

Ultrasound – Baby phantom and / or Doppler Demo

Equipment

- Rupert the baby
- Ultrasound Machine
- Ultrasound gel
- Wipes or tissues for gel
- Doppler machine
- Table, table cloth if possible
- “Ultrasound” leaflet and poster

Safety / Risk assessment notes

There are several minor risks associated with the size and weight of the equipment. Carry the baby very carefully as he is very heavy. Both the phantom and the US machine will need to sit on a table so there is a risk of them falling down and injuring them. Ultrasound is very safe and using the machine to scan Rupert should be completely fine. We generally suggest to not let the kids scan themselves with the proper machine BUT they can use the Doppler on themselves which pretty much entirely risk free.

Background

Described as the “stethoscope of the future” ultrasound is used very widely. It is quick, very safe, accessible and a relatively cheap way of diagnostic imaging. It can also capture moving images.

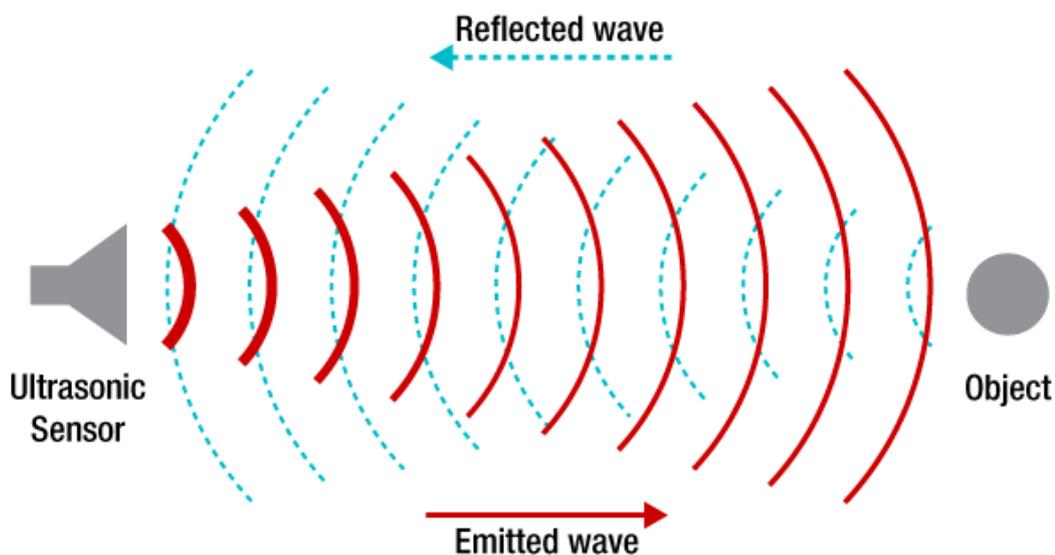
Activity details

- Start with a question about whether they have seen an Ultrasound scan of themselves when their mother was pregnant with them.
- Then explain the science behind ultrasound (see below)
- You could also mention different uses -not just for foetal monitoring. (blood flow monitoring, muscle damage in physiotherapy, looking for kidney and bladder stones etc)

- Finally, end by saying that in medicine sound can be extremely useful and is used to safely scan patients. You can show them the poster and leaflet.

The Science

Ultrasound images are made by sending pulses of high frequency inaudible sound waves – ultrasound – into tissue using a probe. The sound bounces off the tissue and different tissues reflect varying degrees of sound. These echoes are turned into an image. The machine calculates the distance from the probe to the tissue or organ (boundaries) using the speed of sound in tissue (5,005 ft/s or 1,540 m/s) and the time of the echo's return (usually on the order of millionths of a second). The machine displays the distances and intensities of the echoes on the screen, forming a two dimensional image like the one shown below.



Rupert

Rupert is a baby “phantom” which is a model designed to mirror the tissue and shape of a full term baby at 36 weeks. Our ultrasound machine can produce realistic images but you need to practice a bit to find the right angle.

Doppler Ultrasound

Doppler ultrasound is based upon the [Doppler Effect](#). When the object reflecting the ultrasound waves is moving, it changes the frequency of the echoes, creating a higher frequency if it is moving toward the probe and a lower frequency if it is moving away from the probe. How much the frequency is changed depends upon how fast the object is moving. Doppler ultrasound measures the change in frequency of the echoes to calculate how fast an object is moving. Doppler ultrasound has been used mostly to measure the rate of [blood](#) flow through the [heart](#) and major arteries.

This device is normally used for listening to foetal heart beats but can be used to listen to the blood flow in the carotid artery. It demonstrates that your students do indeed have a blood flow to the brain!!

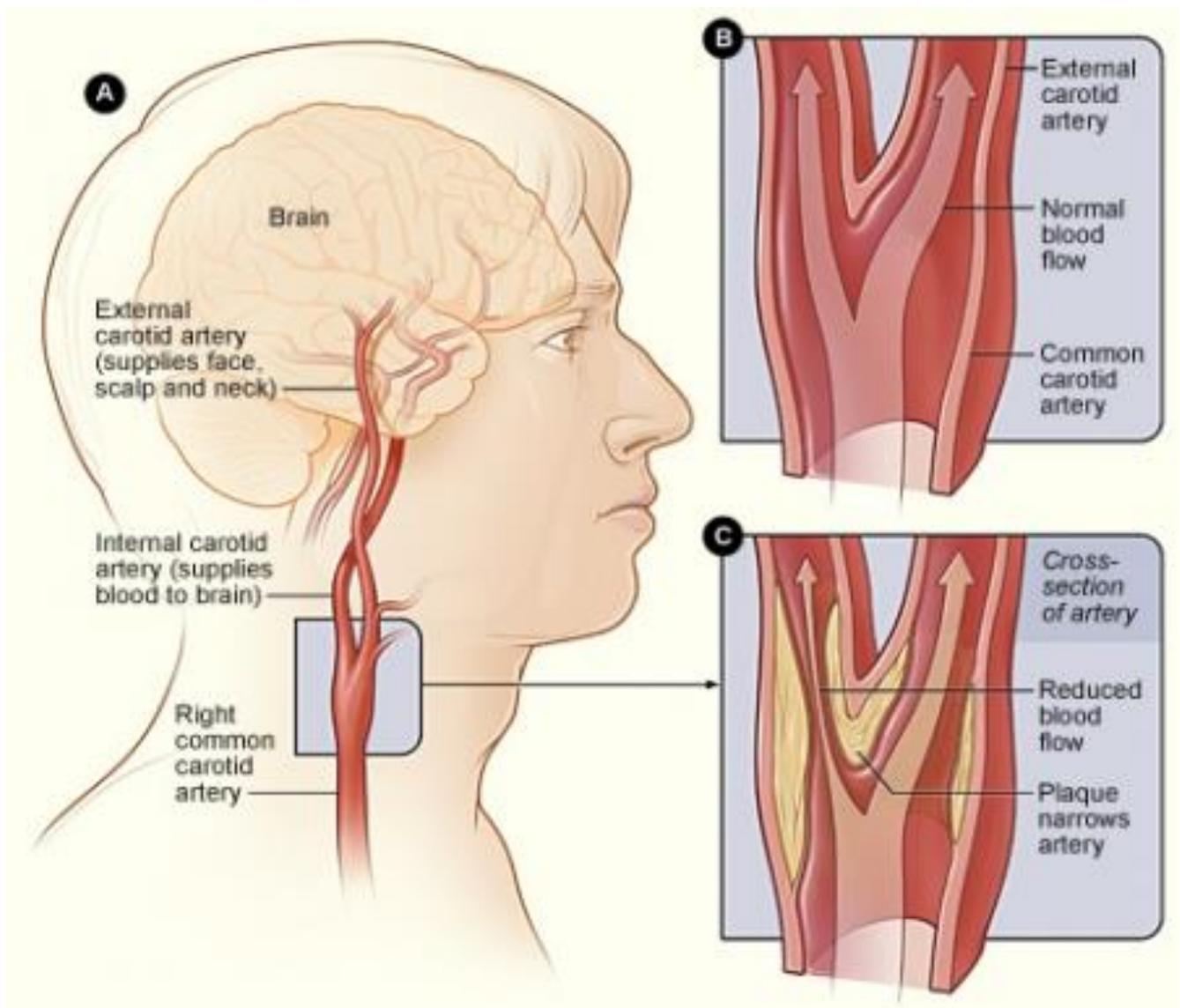


Figure 3: The carotid arteries carry blood to the brain

Place a little gel on the end of the probe (this is to stop the sound all being reflected at the skin/probe junction). Try to find the carotid artery bifurcation (see inset Figure 3). Move the probe around until you can hear the 'whoosh' whoosh' of the flowing blood. The display will tell you the 'patient's' pulse rate. *The 'patient' must not talk or wriggle!*

Safety note: This is completely safe - the gel is harmless and the level of ultrasound is completely non-hazardous (but, if you are an expectant parent, you are recommended to leave listening to your own baby's heartbeat to the professionals!)