

S.K.N.R. GOVT ARTS & SCIENCE COLLEGE, JAGTIAL.



Study project on
“Ultrasound Scanning Machine – A Study”



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Department of Physics
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Objective:

Principle and working of ultrasound scanning machine are studied in this study project.

1. Introduction:

1.1 Principle:

Ultrasound scans use sound waves to produce images of the internal organs, vessels and tissues.

The ultrasound machine directs high-frequency sound waves at the internal body part being examined. The reflected sounds, or echoes, are recorded to create an image that can be seen on a monitor. The sound waves are emitted and received from a small, hand-held probe. The high frequency of the sound means the human ear cannot hear it – which is why it is called ultrasound.

2. Medical issues and ultrasound scans:

Some ultrasound examinations require special preparation beforehand, such as:

- You may be asked not to eat for a few hours before an upper abdominal scan.
- Some pelvic examinations require you to have a full bladder before the scan.

3. Ultrasound procedure

The entire ultrasound scanner machine consists of: a control panel, a TV screen on which to look at the images and a probe, which contains the special crystals which produce the sound waves. The ultrasound scanner probe looks like a small paint roller. It is the probe that is placed on the body in order to assess the underlying organs and tissues.

Before the probe is placed on the body however, a special water-based gel is applied to the skin prior to starting the examination. This is because sound waves are unable to travel through air, and the use of this gel allows sound waves to travel from the probe, through the skin to the underlying structures. The probe is then moved back and forth over the body,

sending sound waves through the skin and muscles. These waves are reflected back from the organs, tissues and vessels. It is these reflected sound waves, or echoes, which are turned into an image that then appears on the TV screen. The scan can also be copied onto paper or X-ray film, so that a permanent record can be kept of the scanned images. Moving scans can also be recorded and kept permanently.

If you are having an upper abdomen ultrasound, you will need to lie down on an examination table or bed. The ultrasound technologist, known as a sonographer, will place some gel onto your skin to provide better contact between your body and the ultrasound probe. They will then place the hand-held probe on your skin above the area of your body, organ or tissue that is being studied. The two-dimensional (or sometimes three-dimensional) pictures are shown instantly on a screen.

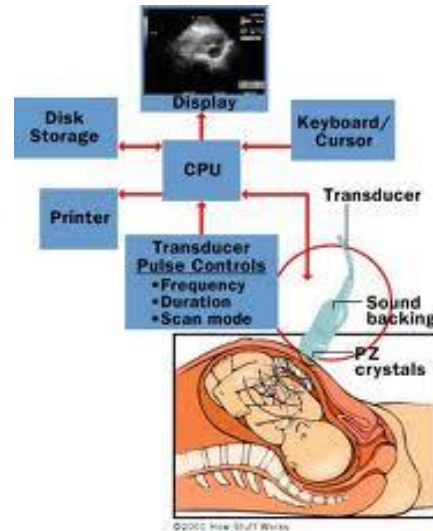


Other types of ultrasound may need a slightly different procedure. For example, a woman undergoing an investigation of her pelvis may have a transvaginal scan, which involves inserting a special ultrasound probe into her vagina rather than (or as well as) scanning through the front of her pelvis.

Ultrasound scans are used to study a person's internal body structures. A machine sends out high-frequency sound waves and records the reflected sound or echoes to create an image. Ultrasound is commonly used to study the developing fetus, abdominal and pelvic organs, muscles and joints, the heart and blood vessels. Other names for an ultrasound scan include sonogram and ultrasonography.

An ultrasound scan uses high-frequency sound waves to make an image of a person's internal body structures. Doctors commonly use ultrasound to study a developing fetus

(unborn baby), a person's abdominal and pelvic organs, muscles and tendons, or their heart and blood vessels. Other names for an ultrasound scan include sonogram or (when imaging the heart) an echocardiogram.



3.1 Immediately after an ultrasound scan

An ultrasound scan usually takes around 20 to 40 minutes, depending on the type of examination. After the procedure, the technologist will give you paper towels (or something similar) to wipe off the gel. You can then get dressed. The results of the ultrasound scan are usually sent to your doctor, so you will have to make a follow-up appointment with them to get the results.

Most ultrasound scans are non-invasive and the procedure does not involve the use of ionising radiation such as x-rays. Ultrasound scans for pregnant women are now routine in Australia.

3.2 Taking care of yourself at home after an ultrasound scan

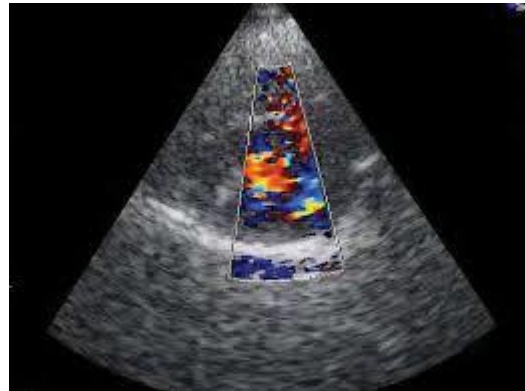
The scan itself should not cause you much pain, if any, and is generally non-invasive, so you don't need any recovery time. Most people can go about their normal business once they have finished the scan.

4. Different uses of ultrasound scan

Doctors commonly use ultrasound for procedures such as:

- **Abdominal scan** – may be used to investigate abdominal pain, nausea, vomiting, abnormal sounds and lumps. Structures to be examined may include the gall bladder, bile ducts, liver, pancreas, spleen, kidneys and large blood vessels. Structures that contain air (such as the stomach and bowels) can't be examined easily by ultrasound because air prevents the transfer of the sound waves
- **Pelvic scan** – may be performed if a woman is suffering pelvic pain or has abnormal periods, fibroids, cysts or other conditions associated with the female reproductive system
- **Pregnancy scan** – used to check for fetal abnormalities (such as spina bifida), check the age and position of the fetus, and monitor fetal growth and development. An ultrasound scan is now routine for pregnant women in Australia
- **Other uses** – musculoskeletal scans (to check regions like a shoulder, hip or elbow), breast scans (for example, to further investigate an abnormality picked up by physical examination or mammogram) and a scan of a person's eye (to check its internal structures). A special type of ultrasound scan, called a Doppler ultrasound, is sometimes used to detect the speed and direction of blood flow in certain regions of the body, for example, neck arteries and leg veins.
- Ultrasound scanning is a quicker and easier way to assess the organs, tissues and vessels when compared to other imaging methods such as CT and MRI for example, and is therefore frequently used to help monitor and diagnose conditions in many parts of the body.

- For example, the organs contained within the abdomen, such as the liver, gallbladder and spleen, are frequently assessed using ultrasound scanning.
- Echocardiograms are produced by ultrasound scanners used specifically to assess the heart. For example, they are often used to check how well your heart is functioning after a heart attack or to look the movement of the valves within the heart – including the kidneys, the liver and the heart (echocardiogram).
- It's often used to examine conditions affecting the organs in a woman's pelvis – the uterus, cervix, vagina, Fallopian tubes and ovaries.
- Ultrasound can also be used to guide medical procedures, such as needle biopsies. This is used when it is necessary to extract sample cells from an abnormal area, so that it can be sent to the laboratory for testing.



5. Does an ultrasound scan hurt?

- An ultrasound scan does not hurt but the gel used for the examination can feel a bit cold.
- Also, there may be some discomfort for the woman during pregnancy scans, since they will be asked to fill their bladder, and compression on this part of the body can be uncomfortable.
- Transvaginal ultrasound scans can feel uncomfortable, but this should pass once the ultrasound probe is gently inserted within the vagina and therefore should only last a few seconds.
- It's not possible to feel the sound waves when they pass from the ultrasound probe and down to the underlying organs and tissues.

6. Conclusion

- An ultrasound scan is used to examine internal body structures.
- Ultrasound sends out (emits) high-frequency sound waves, directed at the tissue being examined, and recording the reflected sound or echoes to create an image.
- An ultrasound scan is generally non-invasive.
- Common reasons for ultrasound scanning include investigations of a person's abdominal and pelvic organs, musculoskeletal and vascular systems, and to check fetal development during pregnancy.