

## Clinical importance of imaging modalities: **Ultrasound**

Attila Kollár MD  
Chief Radiologist  
Semmelweis University  
Dept. of Radiology and Oncotherapy

## Imaging modalities

- Roentgen X-ray
- **Ultrasound**
- CT
- MR
- Angiography, DSA
- Nuclear Medicine (scintigraphy, SPECT, PET)
- Fusion imaging (PET-CT)



## What we need for the US examinations?

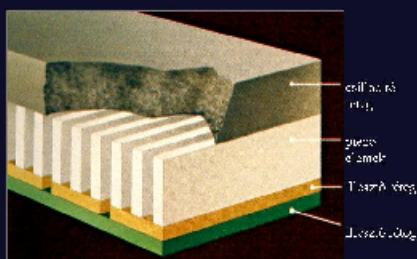
- **Up to date**  
US equipment with proper transducers
- **Knowledge of different anatomical, biophysical, pathophysiological, radiological, clinical aspects** - well trained, experienced radiologists, US specialists, sonographers

## How we generate the US image?

- An electric pulse generates **oscillation** on the piezo-electric crystals. These crystals produce mechanical oscillation and this is the **Ultrasound (1-15 MHz)** which enters into the human body.  
The **reflected echoes** from different tissues come to the piezo-electric receivers in the US probes which generate low voltage electronic impulse. From these electronic impulses the computer generates the echo image on the US monitor.
- Piezo-electric crystals work in **alternate mode** : as US sender and as US receiver.

## US transducer - piezo-electric elements

A transzducer metszeti képe



## Axial and spatial US resolution

- Convex 2,5-5 MHz transducers - deep US penetration (abdominal) - lower resolution (0,8 – 1,2 mm)
- Linear 5-10 MHz transducers – superficial US penetration – higher resolution (0,4-0,8 mm)
- Endoscopic US, Intravascular US transducers – 10-20 MHz - near field penetration, extremely high resolution (0,2-0,4 mm)

## Type of transducers



## Type of US probes

Különböző típusú transzducerek



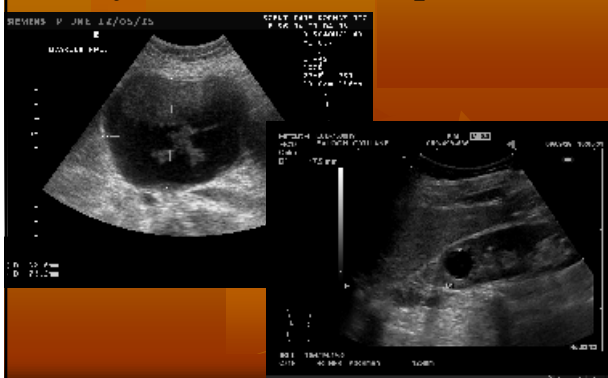
## The Ultrasound image

- The US image shows the different reflexions from a proper thin section of the body. It is a computer collected *echo - image* (which appears real-time on the US monitor - only with 2-4 msec delay - 14-25 frame/sec).
- The reflectibility of different tissues: ECHOGENICITY
- The strength of the reflection: ECHODENSITY

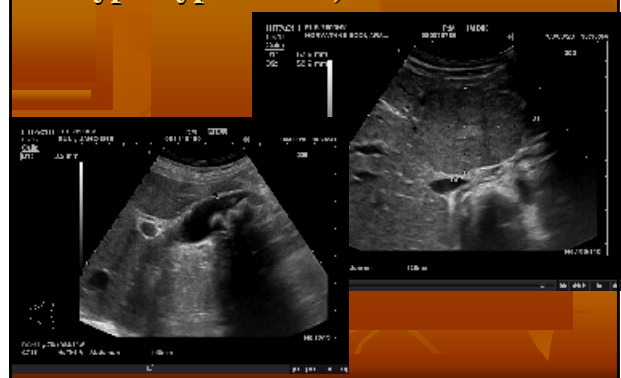
## US terminology

- Anechoic (Cystic)
- Hyperechoic
- Hypoechoic
- Echodens

## Cystic and solid components



## Hypo-hyperechoic, echodens mass





## Different conditions which affect the success of US examinations

- Anamnestic informations
- Knowledge of the clinical datas
- Personal contact with the patient
- Technical conditions (limits of the US equipment, documentation)
- US report
- Final opinion with differential diagnostic options

## Emergency conditions

### Acute abdominal conditions:

- Acute appendicitis
- Bowel ischemia, AMS occlusion, Enteral bleeding
- Icterus (choledochal stone, pancreatic tumor)
- Abdominal fluid collections (ascites, blood)
- AAA rupture, Aortic dissection

### Vascular pathologies:

- Stroke
- Peripheral Embolism
- Deep vein thrombosis
- Peripheral arterial occlusion

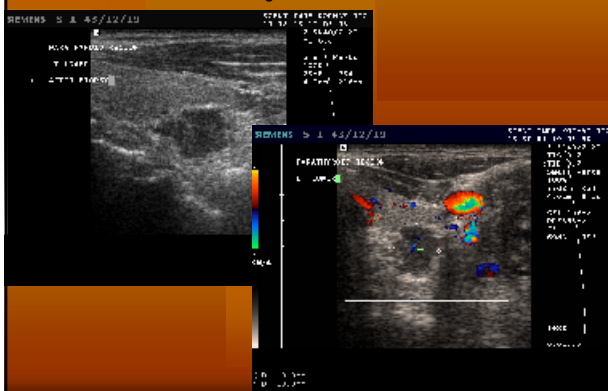
## Internal medicine applications

- Organ specific US examination indications:
  - Gastroenterology (abdominal organs)
  - Endocrinology (thyroid, parathyroid, suprarenal, soft tissues)
  - Angiology (arteries, veins)

## Hepatic tumors



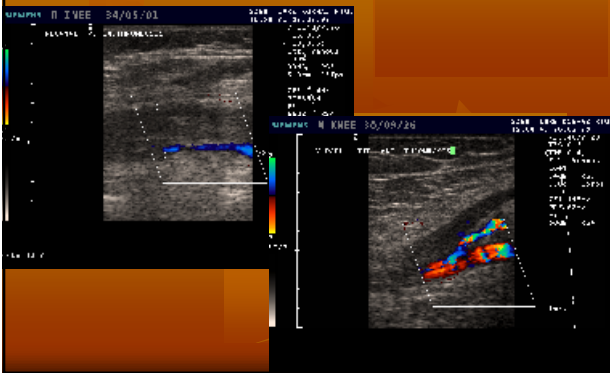
## Parathyroid tumor



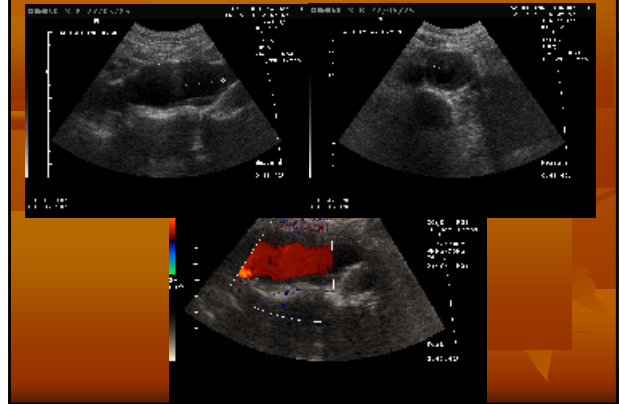
## Thyroid



## Deep Vein Thrombosis



## Abdominal Aortic Aneurysm



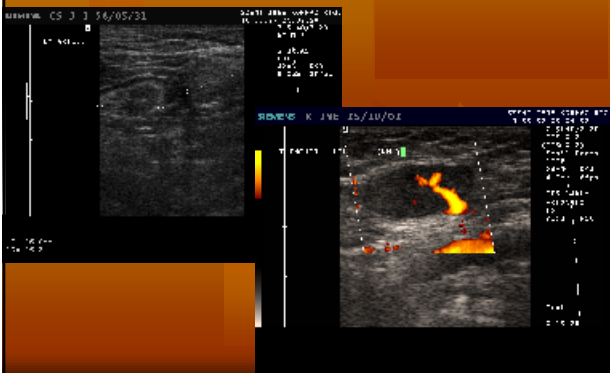
## Urinary bladder tumor



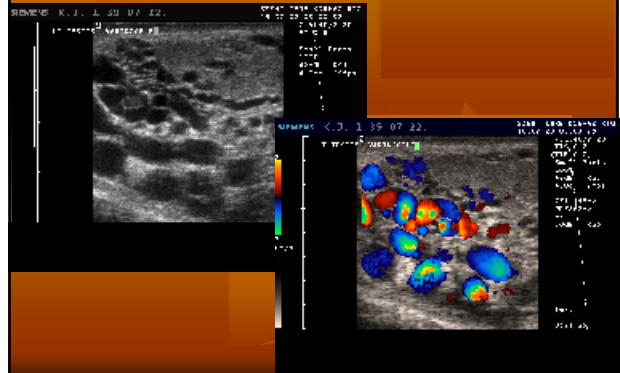
## Soft tissue US examinations

- Neck masses: thyroid, parathyroid, salivary glands, lymph nodes, neck cyst
- Joints
- Scrotum
- Axillary, inguinal regions
- Superficial masses (lipoma, atheroma, hematoma, vascular malformations)

## Lymph nodes



## Scrotal US - varicocele





This document was created with Win2PDF available at <http://www.daneprairie.com>.  
The unregistered version of Win2PDF is for evaluation or non-commercial use only.