Hello everyone,

I hope you are all having a splendid Easter weekend.

Spring is blooming in Vancouver. Cherry blossoms are budding and daffodils seem to be popping out of nowhere.

In just a few weeks, the semester will end and I will have completed my third year at UBC!

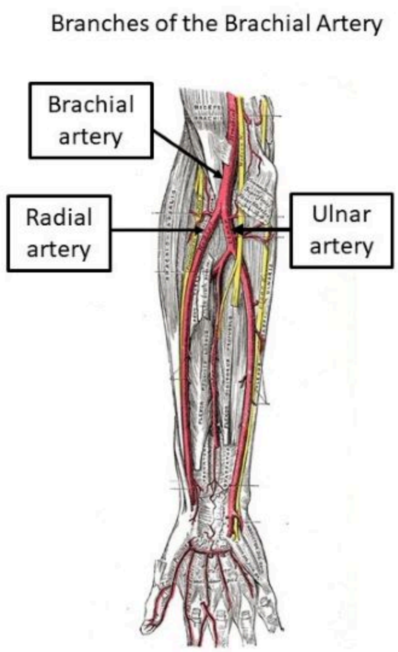
In this email, I will share some of the things I have learned in my biomedical instrumentation course. This course has taught me the theory behind and how to use a bunch of commonly used medical equipment. We've looked at electromyography (EMG), electrocardiography (ECG), electroencephalography (EEG), spirometry, and laparoscopy!
Specifically in this email, I will share what I've learned about ultrasound technology and show you all some of the images I was able to capture during my lab.

Ultrasound technology works by having a transducer emit sound waves that penetrate through the body. These sound waves travel through the body, hit different tissues/bones, and get reflected back into the transducer where their speed, distance travelled, and direction can be measured. Using computer technology, these measurements can be used to produce a 2D image.

One drawback to ultrasound technology is that as you increase the imaging depth (ie. you want to image deeper within the body), the image resolution decreases. One reason for this is because to image deeper, you need to use sound waves with lower frequencies. Lower frequency sound waves are not as easily absorbed by tissue and bone, and do not dissipate as quickly as high frequency sound waves. However, lower frequency sound waves cannot produce highly detailed images and allow more noise to be collected by the transducer. Where noise is unwanted background electrical signals that can come from power lines or other electronic devices in the room.

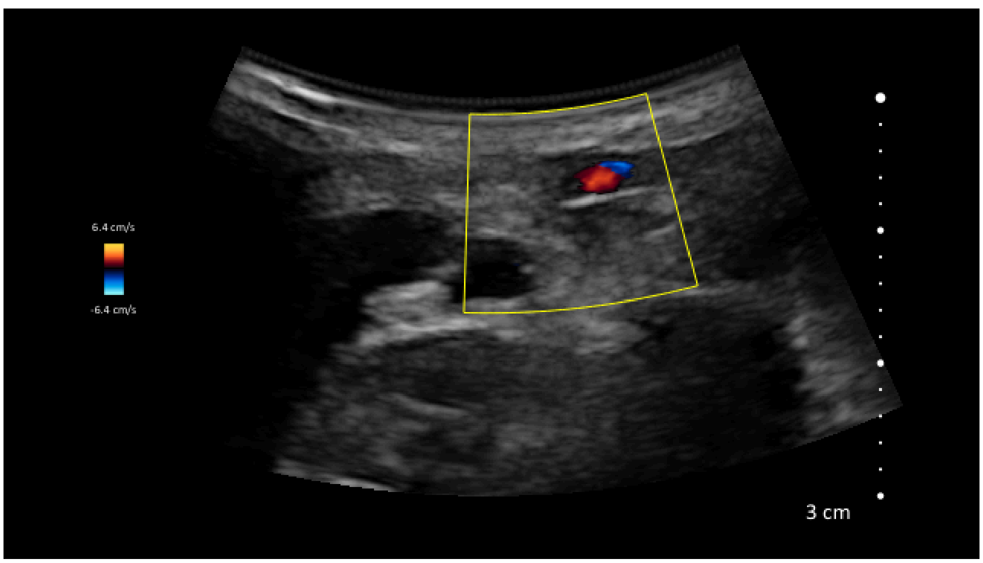
The applications of ultrasound technology are pretty diverse. It’s common to think of ultrasound to be used only in obstetrics (imaging fetuses during pregnancy), however ultrasound images can be used to image a myriad of different body parts and diagnose many different diseases.

In my lab, we tried imaging the brachial artery, which is the main vessel that delivers blood to the muscles in your upper arm and elbow joint.

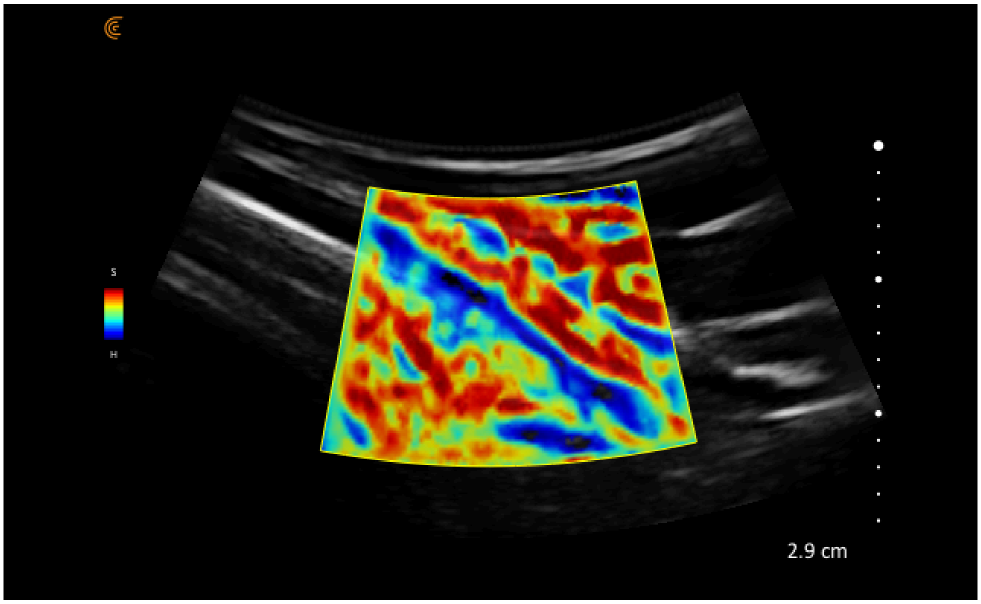


During my lab, I spent around half an hour moving the ultrasound probe here, there, and everywhere trying to find the artery on myself. My arm was lathered in sticky gel before I got it, but here’s my wonderful brachial artery circled in red below!

What’s pretty cool about ultrasound is that there are different ‘modes’ you can image with. In the ‘Colour Doppler’ mode, computer technology can change the colour of your image depending on which direction blood flows. As the reflected sound waves travel in varying directions and speeds based on which blood cells they bounce off of. For example, the image below shows my brachial artery again, but there are two tiny circles present, one red and one blue. Where the blue circle represents blood that is flowing towards the imaging probe, while the red represents blood flowing away from it.



Additionally, ultrasound technology can also detect the stiffness and elasticity of bodily tissue. That’s how ultrasound imaging can detect tumors, liver diseases, and muscular disorders. In my lab, we could practice looking for lesions in a dummy, where lesions are regions of abnormal tissue. In the image I took below, notice the diagonal streak of blue while the rest of the square is mainly red. In this mode of ultrasound imaging, blue means that the tissue is very stiff while red means the tissue is of normal stiffness. If this was taken from a real human, this region of stiff tissue may indicate the presence of cancer.



Anyway, that’s all for this email. Feel free to reply to this thread with any questions or comments. Or if you’d like to know more/see any pictures of the other medical equipment I’ve learned about.

I hope you all have a wonderful weekend and enjoy the coming of Spring!

Lillian