**page 1 image:* Endocardial longitudinal strain study of a patient with coronary artery occlusion. *Brown color* indicates areas with impaired strain. GLS was reduced in this patient to -15 percent.

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1600 Haddon Avenue • Camden, NJ 08103 • www.lourdesnet.org
1-888-LOURDES (1-888-568-7337)
AVP, Communications: Carol Lynn Daly
Publications Manager: Josh Bernstein • Writer: Russ Allen