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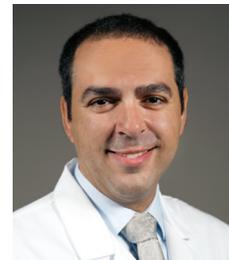
A newsletter from the BayCare Cardiovascular Service Line

Fundamental Principles and Applications of Myocardial Strain

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The fractional change in the length of a segment of myocardium is referred to as strain. The rate of change of a myocardial segment is the strain rate. Valuable information regarding myocardial mechanics can be obtained by characterizing longitudinal and circumferential strain. A normal global longitudinal strain (GLS) value is greater than -20 percent, and below this would be abnormal (*e.g. -21 or -22 would be considered good/normal*). Strain can be viewed as an adjunct to ejection fraction (EF). EF essentially yields blood displacement. Strain can characterize properties of the myocardium in various disease states (*ex. scar/fibrosis, hypertrophy or an infiltrate process like amyloidosis*).

GLS is now recognized as a very important aspect of cardiac function, alongside ejection fraction. GLS has been studied and can yield valuable information in the following patient populations: Cardiotoxicity and chemotherapy, heart failure with reduced ejection fraction, heart failure with preserved ejection fraction, amyloidosis and valvular heart disease. GLS can be used to help differentiate different disease processes that can mimic each other. For example, GLS can be used to differentiate different causes of left ventricular hypertrophy, such as athlete's heart, hypertensive heart disease and hypertrophic cardiomyopathy. Future applications may include 3-D strain, atrial strain and right ventricular strain.

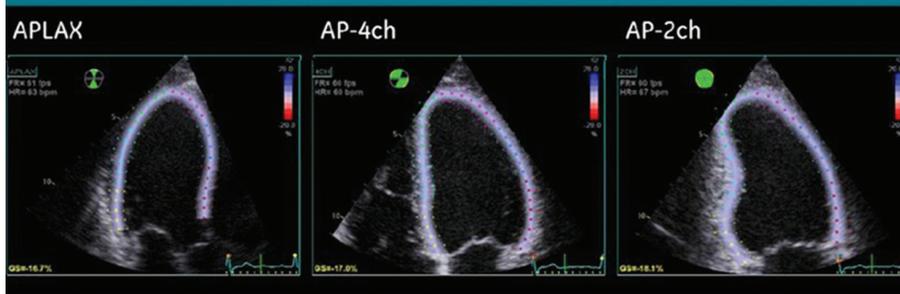


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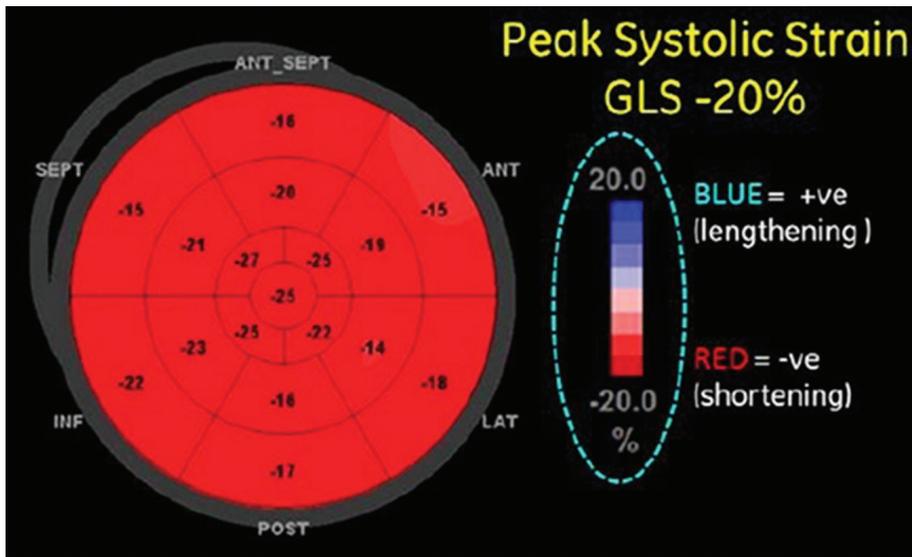
Global Longitudinal Strain (GLS) of LV



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GLS has gained popularity as an invaluable echocardiographic modality for patients receiving potentially cardiotoxic chemotherapy. In this regard, GLS has been used to predict LV systolic dysfunction prior to changes in ejection fraction, allowing for changes in chemotherapy dosing or regimen prior to the actual onset of LV systolic dysfunction. In other words, changes in GLS occur earlier than changes in the ejection fraction. Once an abnormal GLS is recorded, the intervals between chemotherapy can be lengthened or the duration can be reduced. The offending agent may be changed. Early detection of abnormal GLS can allow for early initiation of guideline-directed medical therapy as well as closer monitoring of patients with serial echocardiography. GLS has also been shown to be a predictor of all-cause mortality in heart failure with reduced ejection fraction. GLS has been studied as a predictor of survival in patients with ESRD and preserved systolic function. GLS was also used in a recent study to predict mortality in patients with acute heart failure. A GLS <8.0 consistently demonstrated worsened five-year survival.

To better serve our community, this testing is available at select BayCare hospitals. Over the next few months, we'll be adding a strain program at additional locations for any patients who would potentially benefit from the information that this testing would offer.

Past issues of the Cardiovascular Update newsletter are now available online.

View the newsletter archive and previous editions of BayCare's Cardiovascular and Surgical Outcomes book.

References

- 1) Anderson, Bonita. (2018). Beginner's Guide to Strain: What should be in your lab in 2018. Retrieved from <https://www.asecho.org/wp-content/uploads/2018/01/Anderson-Beginners-Guide-to-Strain.pdf>.
- 2) Lang, R.M., Badano, L.P., Mor-Avi, V., Afilalo, J., Armstrong, A., Ernande, L., ... Voigt, J. (2015). Recommendations for Cardiac Chamber Quantification by Echocardiography in Adults: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. Retrieved from <https://asecho.org/wp-content/uploads/2015/01/ChamberQuantification2015.pdf>.

