ULTRASOUND 101

Practical course of Ultrasonography

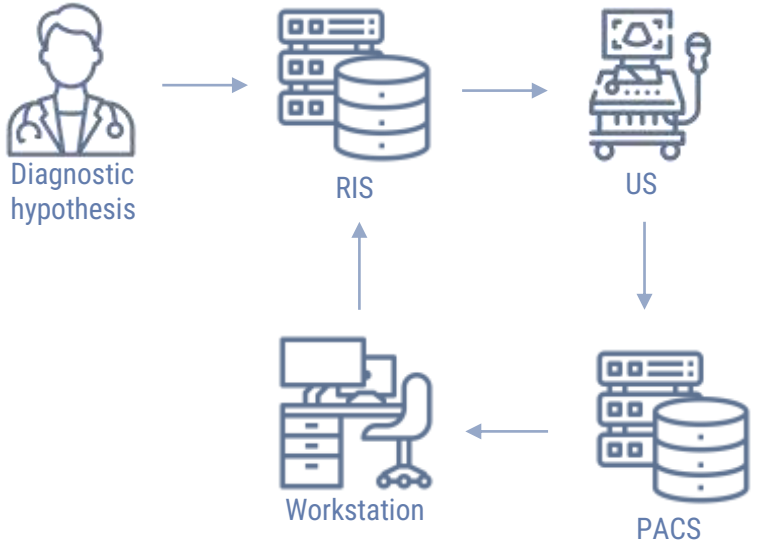
November 16, 2021

HOW DOES IT WORK?

- Electric drive
- Inverse piezoelectric effect
- Quartz crystal
- Convex / linear probe
- US image extraction
  - A-Mode
  - B-Mode
  - M/TM-Mode

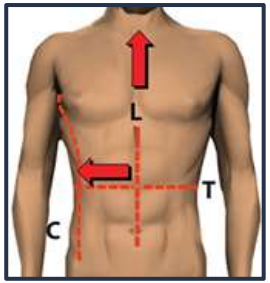
WHAT DO WE DO IN CLINICAL PRACTICE?

- Verify appropriateness of exam (diagnostic query)
- Worklist : list of all patients linked to Priamo (RIS)
- RIS (Priamo): Radiology Information System
- PACS (Telemis): Picture Archiving and Communication System



WHAT DO WE DO IN CLINICAL PRACTICE?

- Choose of probe
  - Convex (e.g. abdomen)
  - Linear (e.g. thyroid)
- Probe marker
- Choose of preset
  - e.g. superficial or deep abdomen



WHAT DO WE DO IN CLINICAL PRACTICE?

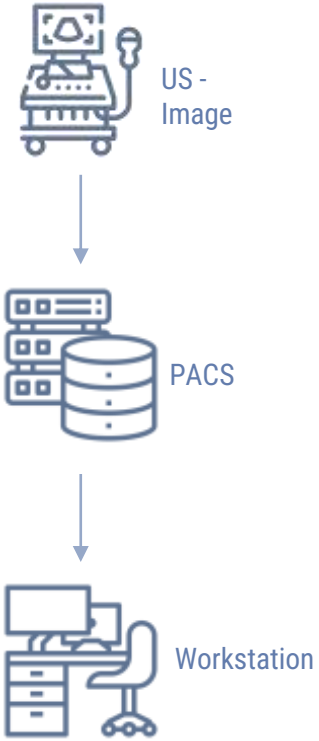
- Choose of US-Mode
  - Brightness Mode (B-Mode)
  - Color Flow Mapping Mode (CFM)
- If CFM, use Pulsed Wave doppler (PW)

MAIN SETTINGS & KNOBOLOGY

FREEZE: image «freezing».

It’s useful to perform calculations or measurements for morphological evaluations or to reproduce image onto photographic supports.

IMAGE: save the current picture and send it to PACS



WHAT DO WE DO IN CLINICAL PRACTICE?

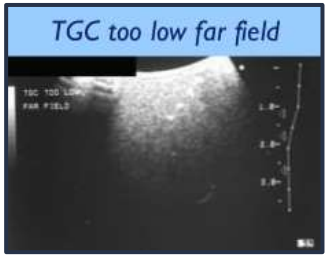
- Choose of focus
- Choose of frequency
- GAIN

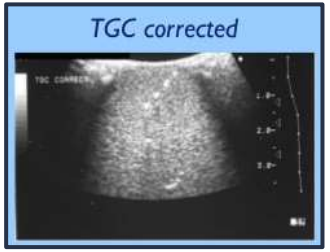
MAIN SETTINGS & KNOBOLOGY

- TGC (time gain compensation): consists into two properties such as attenuation and compensation.

Attenuation → echoes from deep structures have got less amplitude than echoes from superficial structures.

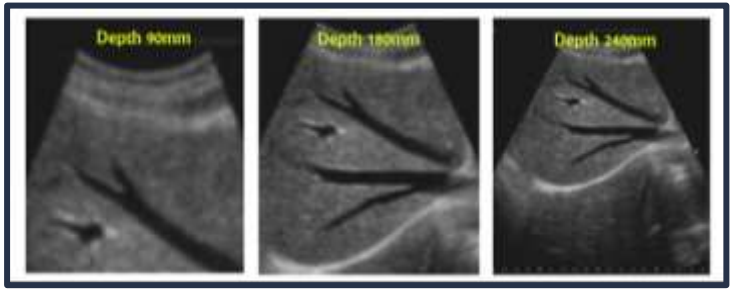
Compensation → more amplitude of echoes derived from deep structures than ones derived from superficial structures.
Gain increases in function of time otherwise of depth of penetration.





MAIN SETTINGS & KNOBOLOGY

DEPTH: it represents lenght of ultrasound beam (distance between probe and end of ultrasound column)



It modifies size of area showed on screen:
it's useful to verify that a structure of our interest is completely displayed on monitor.

This function is linked to depth variation of ultrasound beam.

Normally, it's expressed in centimetres (cm) but remember that's not Zoom function! We change angle of view to study same target modifying depth of ultrasound beam.

MAIN SETTINGS & KNOBOLOGY

ZOOM: it enlarges on screen region of interest that's present on scansion area.

READING ZOOM: it enlarges area of interest on freezed image. (it enlarges pixels showed on interest zone such as a magnifying glass.

WRITING ZOOM: it enlarges on real-time during image acquisition and so image can be represented using an elevated number of pixels of normal size (image more defined and richer of details).

MAIN SETTINGS & KNOBOLOGY

- TEI (Tissue Enhancement Imaging): it improves image quality that becomes more detailed and less unrefined.

This function it's possible beacuse our machine can select best return echo (2f0) from all return echoes derived initial source echo (f0).

It costs lost of axial resolution (less present in modern machines).

MAIN SETTINGS & KNOBOLOGY

- FREQUENCY: what do we choose?

LOW FREQUENCY: deep layers.

HIGH FREQUENCY: superficial layers.

MAIN SETTINGS & KNOBOLOGY

- DINAMIC RANGE: extension of representable frequencies into grayscale (expressed in dB).

LOW DINAMIC RANGE: it increases contrast resolution (near to gain decrease).

HIGH DINAMIC RANGE: it decreases contrast resolution (near to gain increase).