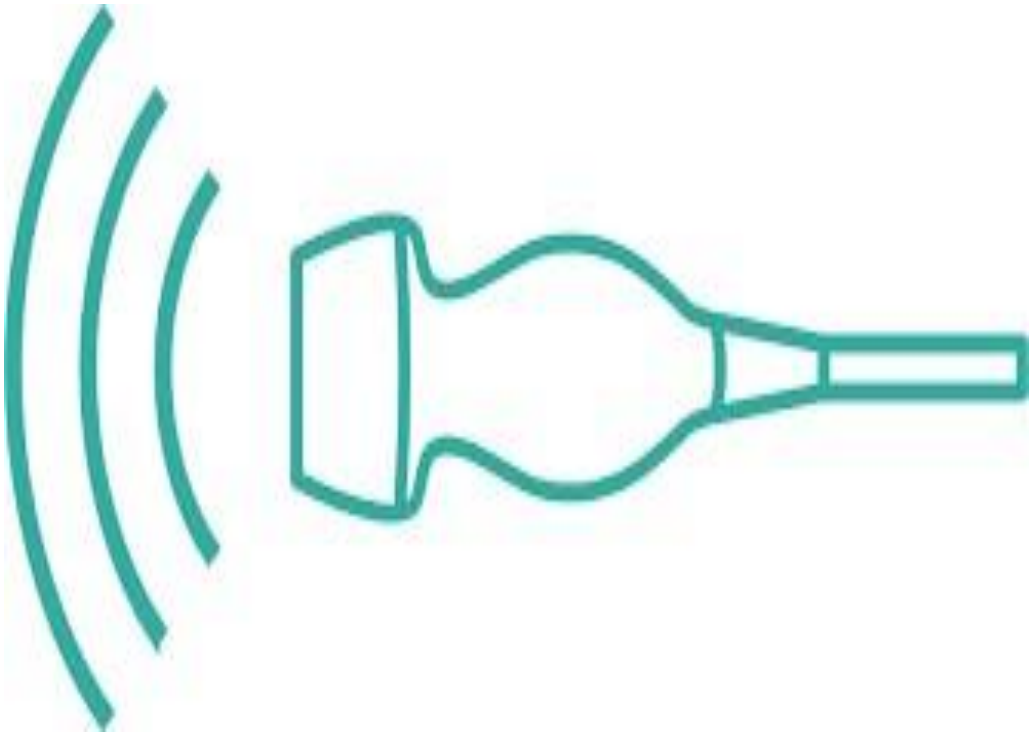
College of Health and Medical Techniques
Department of Radiology Techniques

ULTRASOUND EQUIPMENT TECHNIQUES

(Ultrasound waves)

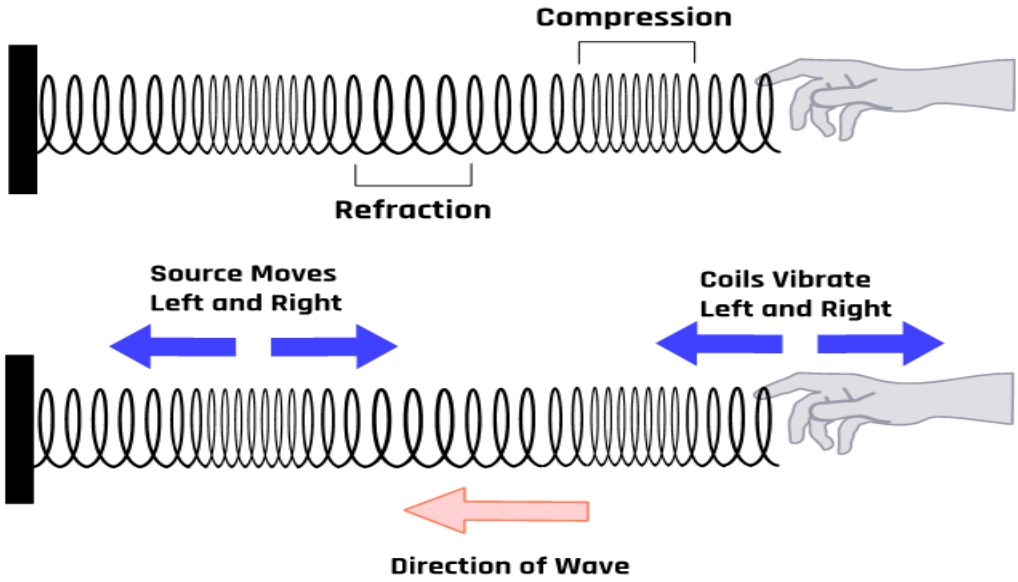


3RD STAGE / 1 ST SEMESTER

Ultrasound waves

Introduction and Overview

Unlike light and x-ray, sound requires a medium which propagate through it such as water or soft tissue and it is consists of longitudinal vibrations in much the same way as a shown in figure1.



Diagnostic Ultrasound (ultrasonography) is an ultrasound-based diagnostic imaging technique used for visualizing subcutaneous and examination of different parts of human body structures including tendons, muscles, joints, vessels and internal organs for possible pathology or lesions using high frequency sound waves, which are emitted from a probe and directed into the body. Ultrasonography commonly used during pregnancy and usually recognized widely by the public.

All the various techniques of diagnostic ultrasound involve the detection and display the acoustic energy reflected off different tissues in the body. Different body structures have different characteristics that scatter and reflect sound energy in predictable ways,

making it possible to identify these structures in the two-dimensional images, gray-scale scanners produced by ultrasound.

Diagnostic ultrasound offers advantages over other imaging modalities, and the most important of these advantages do not use ionizing radiation, making it safer, especially in imaging during pregnancy. The other important feature is its ability to image in real time, making it simple to perform live active and passive range of motion studies, in addition to the low cost. **In summary, the feature of ultrasound:**

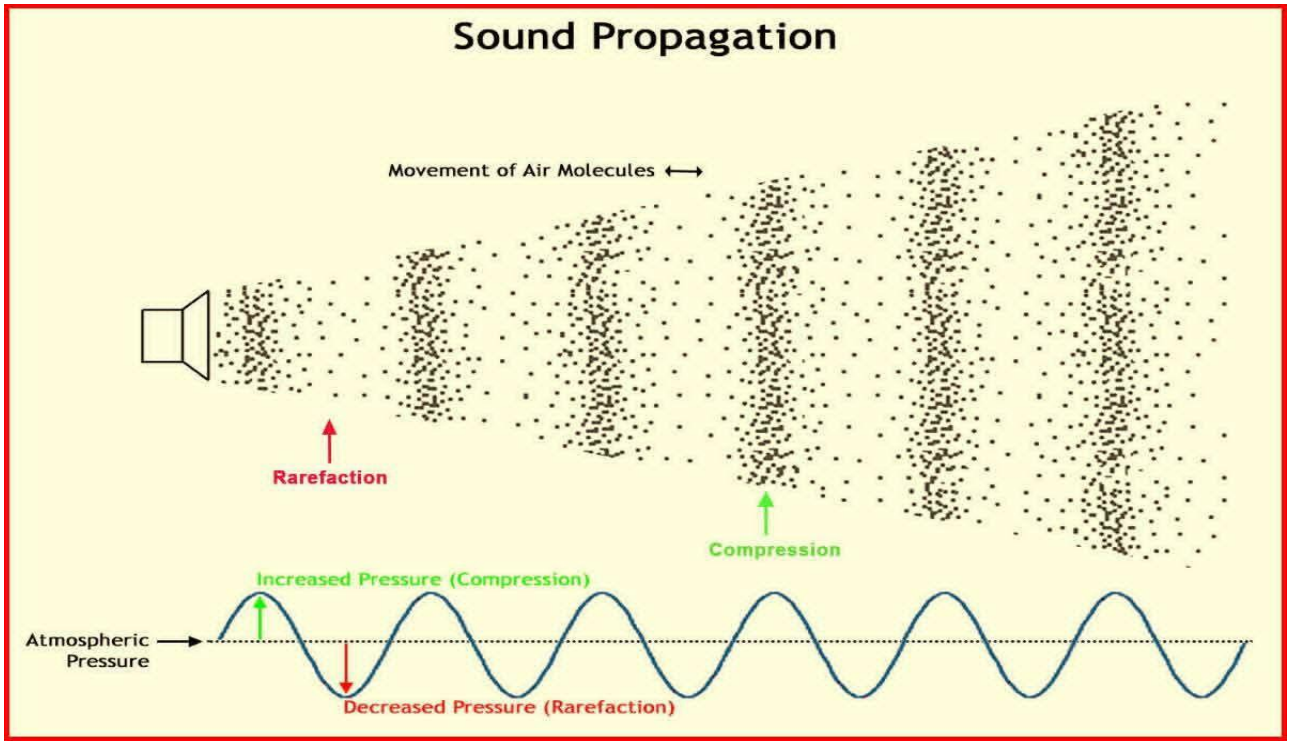
- ✓ Uses no ionizing radiation
- ✓ Safe in pregnancy
- ✓ Has no known side effects
- ✓ Inexpensive
- ✓ Portable
- ✓ Minimal preparation of patients
- ✓ Painless
- ✓ Gives direct vision for biopsies

Some problems with ultrasound imaging are that the diagnostic images sometimes cannot be obtained because of the size of the patient, or because the ultrasound beam cannot traverse the areas of air-filled or bone in such cases, the cross-sectional imaging with CT or MRI can be used instead.

Sound is a physical phenomenon that carries energy from one point to another. In this respect is similar to radiation, but differs from the radiation that does not pass through the vacuum and that means it needs to matter in order to transfers from one place to another.

This is because the sound waves are actually vibrations that pass through the material. If there is any substance, nothing can vibrate and sound cannot exist.

One of the most important features in the sound is frequency, defined as the rate of vibration source of sound and material that passes through it. Sound frequency is measured in a basic unit called the hertz, and defines the hertz as one vibration, or cycle, per second. Pitch is the term commonly used as a synonym for sound frequency.



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Assays medical uses high-frequency sound waves to look inside the body. These sound waves are too high for the human ear can hear. There is a specific extent of the frequencies in the human ear can hear or respond to them. The human ear in young adults can hear the frequency extent from 20 Hz to 20,000 Hz. The extent of frequencies greater than this limit is called ultrasonic frequencies (Ultrasound).

Frequencies in the extent of 2 MHz (million cycles per second) to 20 MHz are used in diagnostic ultrasound which is too high for the human ear can hear. Where, ultrasound is used as a diagnostic tool because it can be focused into small, well-defined beams that can probe the human body and interact with the tissue

structures to form images. Acoustic waves are shed on the internal organs through a small scanner called transducer of hand-holding which is placed in direct contact with the patient's skin to be imaged. Transducer has a crystal vibrate and a scanner unlike the sound or echo to form an image.