The Exciting World of Strain

What is Strain?

Global Longitudinal Strain is a dimensionless index and is an imaging technique that analyzes the motion of tissues in the heart. The software follows the squeeze of the walls of the left ventricle (LV). So essentially strain rate is the rate of deformation or stretch of the heart muscle and is provided through an ultrasound of the heart (echocardiogram). Its job is to identify subtle changes not indicated by other imaging methods. It is a widely available, non-invasive, versatile, and inexpensive with minimal patient discomfort. Strain came into popularity around 2010 because it was shown to be a predictor of mortality. Strain picks up subtle changes not evident by other imaging modalities such as LVEF and CMRI.

How Strain Connects to the Inner Workings of the Heart:

The heart happens to have a cluster of nerves called the Sinoatrial Node which work together to keep your heart rhythm going. The SA node sends out pulses which travel down other nerves in the heart, making it all contract and relax as it should. The signal is then brough to the apex for heart where it spreads to the cells of the ventricles causing the ventricles to contract. This in turn connects with Myocardial strain because of the change in myocardial fiber length over the cardiac cycle—is a measure of LV cardiac muscle function.

Cardiologist Interview Questions

1) How do you feel about strain being integrated into what we already know?

Global Longitudinal Strain (GLS) is already integrated into our echo machines. Its strong points is its ability to provide data that can be of diagnostic value. I highly recommend incorporating GLS as a tool to transthoracic echocardiograms. I'd like to add though, more research is required to implement strain across different platforms, recognize specific strain patterns, and investigate potential triggers related to age, gender, and loading conditions. This ongoing research will further prove the value of GLS.

2) Where do you see strain going in the next five years?

I think that strain imaging has become increasingly accessible to clinical operators across healthcare. Of course, this accessibility is caused by our latest generation of cardiac sonographers. One of the key advantages of strain imaging, compared to other cardiac imaging methods, is its speed and its ability to be used effectively even in situations where patient mobility is limited. Scientific evidence supports the role of strain imaging in the diagnosis, treatment, and prognosis of various heart diseases. It has become a tool that can provide insight into cardiac function and pathology. Strain continues to evolve, with preliminary studies already demonstrating its importance in 3D echocardiography. Because of this strain potentially provides even more detailed information about cardiac function.

3) What is the learning curve for a sonographer and physician when it comes to strain?

There are limitations when performing strain there are sometimes hemodynamic changes that may potentially affect the results of the test. When reviewing the report, we do include the blood pressure of every patient, but it does call into question the accuracy of strain value due to factors such as dehydration and uncontrolled BP. Ordering another study, say a limited study, or repeating the entire test is something to reconsider if that needs to be more accurately assessed. This is something I have experienced before where I have seen very different strain patterns compared to previous exams because of hemodynamics. It's hard to conclude without a control group.

Materials:

- Air-clay
- Paints
- Brushes
- Sculpting tools

Which patients do we Use Strain on Typically?

- Athlete's heart
- Post cardiac transplant patients
- Chemotherapy patients
- Covid 19 patients

How to Obtain Strain

The first step to strain is obtaining three images of the left ventricle, a 4C, 2C, and 3C. We then establish an area of interest where we're going to track speckles marked by the glowing red and green lines. It is basically tracking the movements of the LV as it squeeze. The software will automatically generate a bull's eye plot which displays all 17 left ventricle wall segments that were approved for tracking. The orientation such as the septum, anterior, lateral, and inferior walls are relative to how the echocardiographic images show the LV. The color representation on the plot represents the severity of LV dysfunction. Red represents normal LV wall contraction. Light red or pink indicates that the LV is hypokinetic meaning that the wall is not contracted normally, or its function is reduced. Faded red or faded blue represents akinetic motion or in other words the left ventricle wall is not contracting at all. Lastly, if the segment is blue then the wall is dyskinetic which means the wall segment is bulging out when it should be contracting.