Radiology Investigation of Hepatobiliary System

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Lecture outline:

- What is the hepatobiliary system (HBS)?
- ***Radiological modalities*** used in imaging HBS.
- ***Advantages*** and ***Disadvantages*** of each radiology modality.
- ***Indications*** of imaging HBS.

What HBS incudes?

It includes **liver**, **gallbladder** and **biliary ducts**.

Which of the following Radiological modalities canbe used in imaging HBS ?

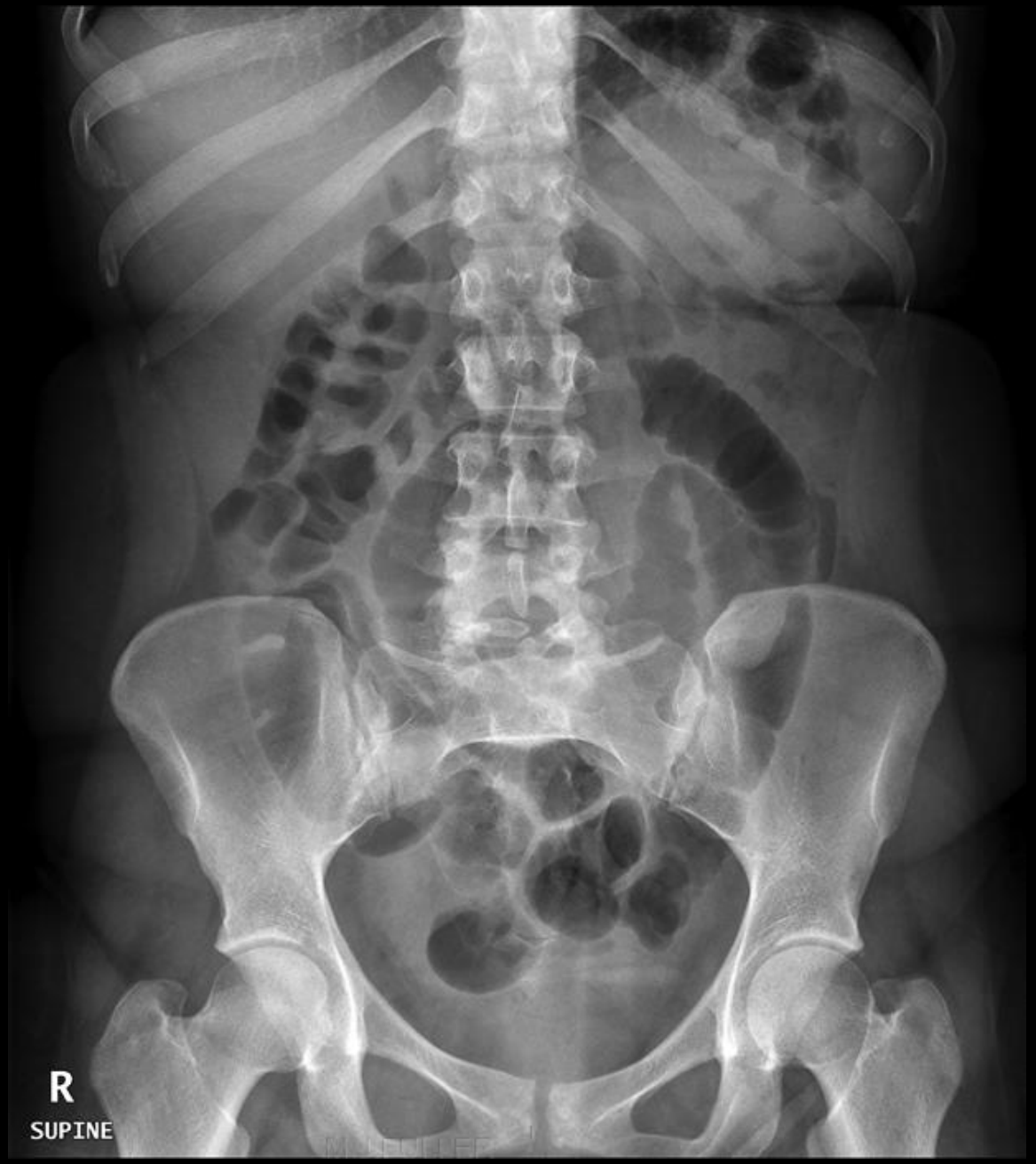
- **X Ray.**
- **Ultrasound.**
- **Computed tomography CT scan.**
- **Magnetic resonance imaging MRI.**
- **Nuclear scan.**

What are Radiological modalities used in imaging HBS ?

- **X Ray.**
- **Ultrasound.**
- **Computed tomography CT scan.**
- **Magnetic resonance imaging MRI.**
- **Nuclear scan.**

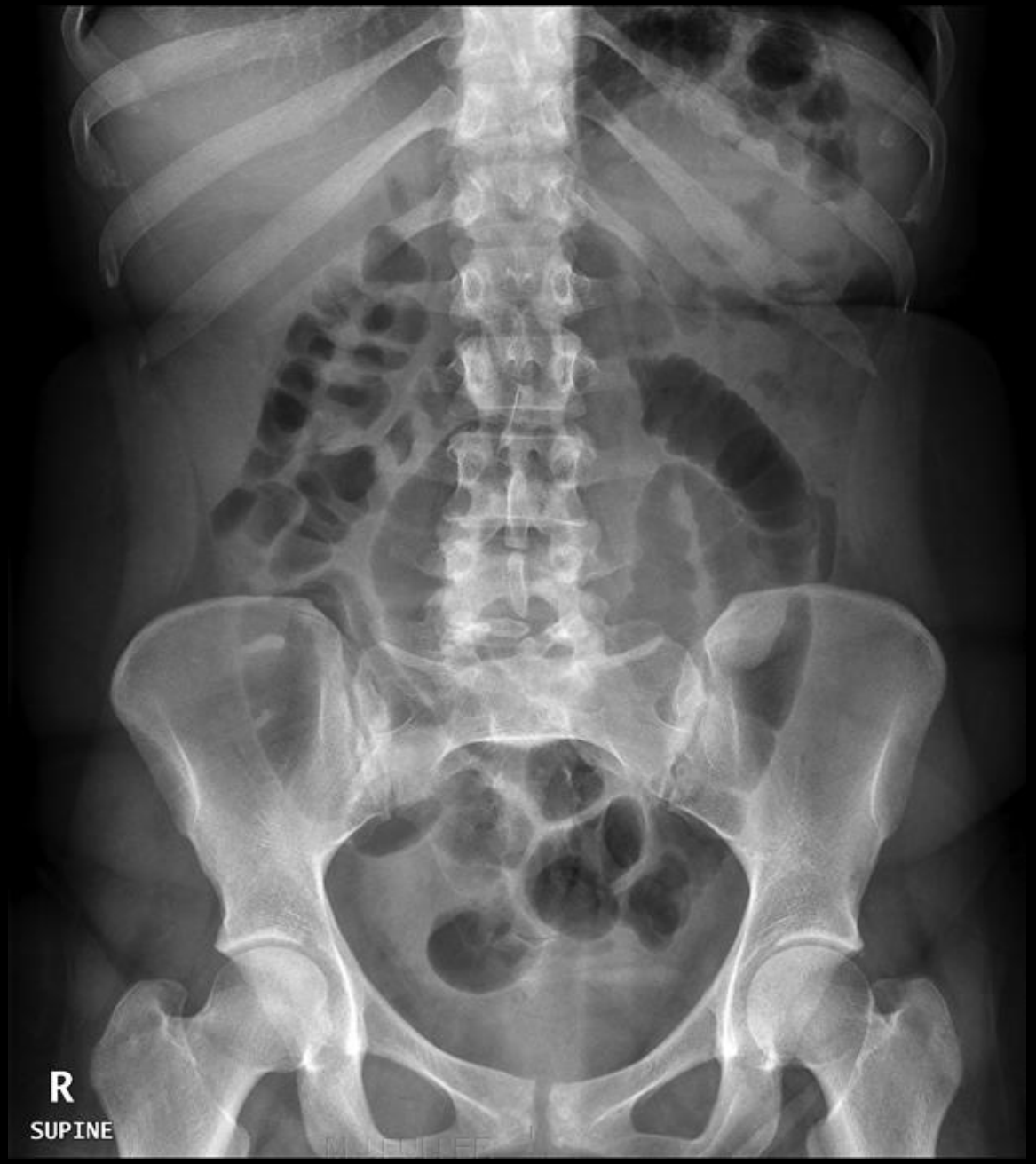
ALL modalities can be used

What is this?



What is this?

Abdomen x-ray
OR
Abdomen radiography



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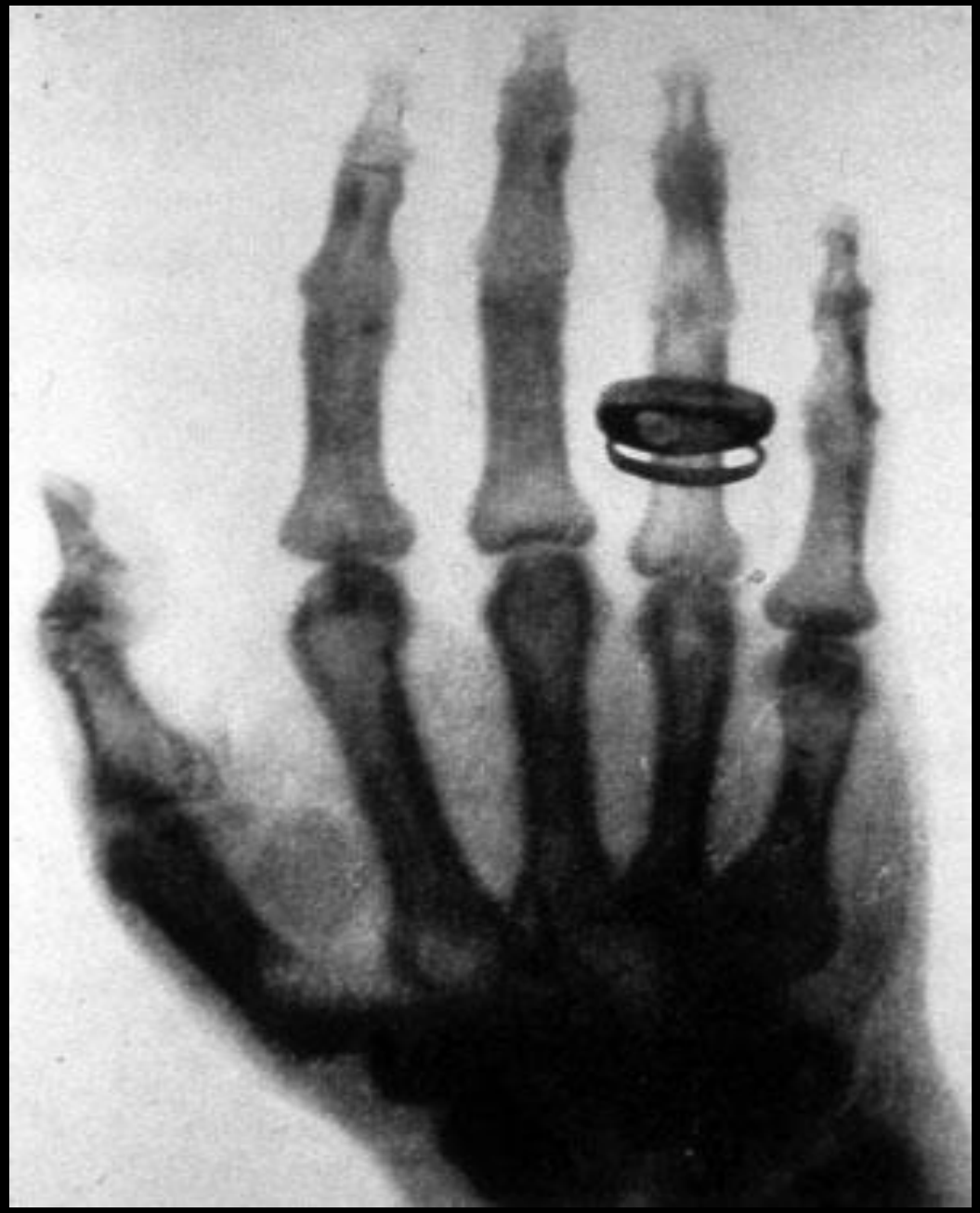


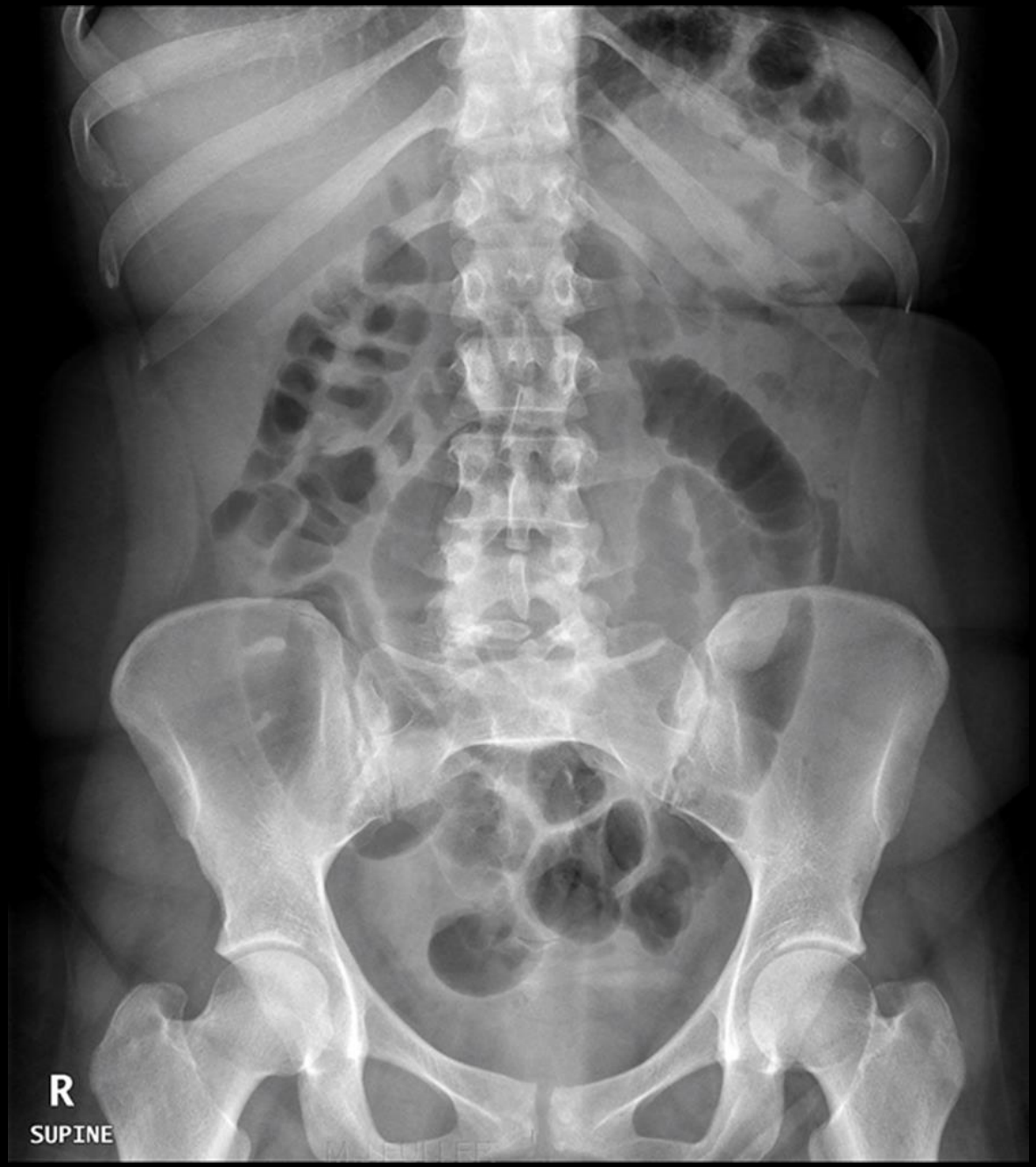
X ray was first observed and documented in **1895** by **Wilhelm Conrad Roentgen**

What is X ray?

It is energetic form of electromagnetic and ionizing radiation that can penetrate solid objects and used to take images of the human body.

X-Ray language:

- **Radio-lucent = black**
- **Radio-opaque= white**



X-Ray:

Advantages:

- Quick and widely available
- Cheap
- Can be done bedside (portable)

Disadvantages:

- Use ionizing radiation
- Very poor in tissue details (including HBS)
- Very limited in detecting gallbladder stones

What is this?

What is this?

ULTRASOUND

What is US?

- A diagnostic technique in which high-frequency sound waves penetrate the body and produce multiple echo patterns.

- Diagnostic Medical applications in use since late 1950’s

Ultrasound

Advantages:

- No radiation.
- Widely available.
- Relatively cheap.
- Very good in evaluating abdomen solid organs.
- Can be done bedside (portable).

Disadvantages:

- Operator dependent.
- Very limited in evaluating structures with air (e.g. bowel) or calcification (e.g. bone).

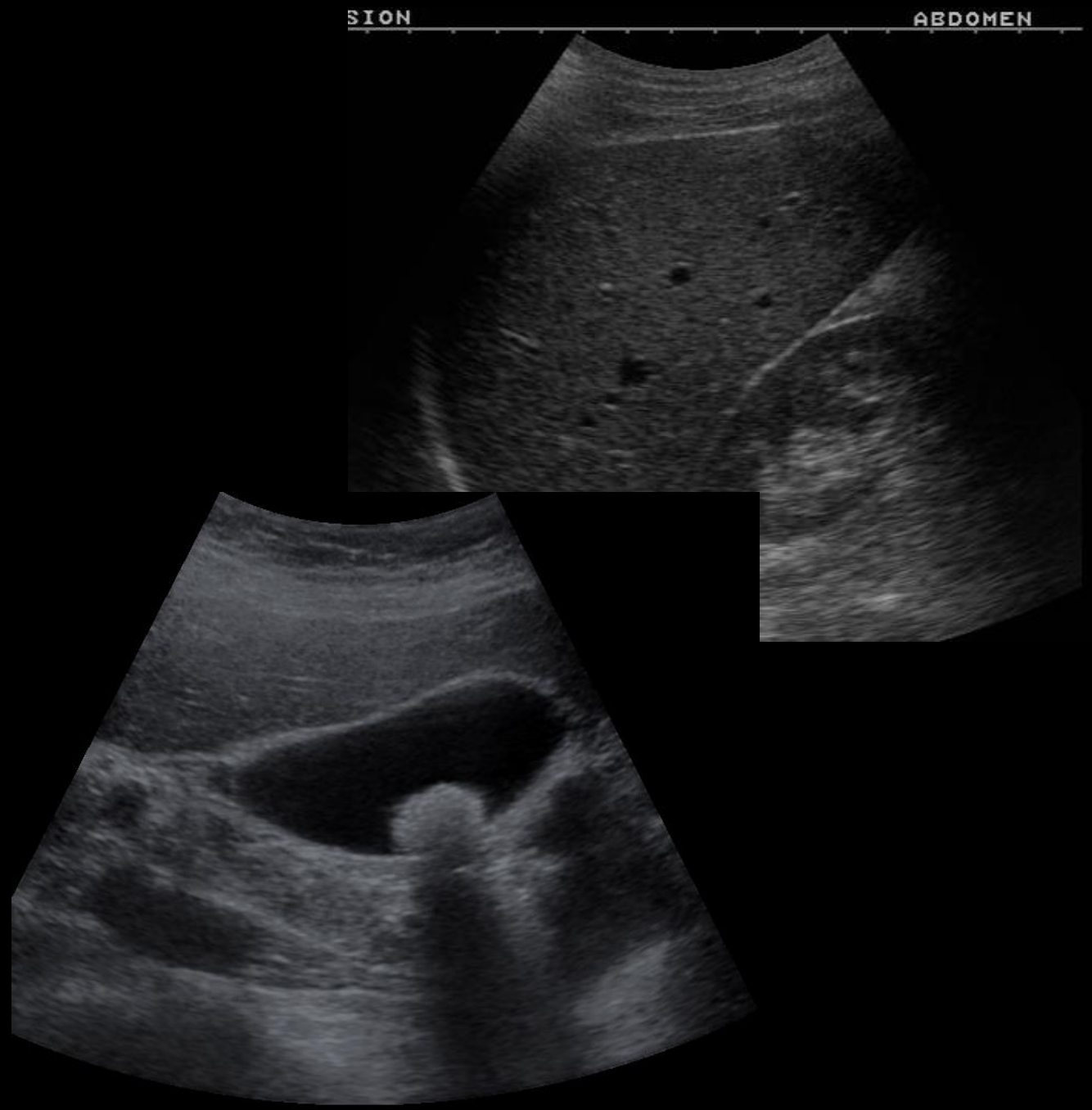
Echo patterns

Hyper-echoic = White

Hypo-echoic = Light Grey

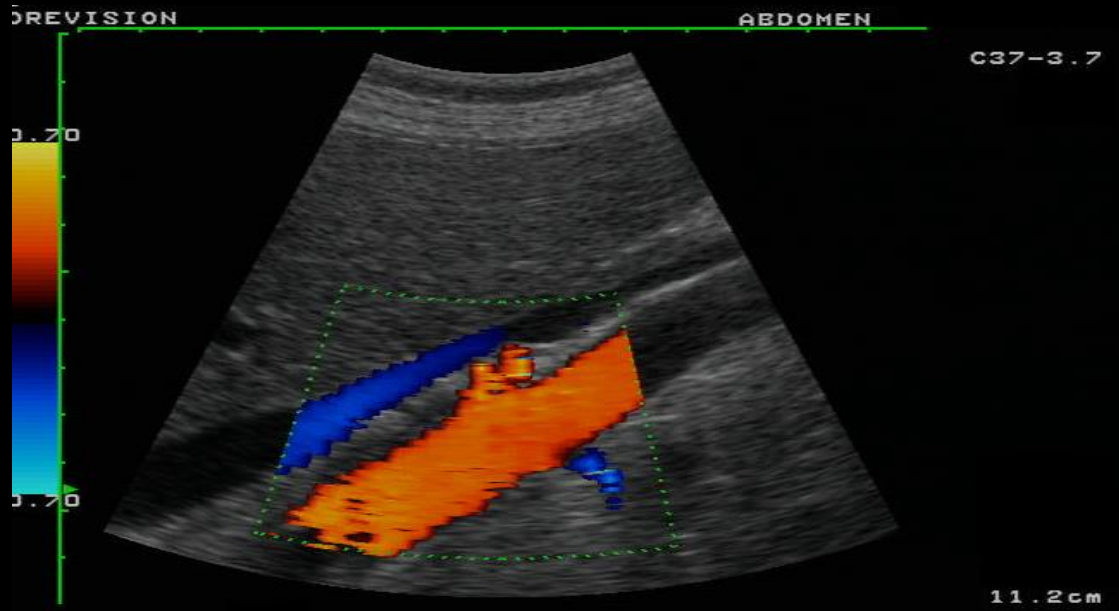
An-echoic = Black

Acoustic shadow: black band behind dense object (e.g. stone)



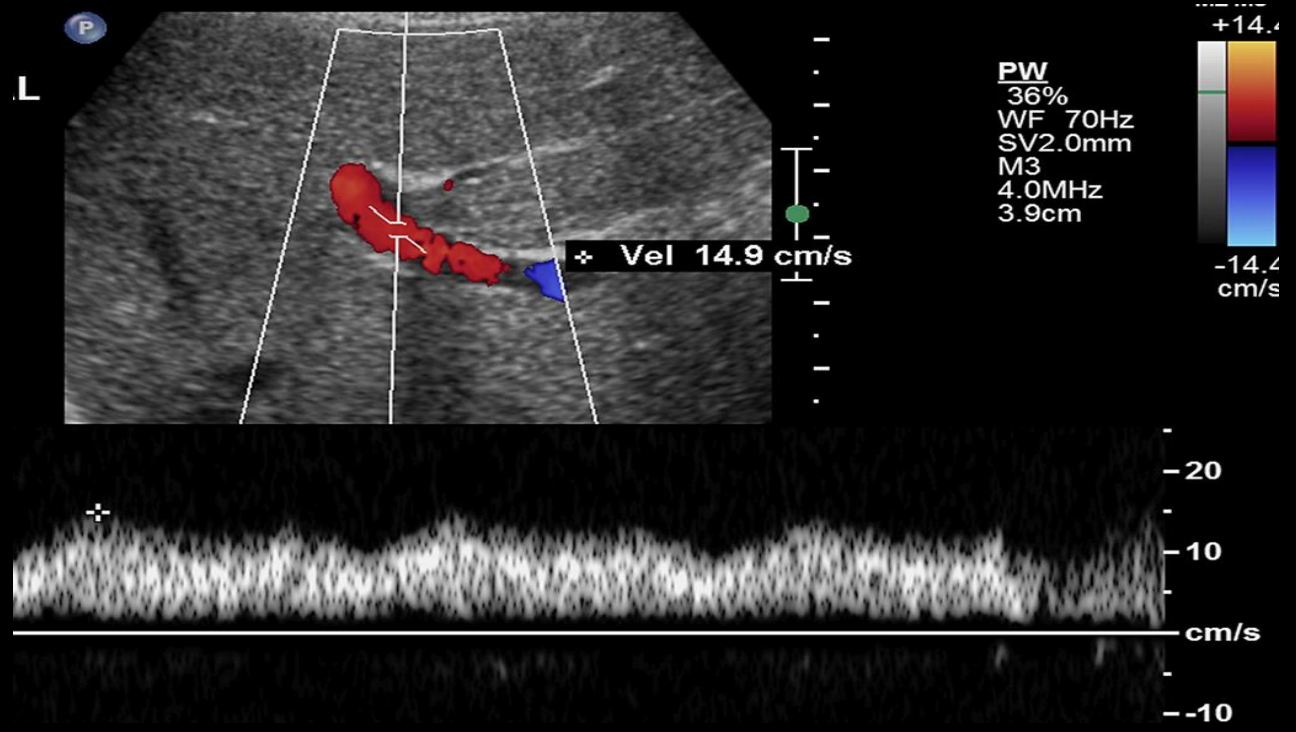
B- MODE

DUPLEX



COLOR DOPPLER

B- MODE



DUPLEX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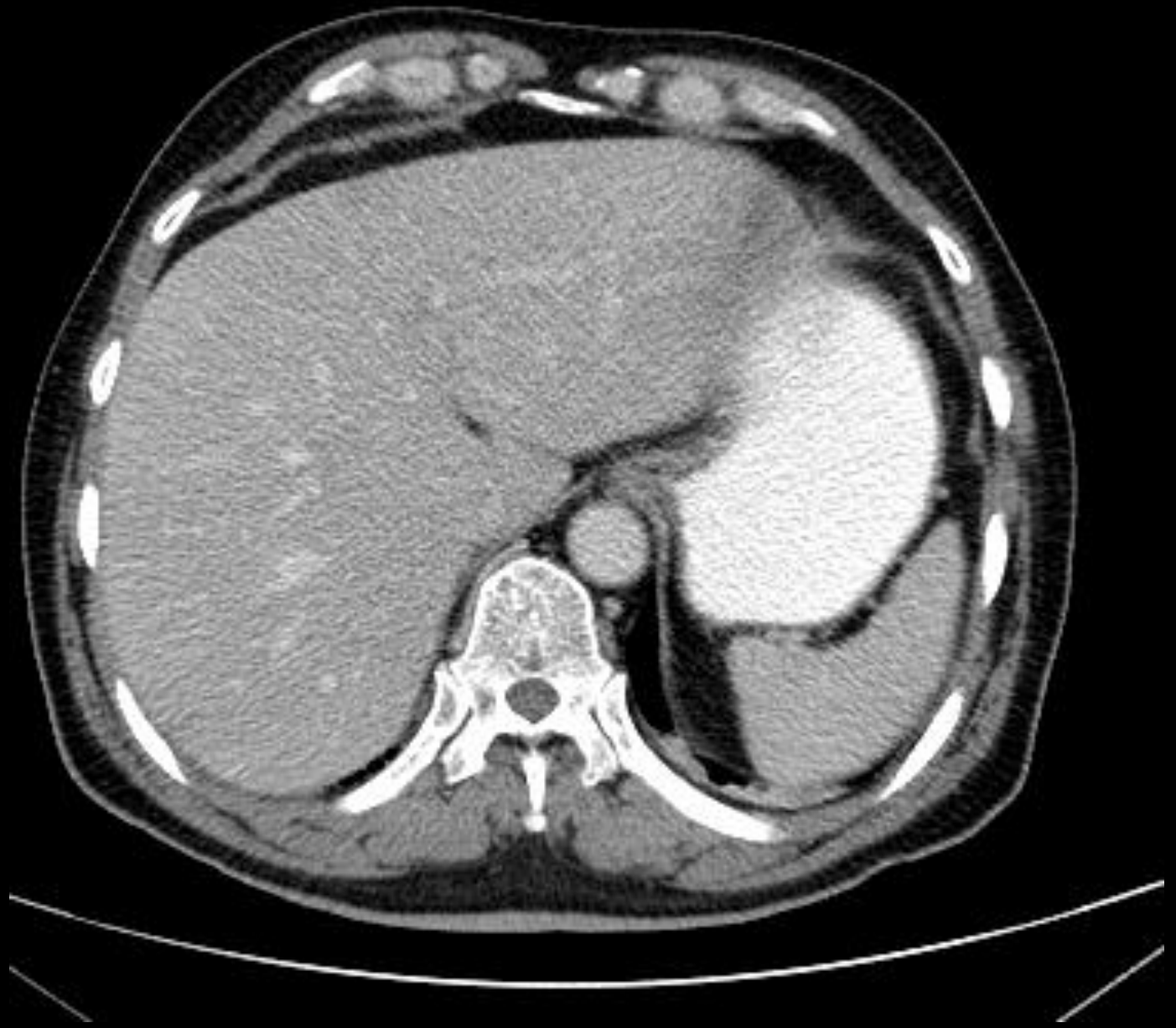
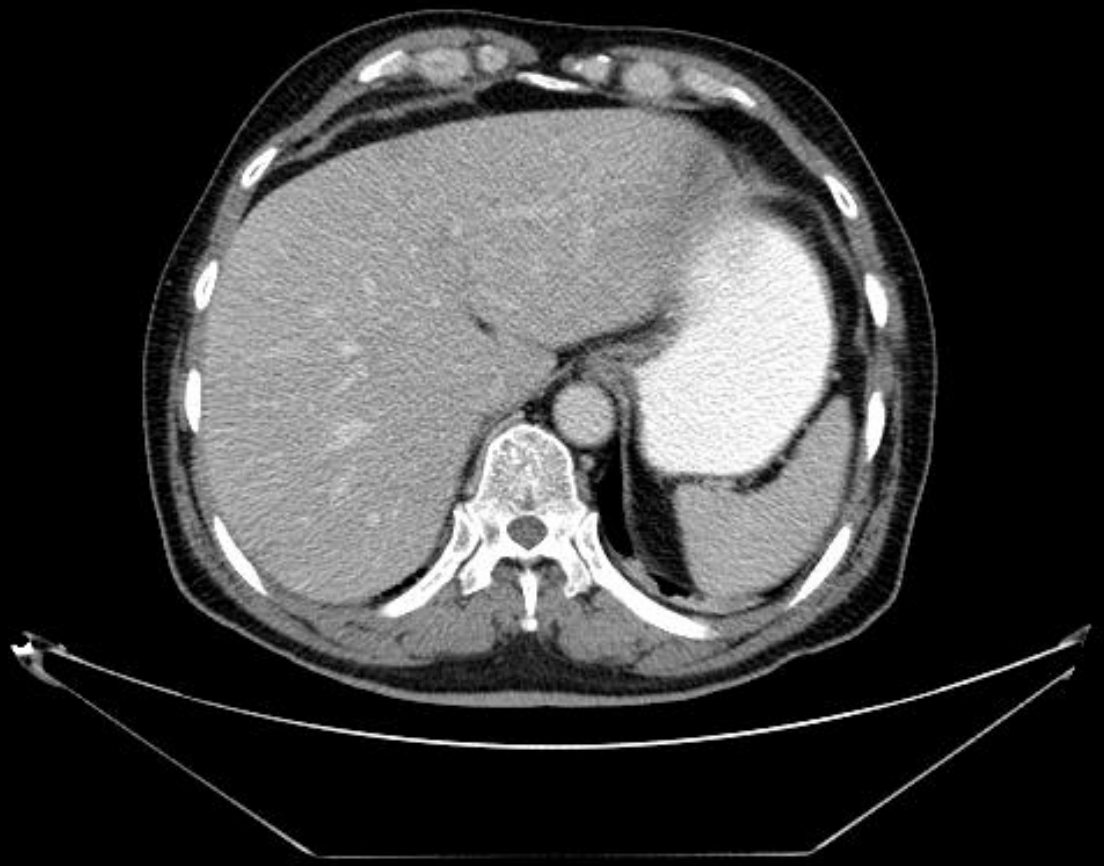
GALLBLADDER

What is this?



What is this?

CT scan = Computed Tomography



What is CT scan?

- A CT scan is computer-processing of many ***X-ray images*** taken from different angles to produce cross-sectional images.

- CT scan can be done with and without intravenous IV contrast.

- CT scan is limited in evaluating gallstones, ***Why?***

What is different between the two images?

What is different between the tow iamges?

Without IV contrast

With IV contrast

Computed tomography CT scan:

Advantages:

- Very good in evaluating soft tissues and solid organs.
- Available more then MRI.

Disadvantages:

- Use ionizing radiation.
- Less available then x-ray and US.
- Relatively expansive.
- Intravenous contrast maybe harmful in patient with impaired renal function..

CT language

- **Hyper-dense = white**
- **Hypo-dense=black to grey**

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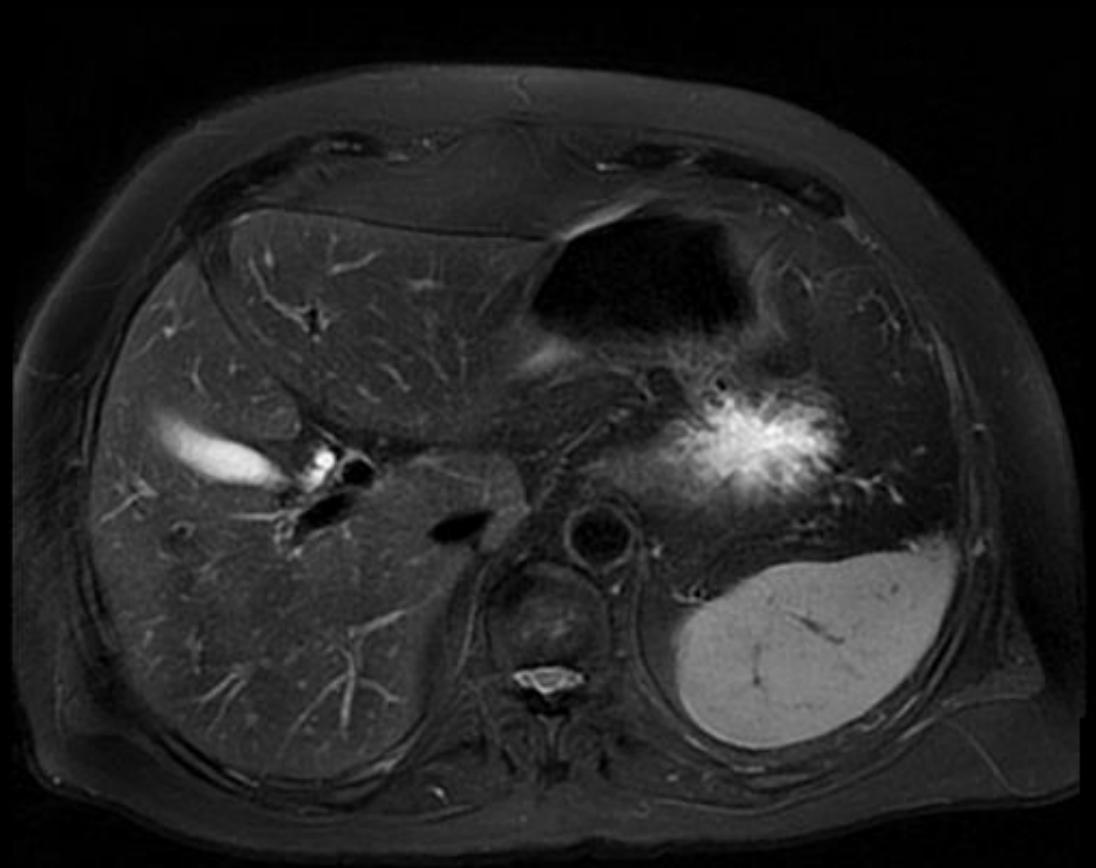
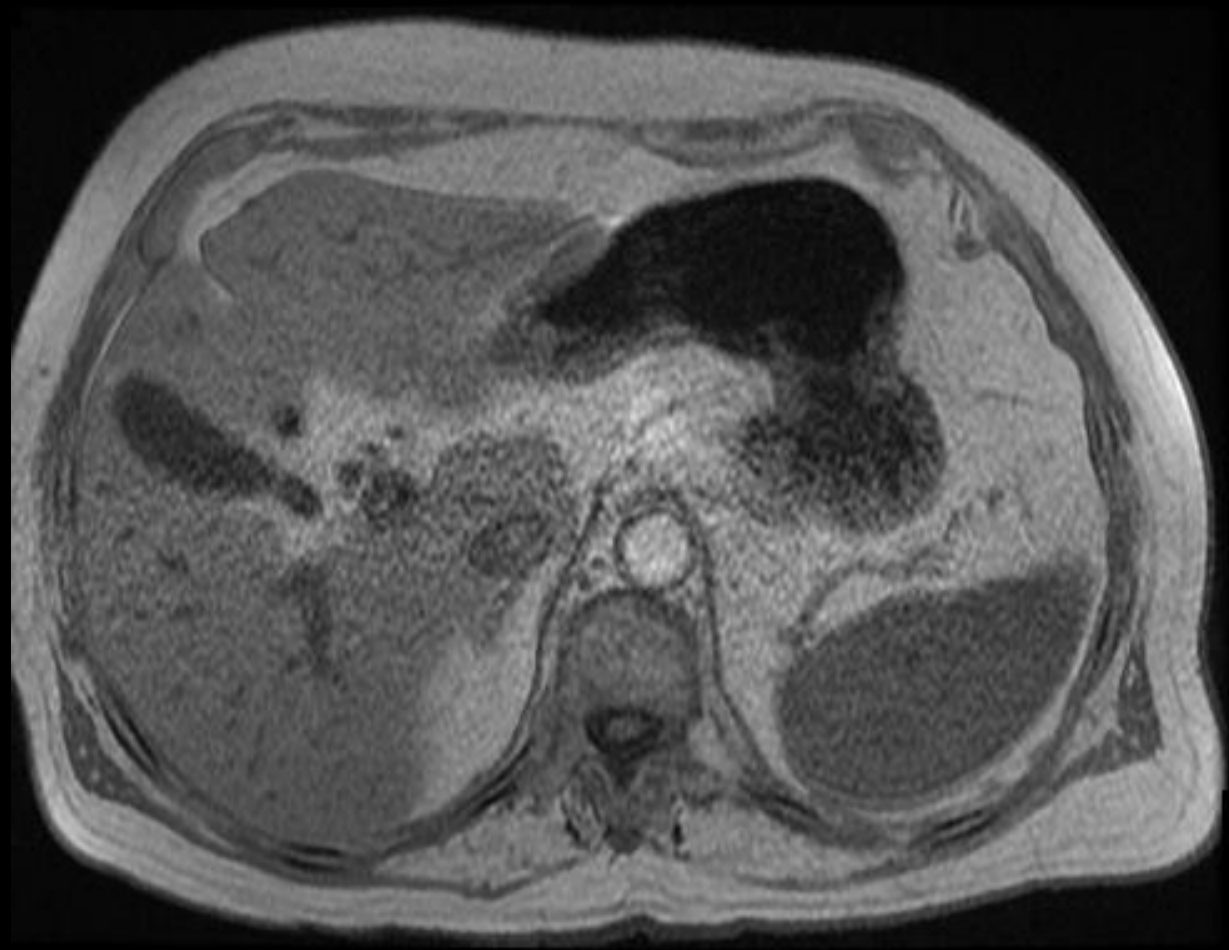
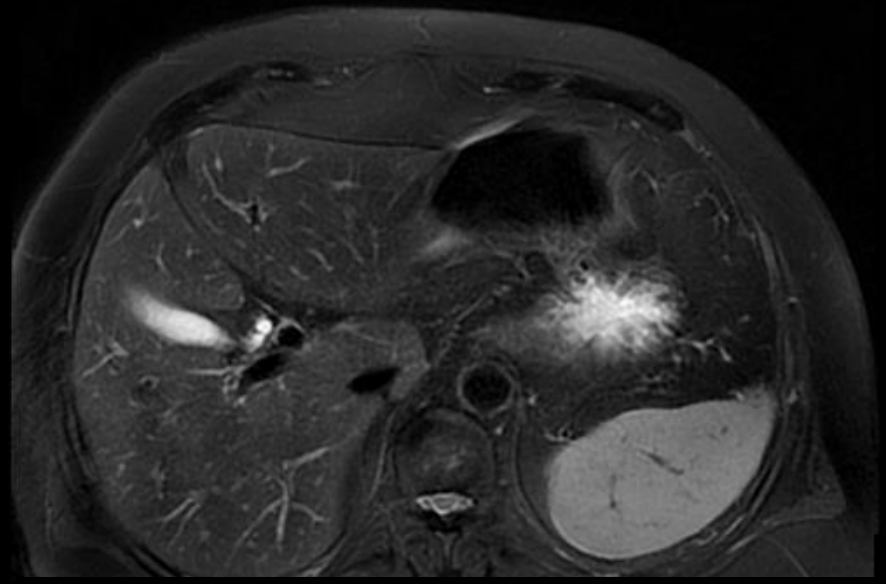
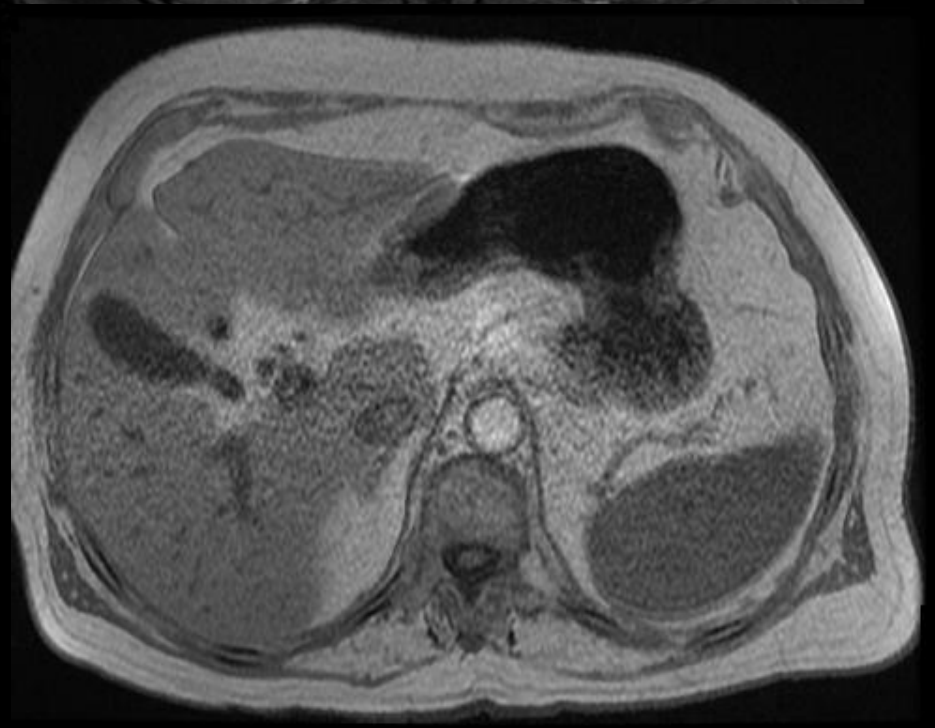




What is this?

Magnetic resonance imaging (MRI)





Magnetic resonance imaging (MRI)

- A medical imaging technique using ***strong magnetic fields*** and ***radio waves*** to form pictures of the human body.

- It has ***no radiation***.

Magnetic resonance imaging (MRI)

Advantages:

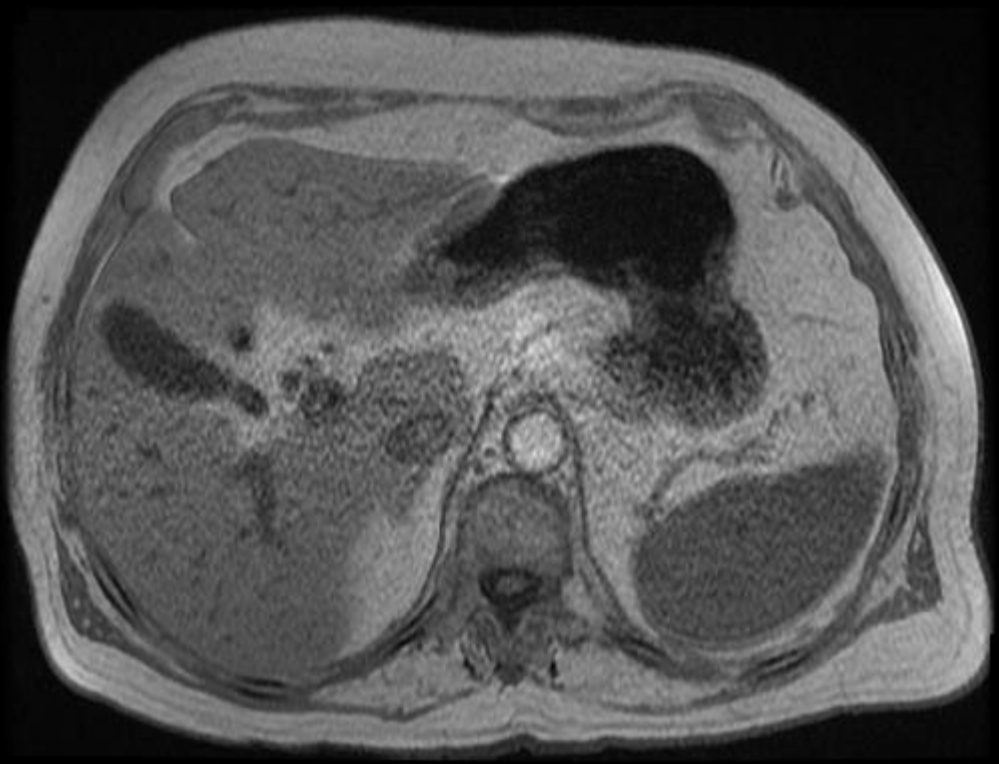
- Excellent in showing tissue details.
- No ionizing radiation.

Disadvantages:

- Expensive.
- Long scan time.
- Less available then other modalities.
- Intravenous contrast could not be safe with impaired renal function.

MRI language

- Hyper intense signal = more white
- Hypo intense signal = more grey/black



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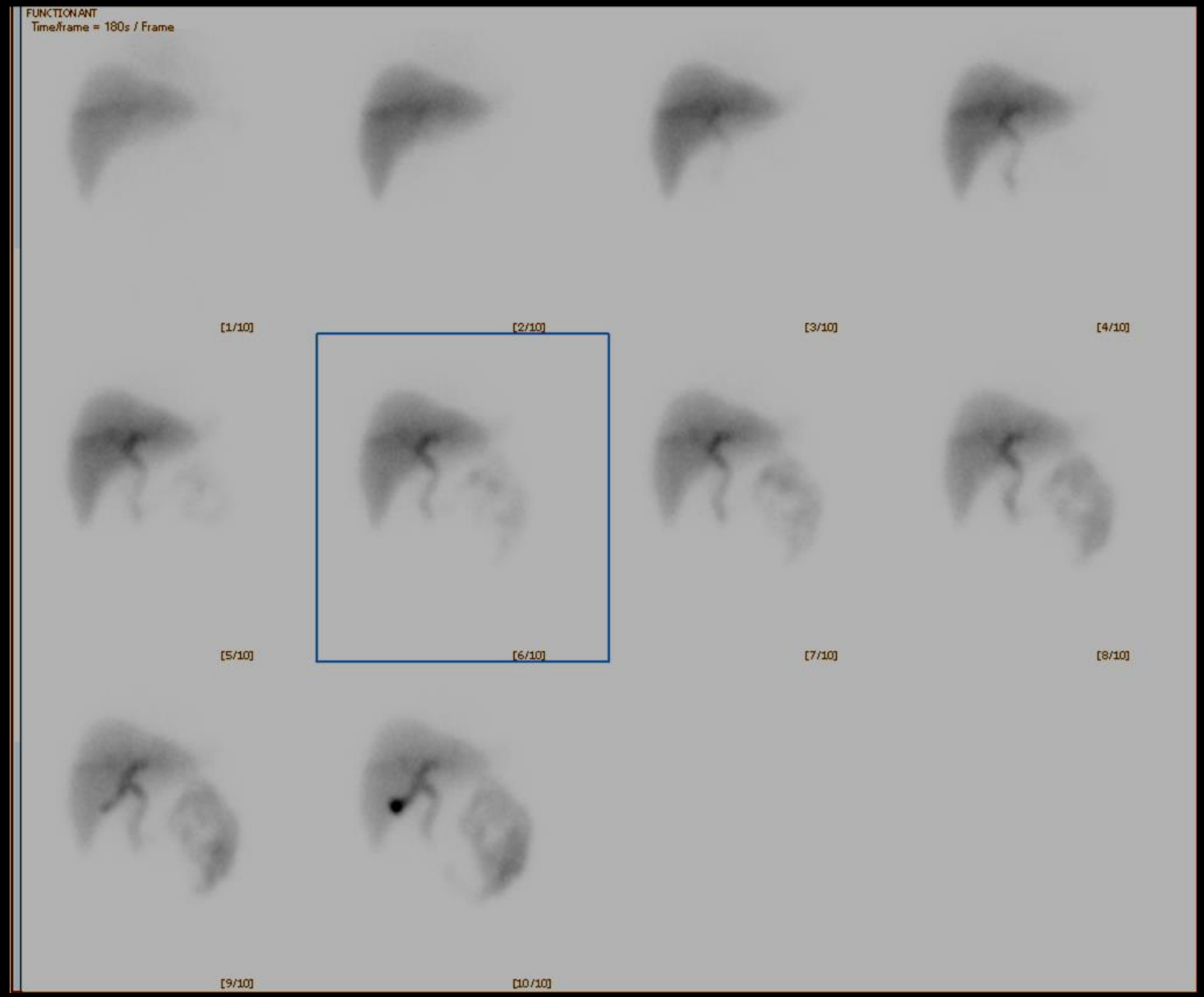
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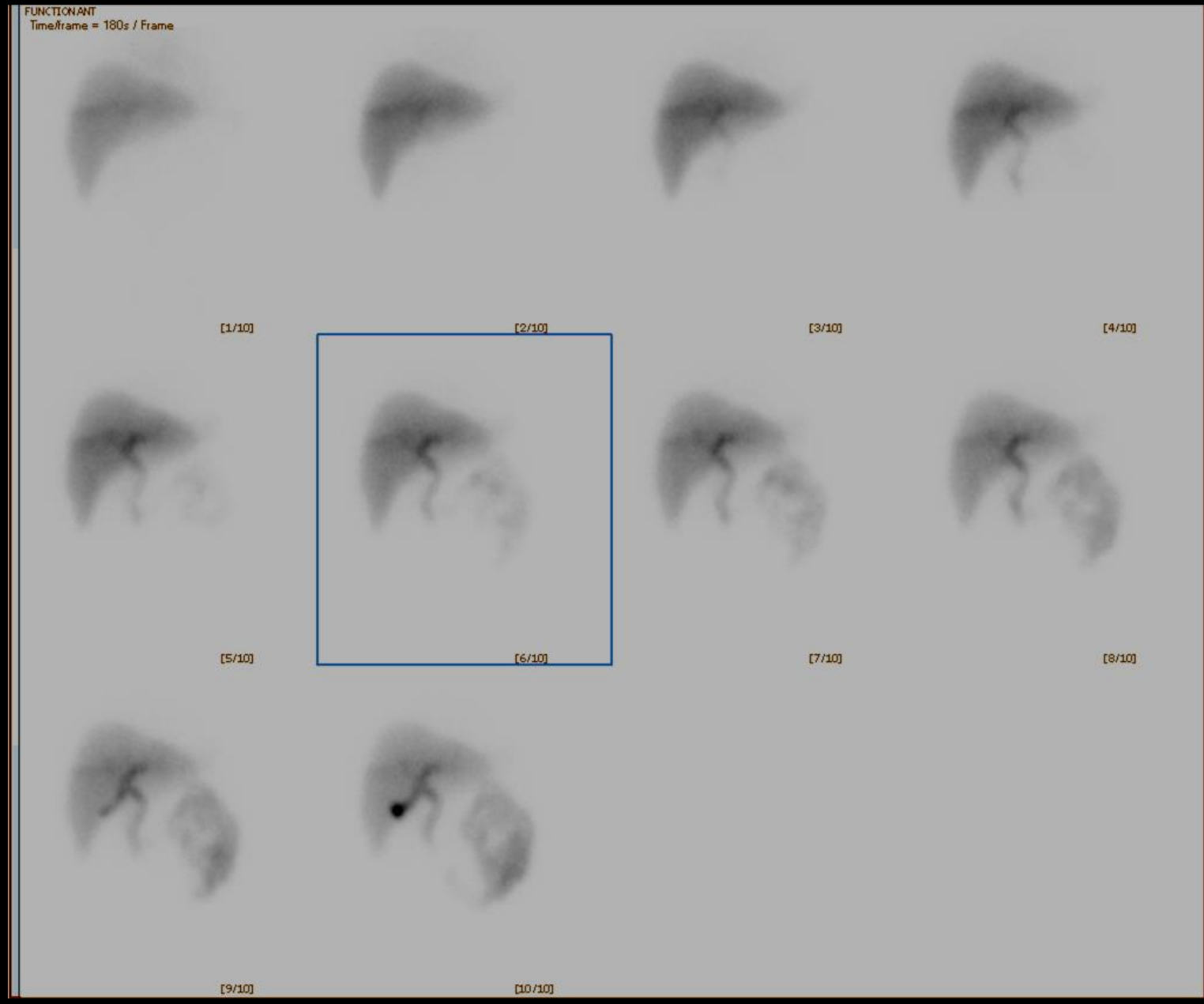
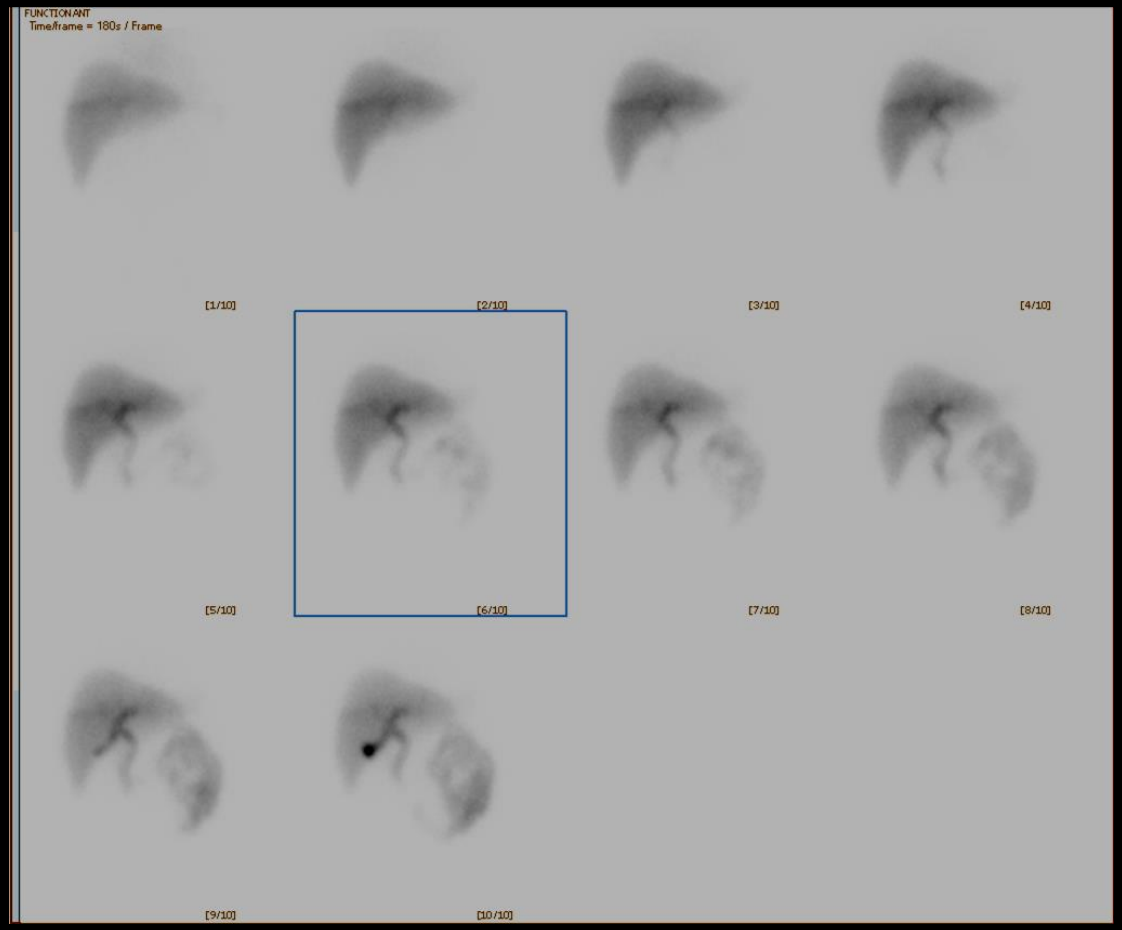
What is this?

Nuclear scan



What is nuclear medicine?

Medical specialty involving the application
of radioactive substances in the diagnosis and treatment
of disease.



Nuclear medicine:

Advantages:

- Excellent in evaluating body organs function/physiology.

Disadvantages:

- Use ionizing radiation.
- Not widely available.
- Poor in evaluating anatomy.

THANK YOU