

التصوير الطبي Medical Imaging

Voluson 11.08.1984 RAB4-8-D/OB MI 1.1 Dr. Moroder ecofetale.com
GE E8 GA=12w3d 8.3cm/1.4/16Hz TIs 0.1 02.02.2012 12:41:36

Routine
Har-high
97
Gn 10
C6 / M7
P5 / E3
SRI II 5

Ultrasound Imaging

التصوير بالموجات فوق الصوتية

LECTURE 7

السونار

Voluson
E8

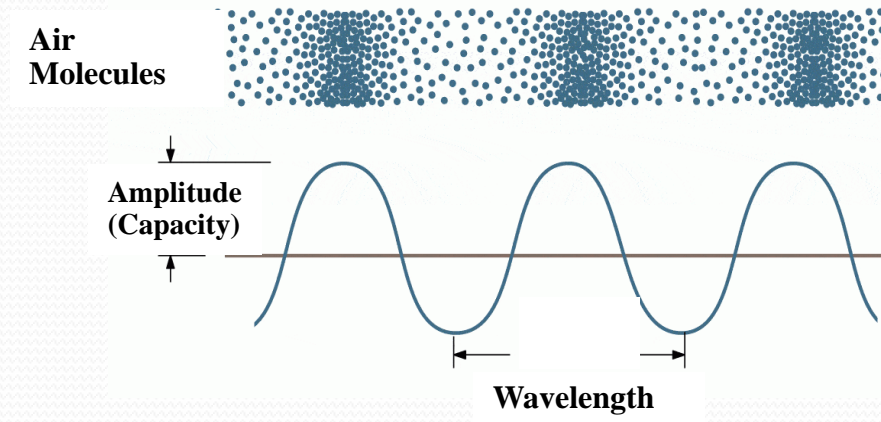
CRL

CRL 6.51cm
GA 12w6d 71.8%

- Sound**
- Classification of the sound waves**
- Ultrasound imaging**
- Ultrasound imaging system components**
- How a ultrasound imaging system works ?**
- Ultrasound imaging system benefits & risks**

What is sound?

Sound is a form of energy, and it is formed when air molecules vibrate and move in a pattern called waves. In addition, the sound move through a transmission medium such as a gas, liquid or solid.



Calculate the length of the sound wave

$$f / c = \lambda$$

طول الموجة الصوتية = سرعة الصوت / تردد الموجة

Hz 343 m/s Decibel

1224 km/h

Classification of the sound waves

☐ Audible Sounds: النطاق المسموع

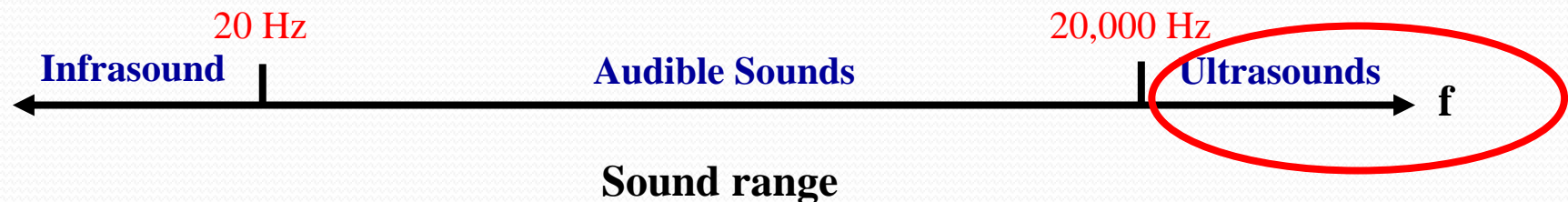
It is audible range of the human ear with frequencies in the range from 20 to 20,000 Hz.

☐ Infrasound: النطاق تحت صوتي

It is the inaudible range of the human ear with a frequency of **less than 20 Hz**

☐ Ultrasounds: النطاق فوق الصوتي

These are sound waves that are outside the human ear's senses with frequencies **above 20,000 Hz**. The audible range of dogs, cats....



Ultrasound imaging

التصوير بالموجات فوق الصوتية

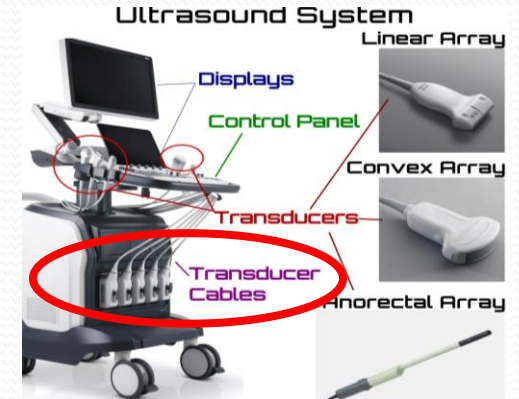


- It is a type of medical imaging for obtaining 3D images of the of human body
- It uses ultrasounds range
- Used to look at organs and structures inside the body, such as view the heart, blood vessel, blood flowing, liver, and other organs.
- In addition, it is also used with checking process during the pregnancy.

Ultrasound imaging system components

Ultrasound imaging system consists of the following parts :

- ❑ Control unit containing a computer, display screen, and a transducer (probe) that is used to do the scanning.
- ❑ The probe is a small hand-held device attached to the scanner by a cord (wire). Some exams may use different transducers (with different abilities) during a single exam
- ❑ Ultrasound gel placed directly on the skin to allow the sound waves to travel from the probe to the body.
- ❑ Storage unit
- ❑ Printer



How a Ultrasound Imaging System Works ?

- High-frequency sound waves (Ultrasounds) are transmitted from the transducer (probe) through the gel into the body.
- Next , the probe collects the sounds that bounce back from the body and the computer, then uses those sound waves to create an image.
- The ultrasound image is visible on a video display screen that looks like a computer or television monitor.
- These images are created based on the following :
 - ultrasound signal capacity
 - ultrasound signal frequency
 - and time it takes for the ultrasound signal to return from the patient to the probe.

Ultrasound imaging system benefits & risks

Benefits

- i) Ultrasound imaging system is easy-to-use and inexpensive.
- ii) Ultrasound imaging is safe and does not use any ionizing radiation.
- iii) Ultrasound scanning gives a clear picture of soft tissues that do not show up well on x-ray images.
- iv) Ultrasound is the preferred imaging modality for the diagnosis and monitoring of pregnant women.

Risks

For ultrasound imaging, there are no known harmful effects on humans.