
بسم الله الرحمن الرحيم

Radiology Introduction

For 5th year Students

2019

BY

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Speaker

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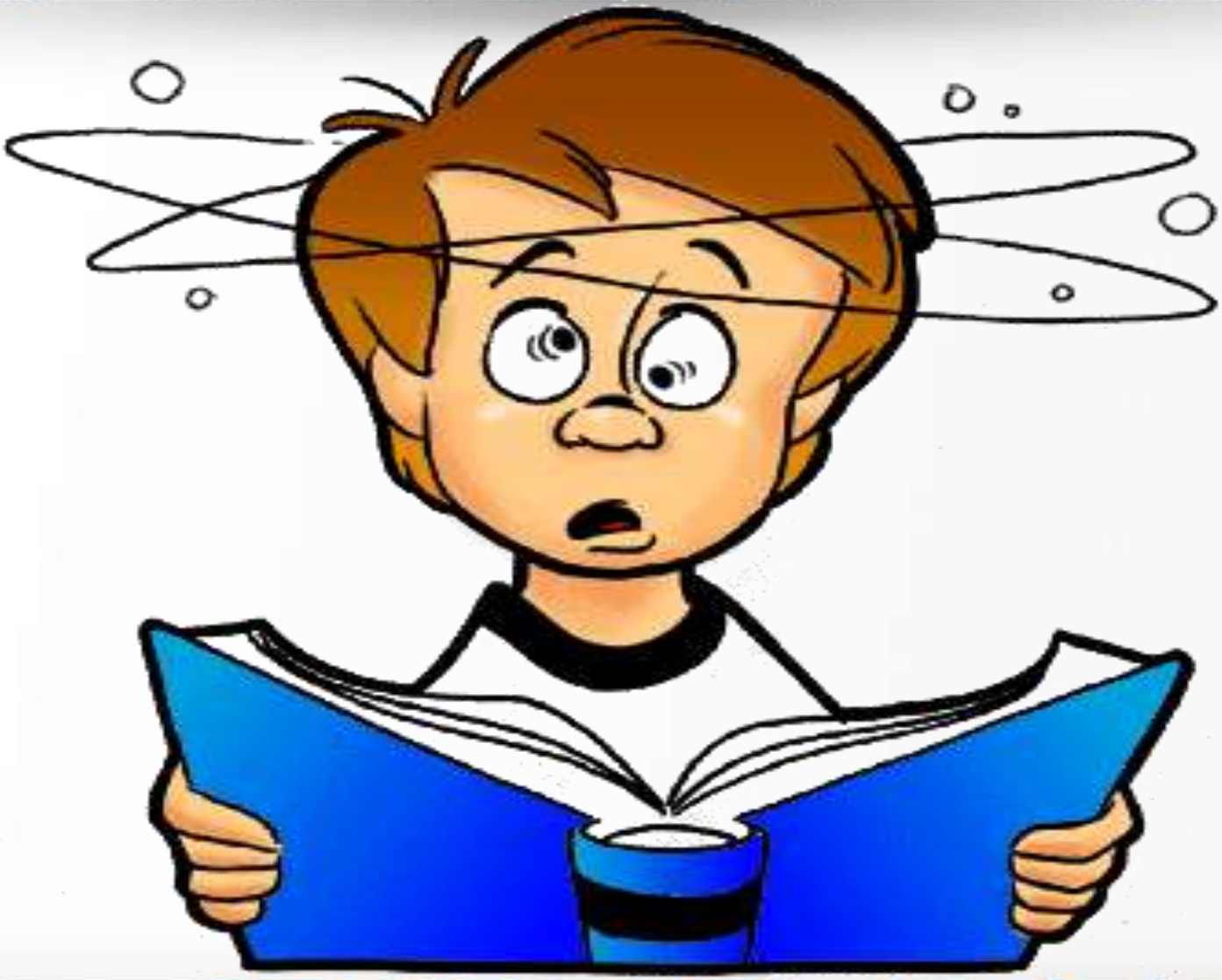
Student & Radiology

- 

Don't Panic

Imaging modalities

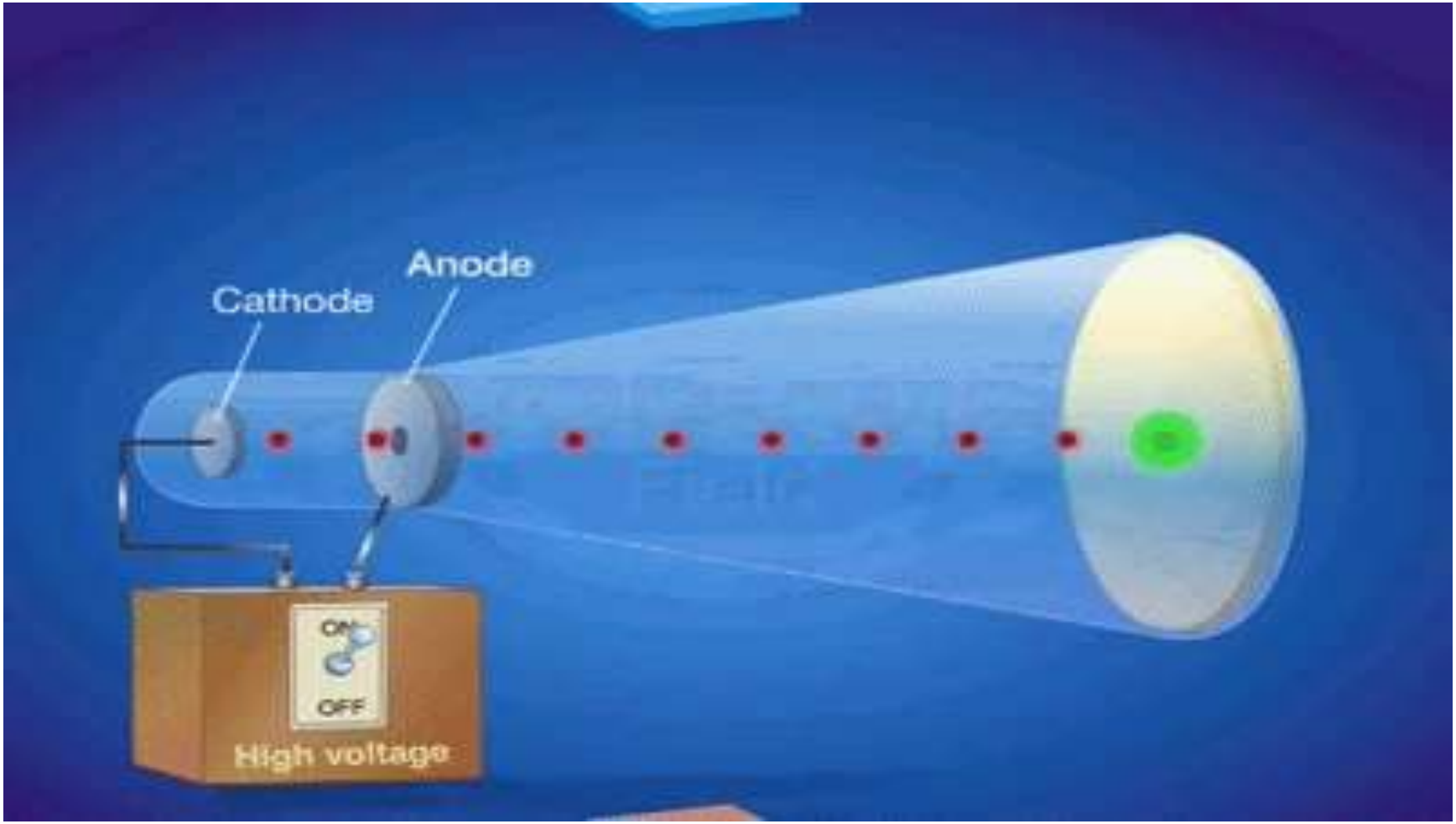
ENUMERATION

- X – Ray
- US
  - Doppler
- CT
- MRI
  - Radioisotope scan
  - PET
  - SPECT

X – RAY

IDEA

CATHODE TUBE → X RAY



ENERGY

X ray

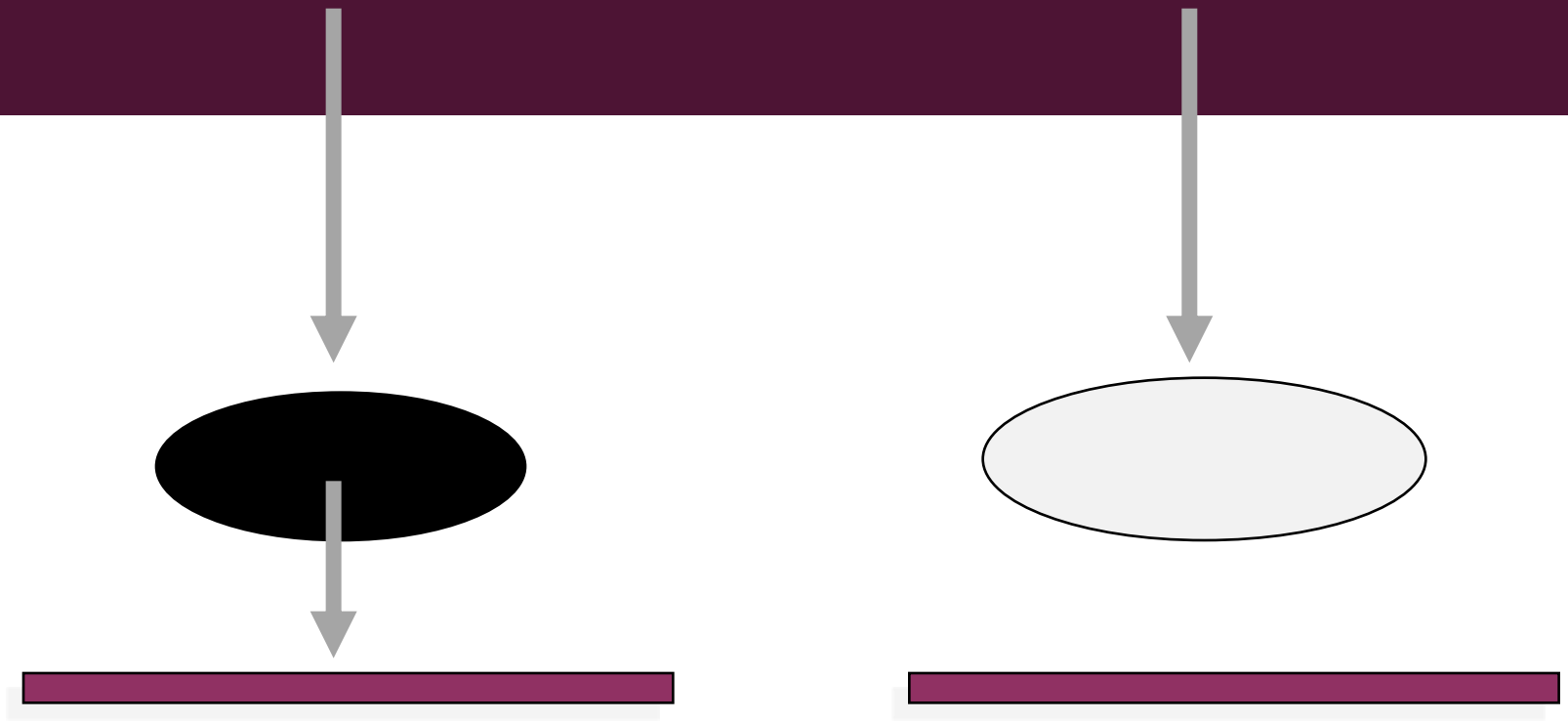
Ionizing radiation

KEY WORD……OPACITY

X-Ray

- **Radio**-opaque / **Radio**-lucent?

X-Ray

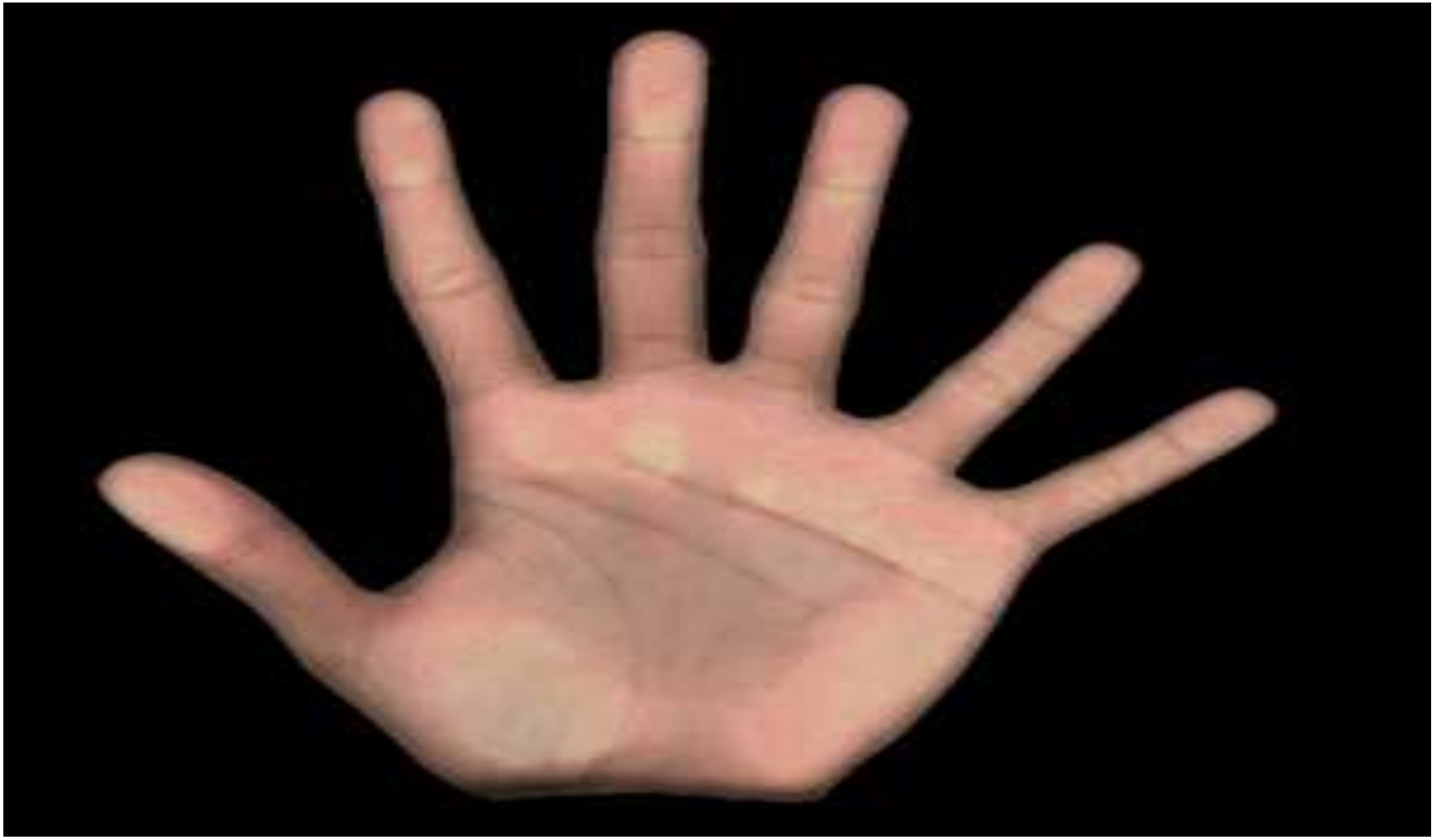


Radio-lucent

Radio-opaque

X-Ray

X-Ray



PLAIN X RAY

- **Skull**
- **CXR**
- **Abdomen**
- **PUT**
- **Spine**
- …… others

X RAY WITH CONTRAST

- GIT **Barium**:
  - Swallow
  - Meal
  - Follow through
  - Enema
- T tube cholangiogram
- Urinary Tract **Urographin**:
  - IVU
  - Ascending
  - Descending

3 -CONTRAST ….WITH / WITHOUT


R
4cm

ULTRASOUND
The modality of Daily Use

THE IDEA IS MAINLY NATURAL ……

US

BAT & Dolphin

are the best US apparatus

US

How Ultrasound Works

KEY WORD……ECHOGENICITY

- Hyper **echoic** …….
- Hypo **echoic** …….or Anechoic

ADVANTAGES

US

- Non Invasive.
- Non **ionizing**.
- Non expensive.
- Portable.
- Real time images.
- For Multi systems.
- Diagnostic & interventional.

NON INVASIVE

PORTABLE

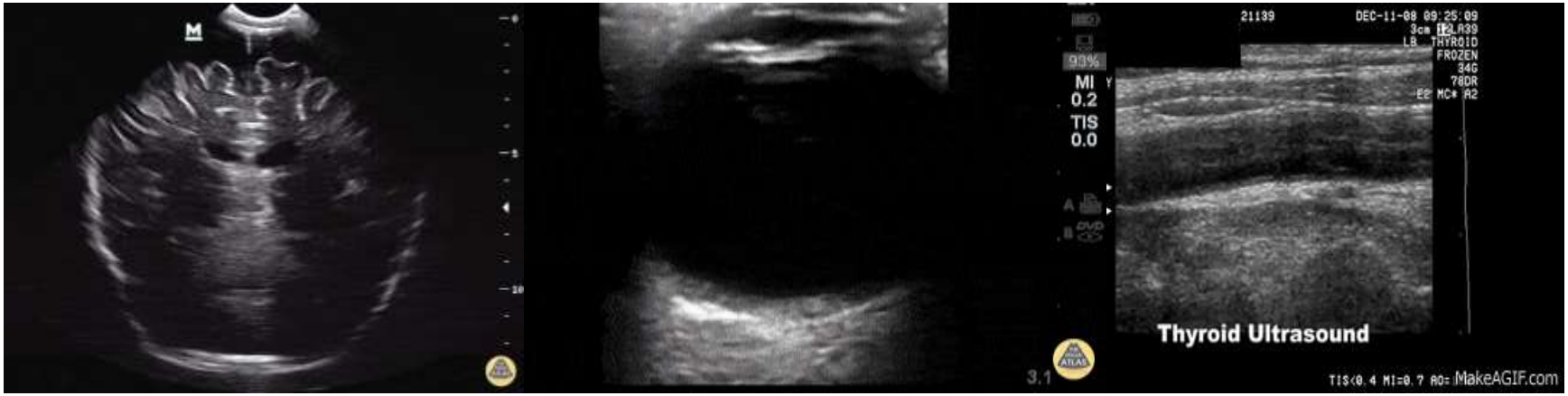
REAL TIME

DIAGNOSTIC & INTERVENTIONAL

- **US** is the most commonly used modality in daily clinical life.
- **US** Has wide rang of use :

- TC US
- Eye
- Neck
- Chest
- **Abdominal**
- scrotal
- TV
- TR
- MSK
- soft tissue

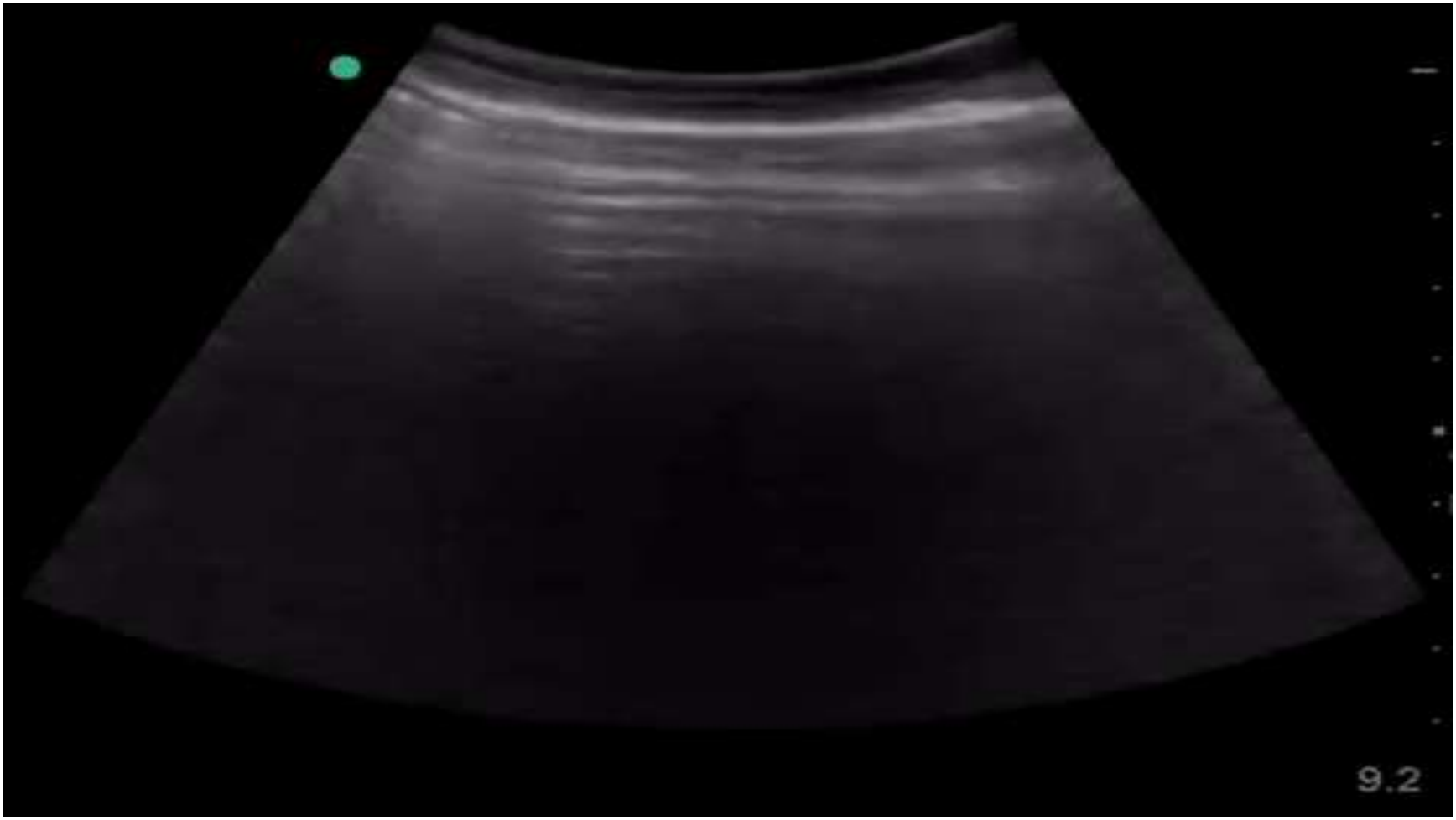
MULTI SYSTEMS

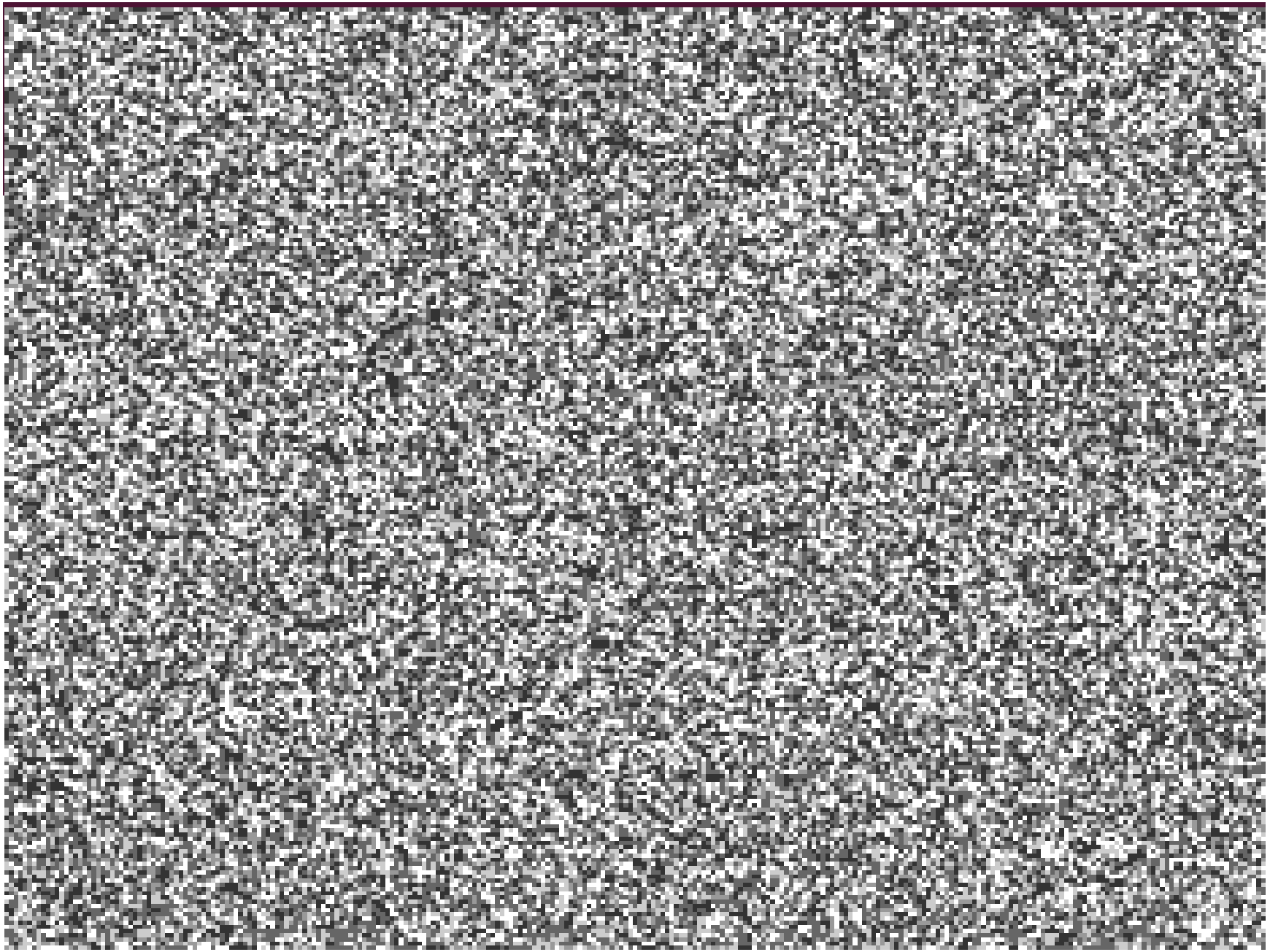


OBSTACLES

- AIR……(**emphysema** …..etc)
- Non co-operation…….(children)
- Bandages.
- Bones……..(eg. T.C. US)
- Hair "relatively"

US & SURGICAL EMPHYSEMA



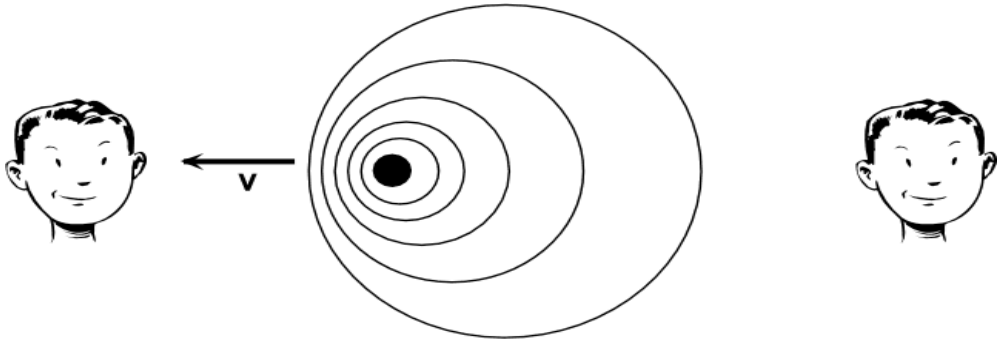


NON COOPERATIVE

DOPPLER

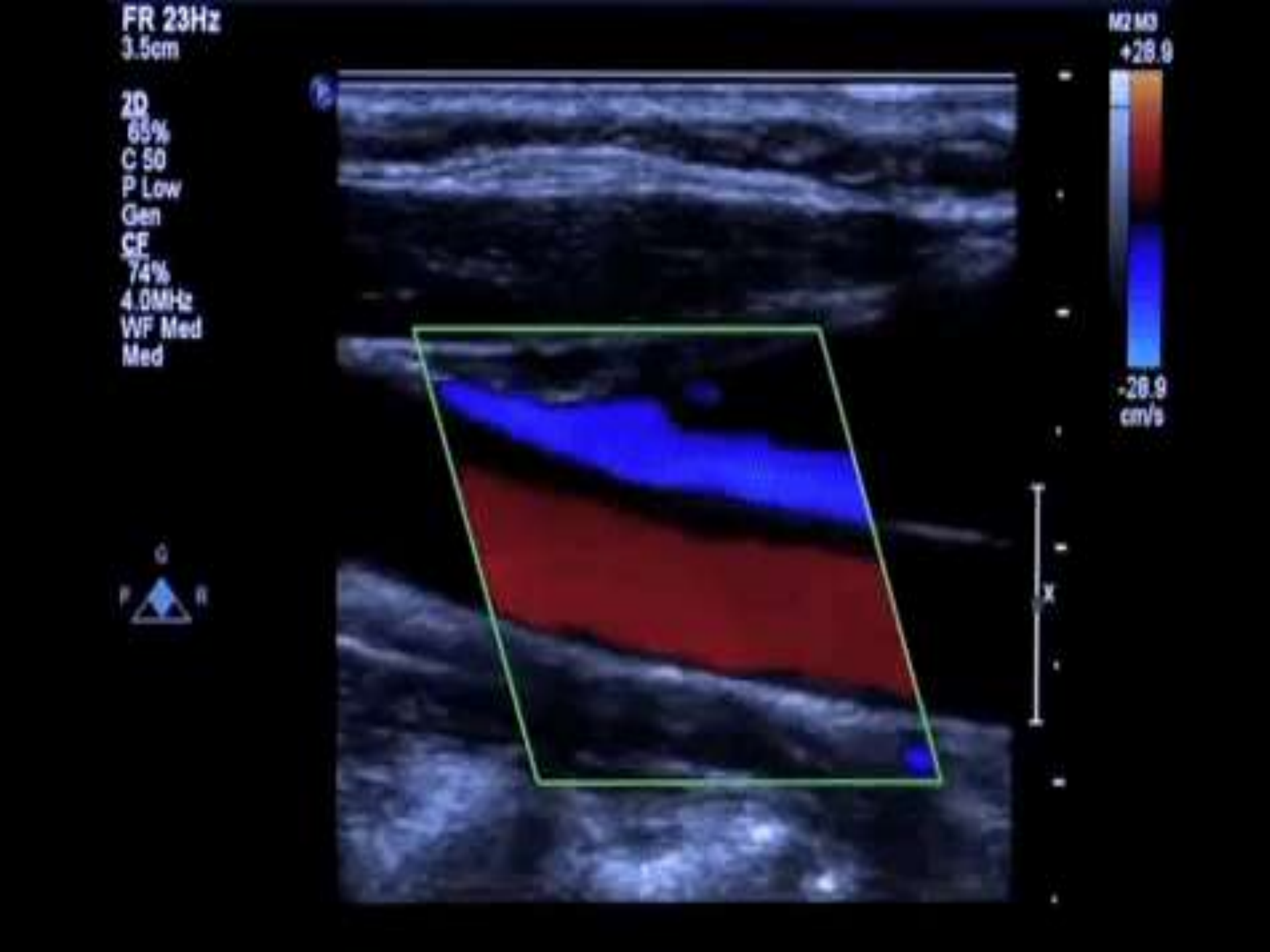
IDEA

➔ Reflected sounds from moving objects has different frequencies.

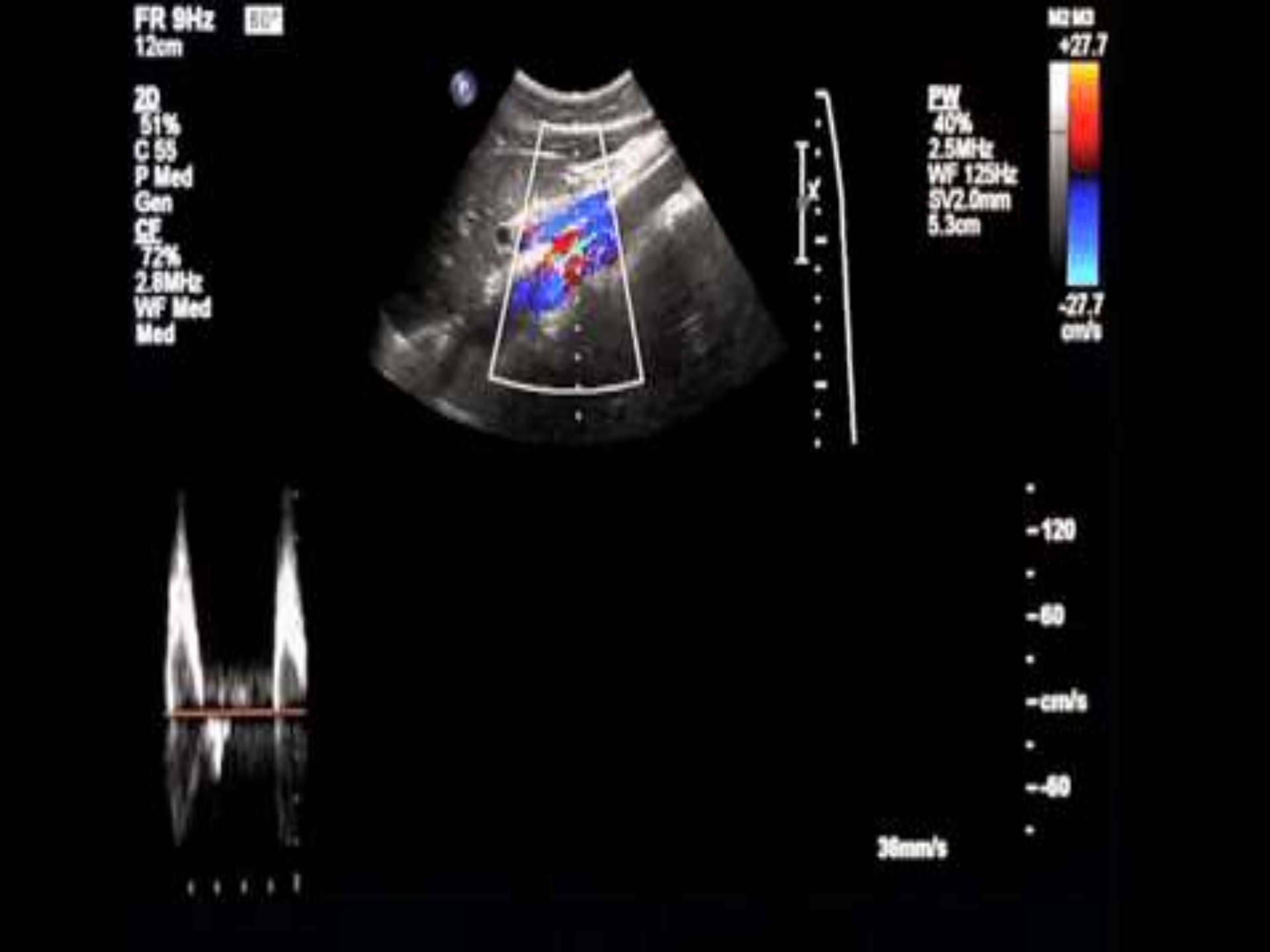


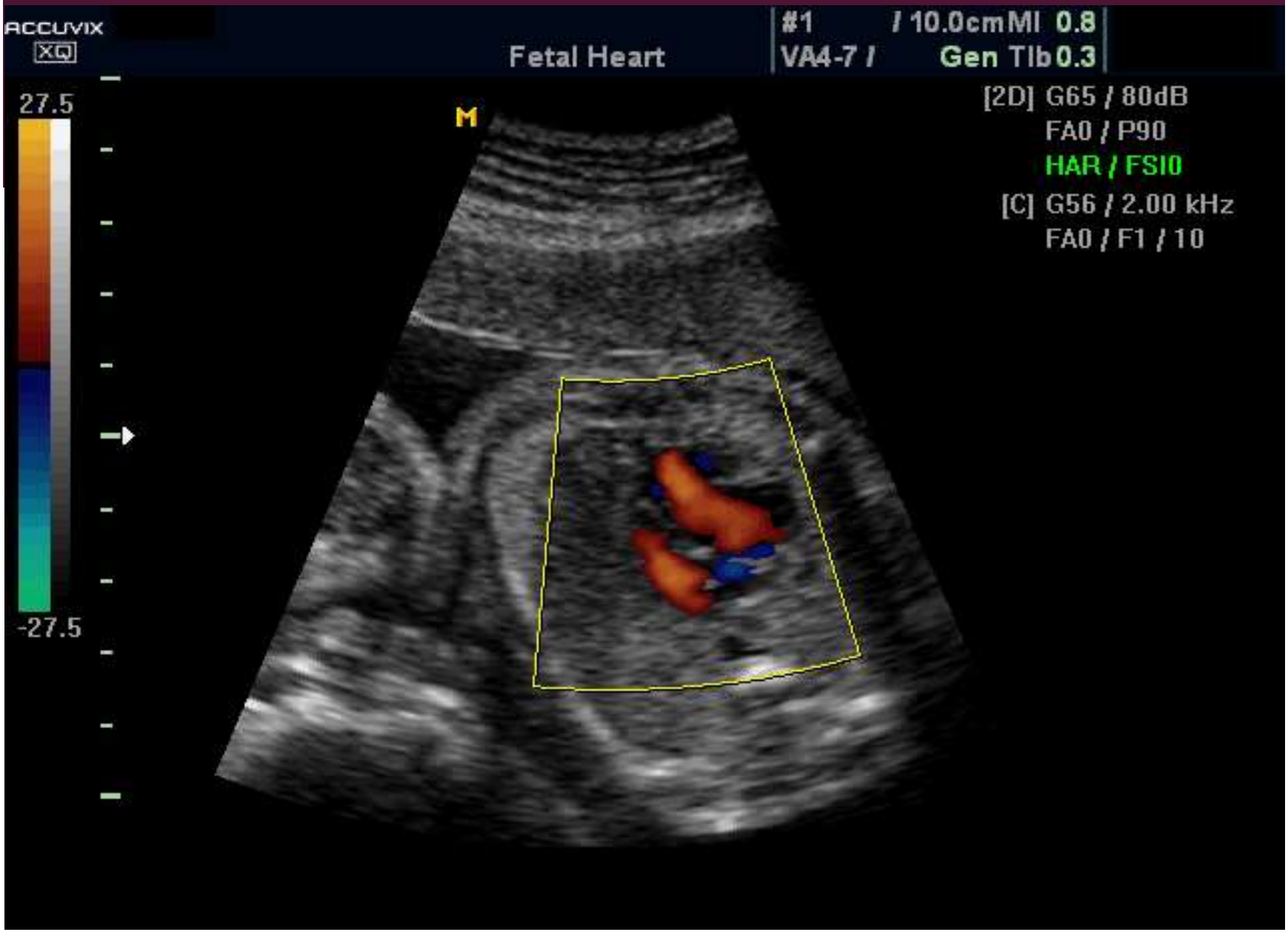
DOPPLER USES :

- **Limbs**
- **Carotid**
- **Portal**
- **Renal**
- **Mesenteric**
- **Scrotal**
- **Fetal:**
  - Umbilical
  - MCA
- ……Others


FR 23Hz
3.5cm
2D
65%
C 50
P Low
Gen
CE
74%
4.0MHz
WF Med
Med
M2 M3
+28.9
-28.9
cm/s


FR 11Hz
12cm
2D
53%
C 55
P Med
Gen
CE
80%
2.8MHz
WF Med
Med
M2 M3
+15.4
-15.4
cm/s
G
P
R


FR 9Hz
12cm
2D
51%
C 55
P Med
Gen
CE
72%
2.8MHz
WF Med
Med
PW
40%
2.5MHz
WF 125Hz
SV2.0mm
5.3cm
+27.7
-27.7
cm/s
-120
-60
-cm/s
-60
36mm/s


ACCUVIX
XQ
Fetal Heart
#1 / 10.0cm MI 0.8
VA4-7 / Gen TIb 0.3
[2D] G65 / 80dB
FA0 / P90
HAR / FSI0
[C] G56 / 2.00 kHz
FA0 / F1 / 10
M
27.5
-27.5

DOPPLER ADVANTAGES :

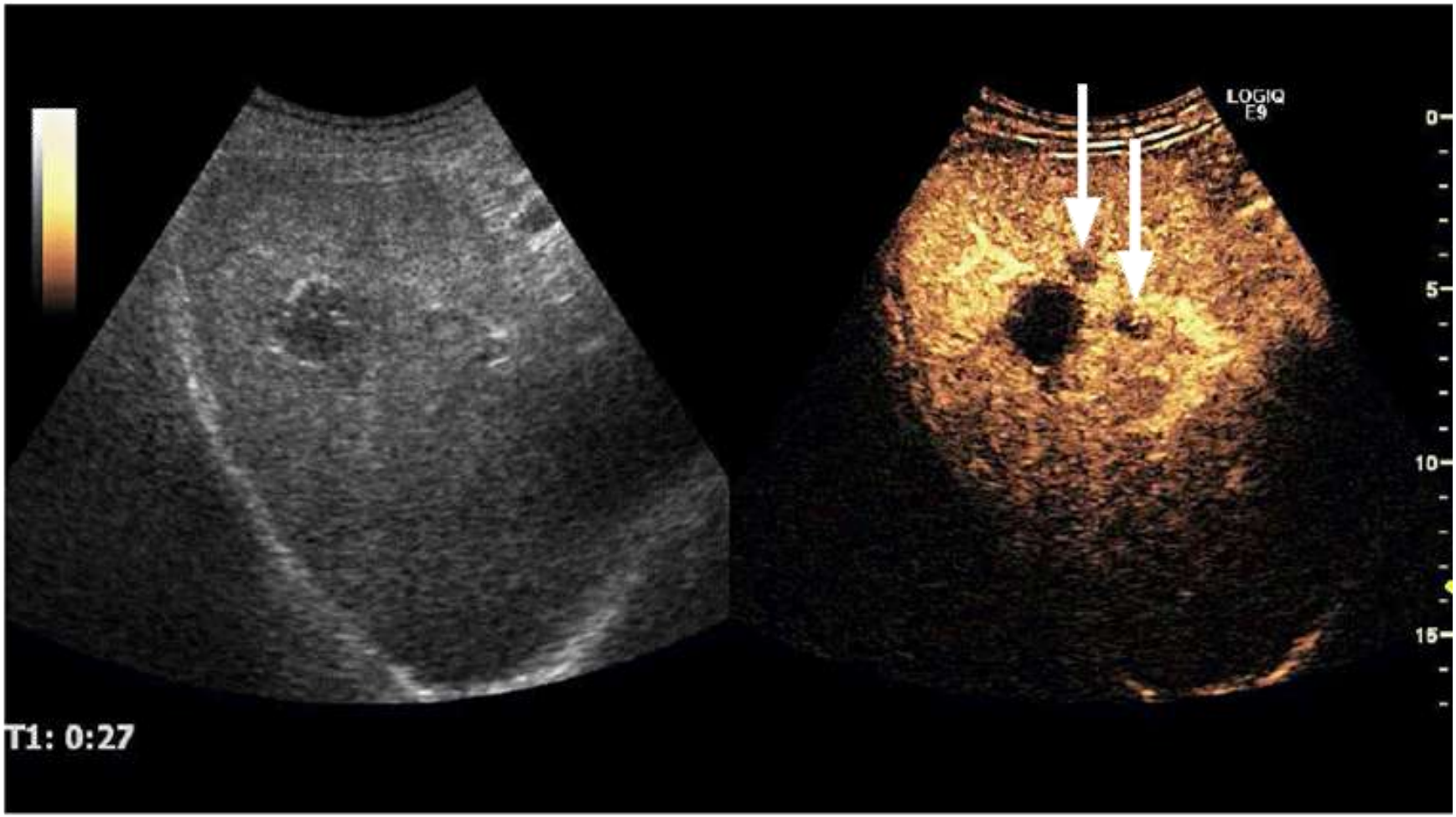
Assessment of :

- **Hemodynamics**
- **Vessels wall & cavity**
- Portable
- non invasive
- Non ionizing

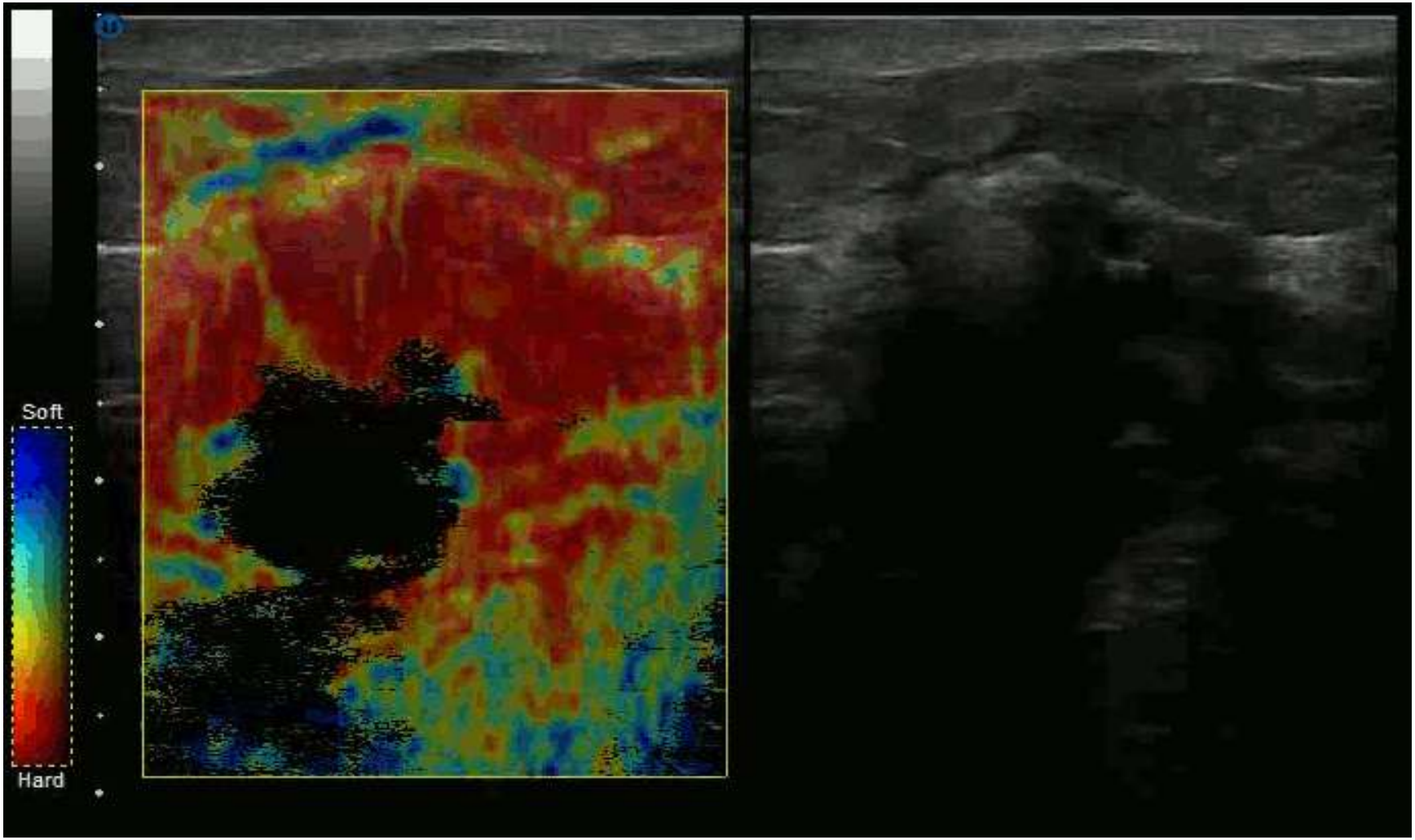
Echo Cardiography

Other US Techniques

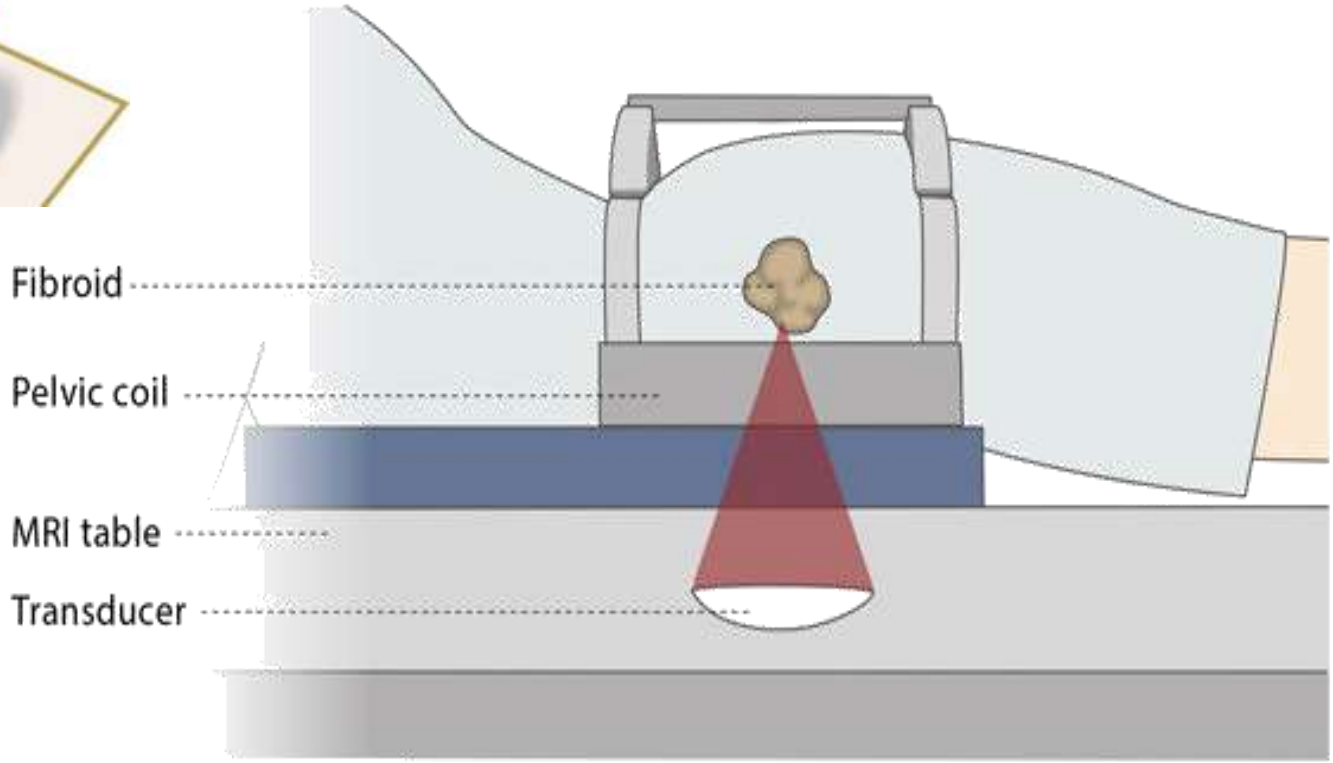
CONTRAST ENHANCED US



ELASTOGRAPHY



HIFU "HIGH INTENSITY FREQUENCY US"



HIFU

Computerized Tomography

BY

CT

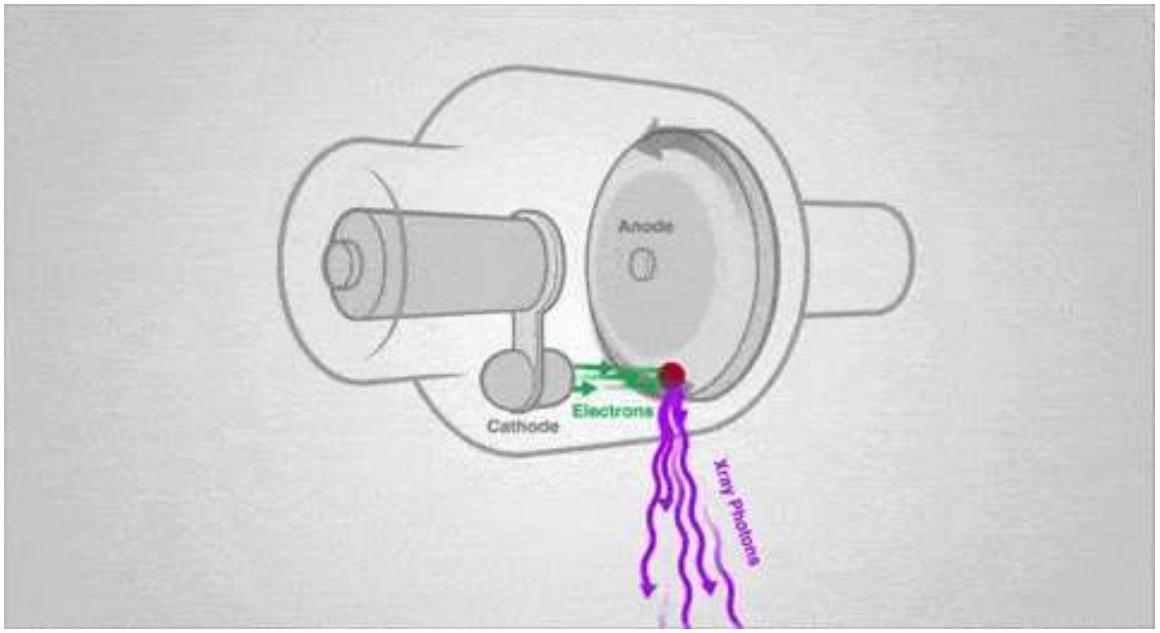
- Dr. G. N. **Hounsfield** in / 1971

Sir Godfrey Hounsfield
1919 - 2004

ENERGY

X ray

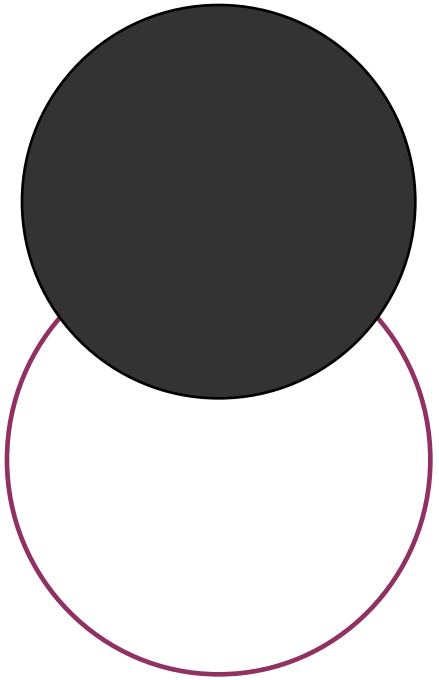
Ionizing Radiation

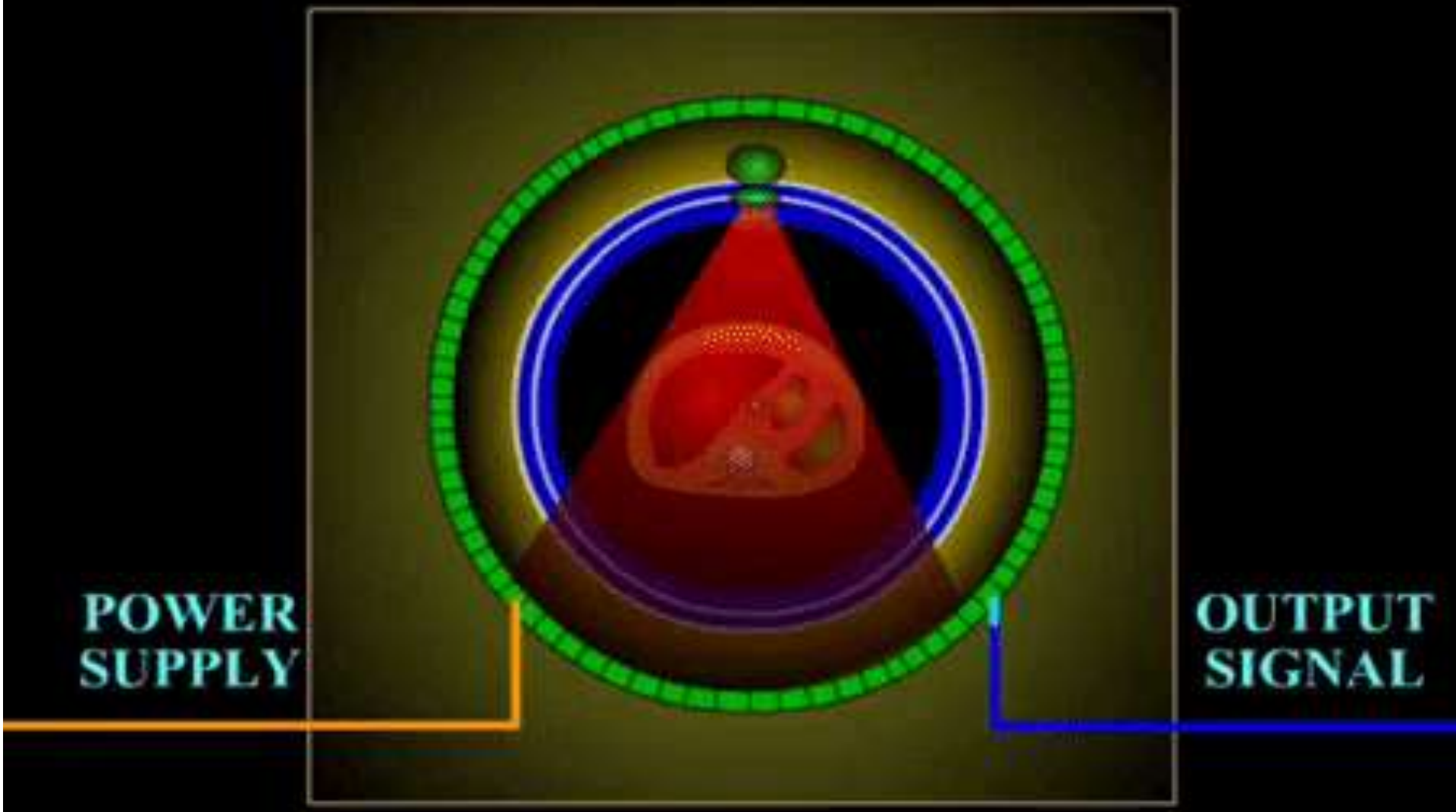


KEY WORD……DENSITY

CT

- **Hyper**
- **Iso** → Dense
- **Hypo**





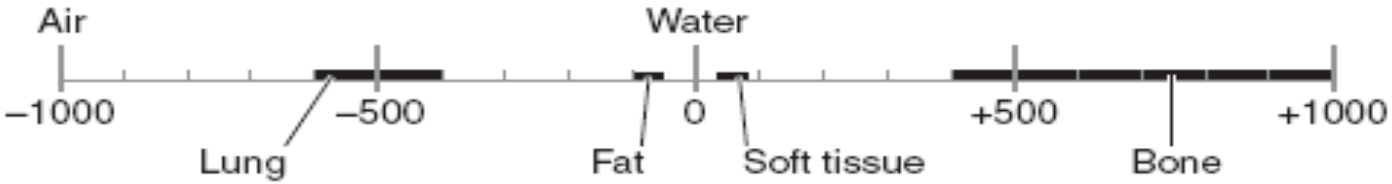
4th Generation

M. Mongkolsuk 11/04/2004


NIH
NIBIB

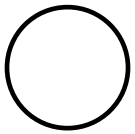
HOUNSFIELD UNIT
HU

The unit of measuring **density** of different objects imaged by CT.



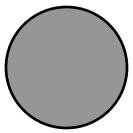
Bone	+400 → +1000
Soft tissue	+40 → +80
Water	0
Fat	–60 → –100
Lung	–400 → –600
Air	–1000

- Hyper dense

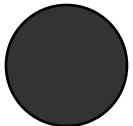


- Iso dense

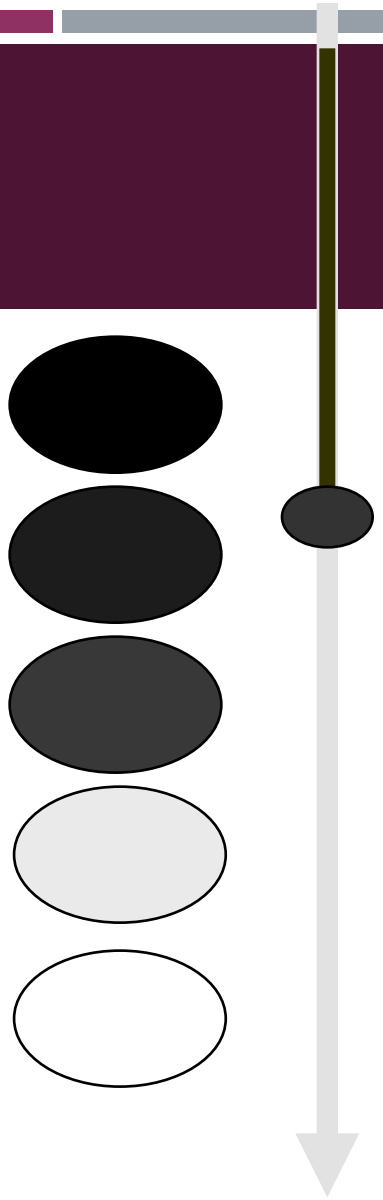
"in comparison with surrounding"



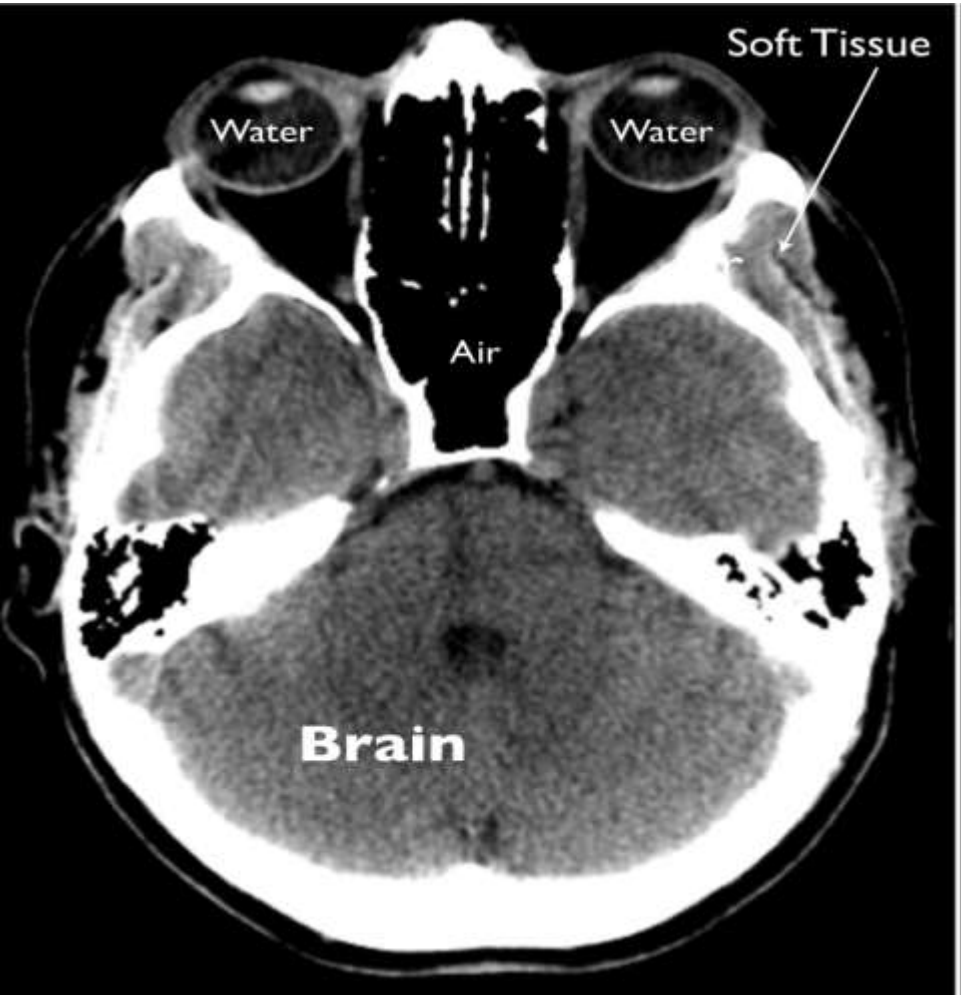
- Hypo dense

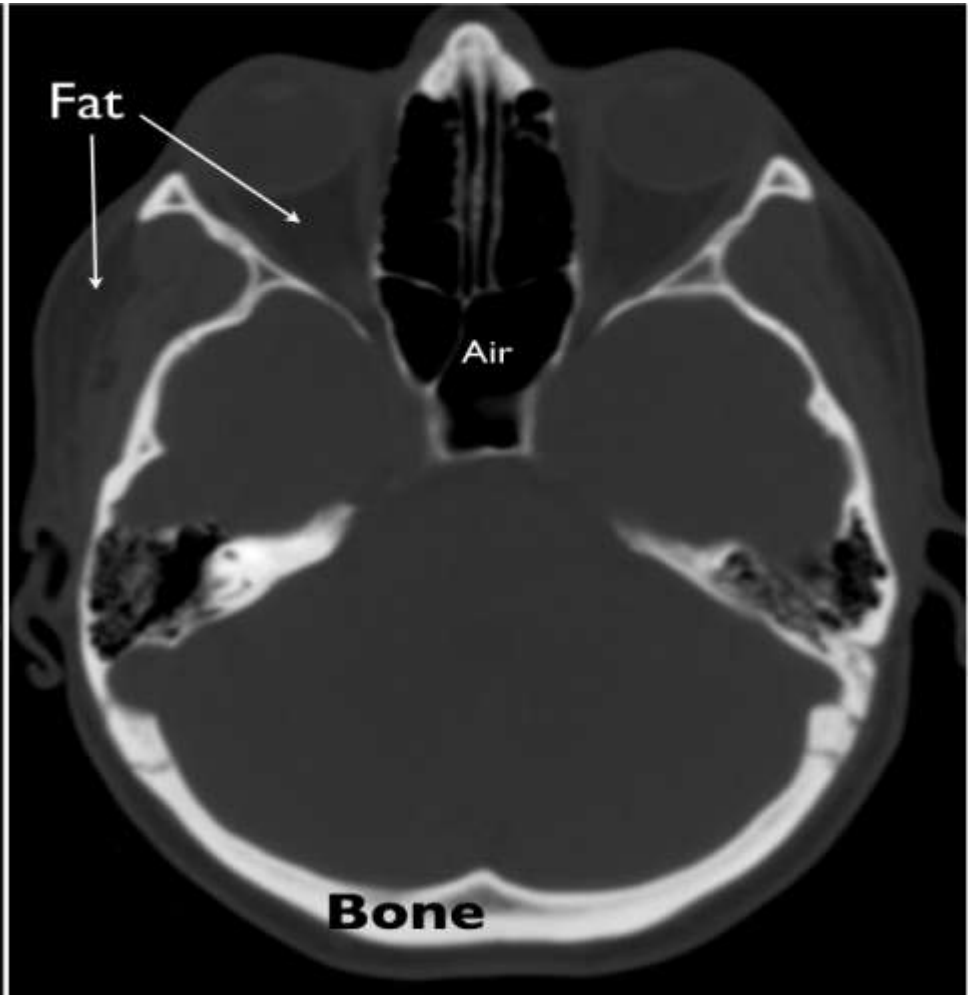


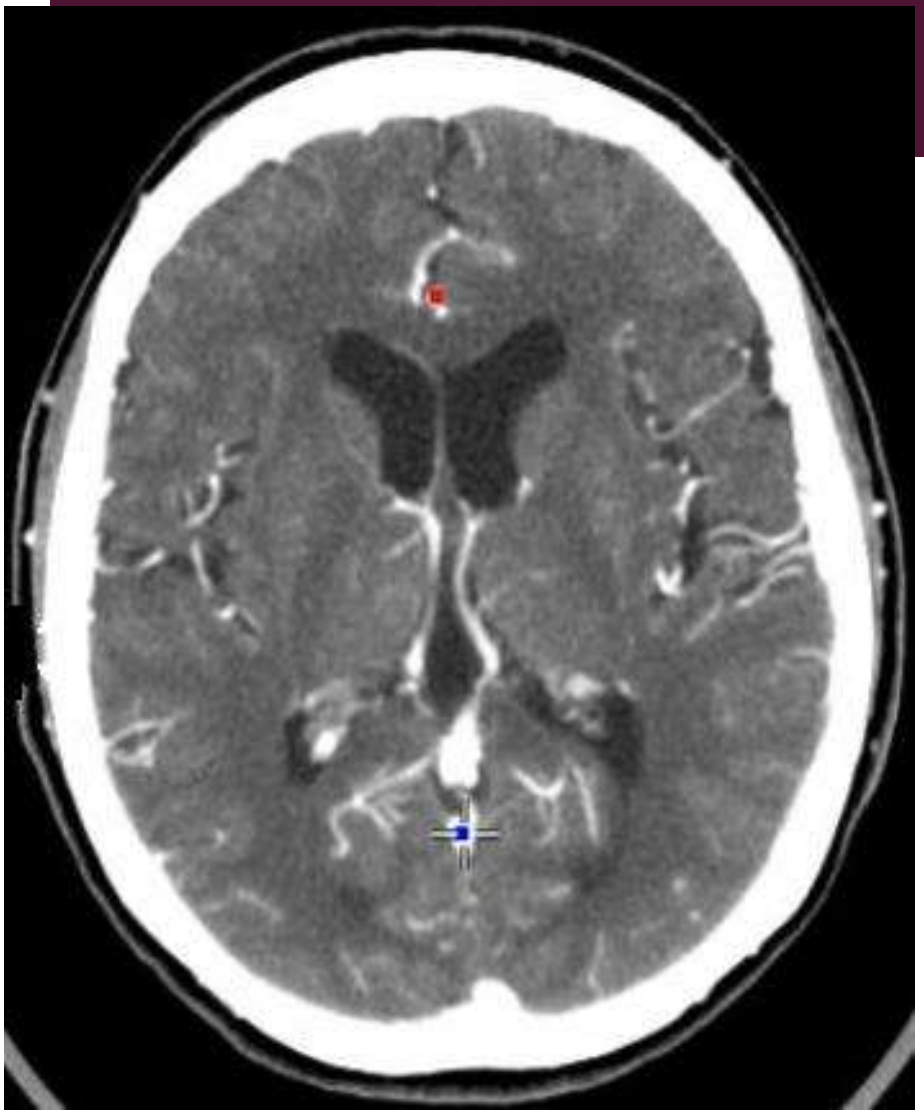
- Air -1000 HU
- Fat -10 : -300
- ***Fluid 0 : 15***
- Recent blood 60 : 90
- Calcification more 100
- Metal > Hundreds



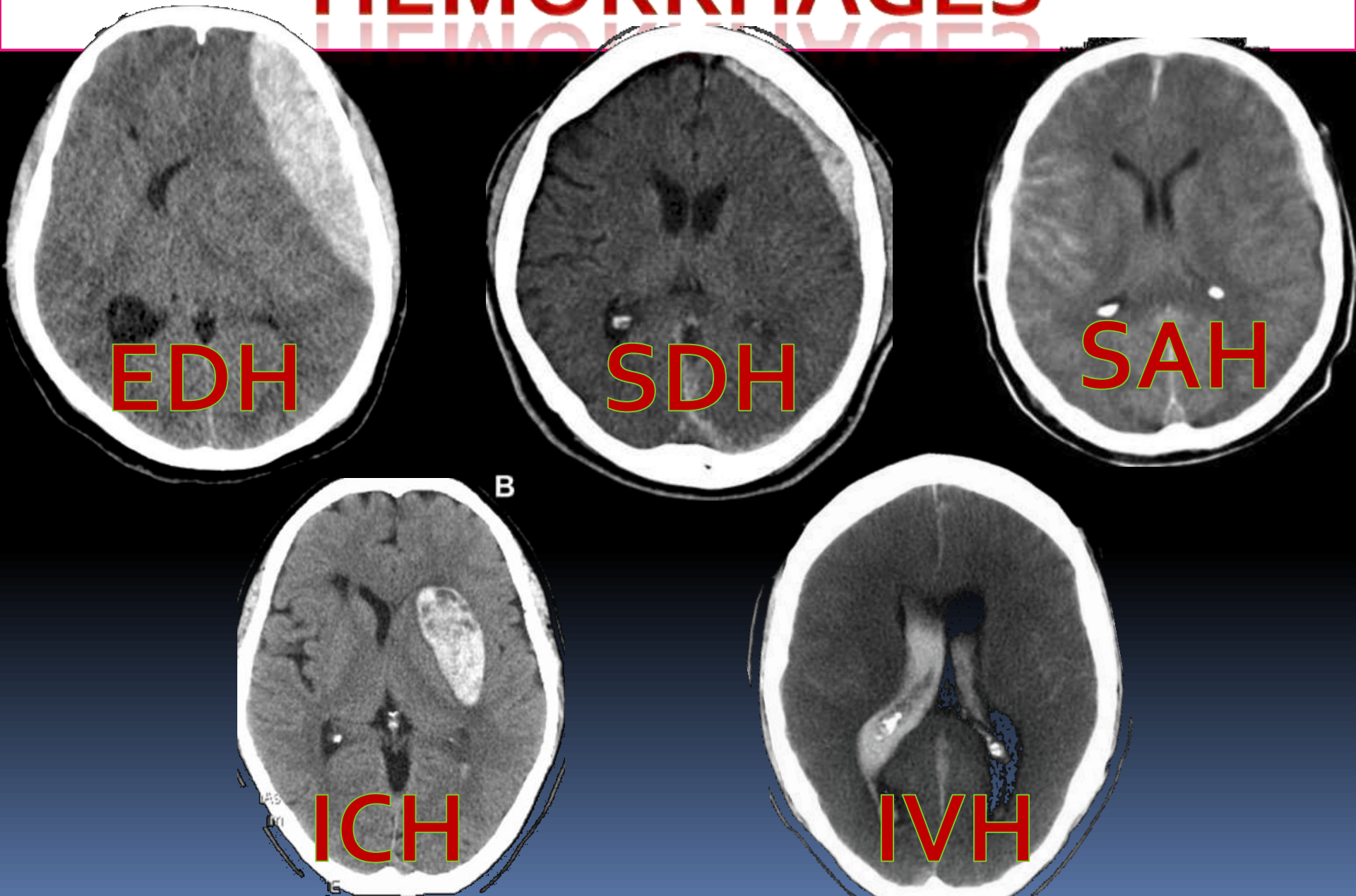
BRAIN WINDOW VS BONE WINDOW





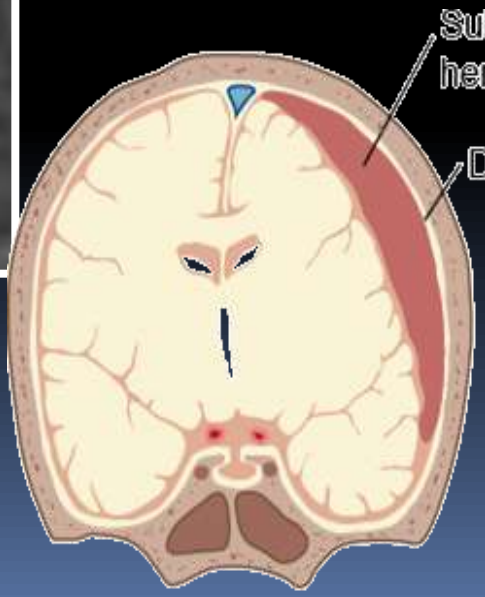


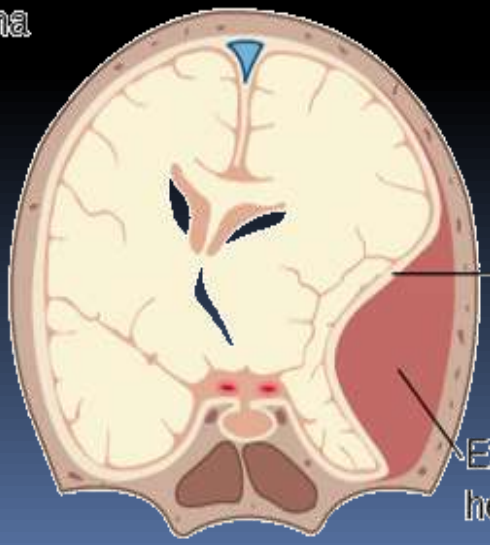
HEMORRHAGES

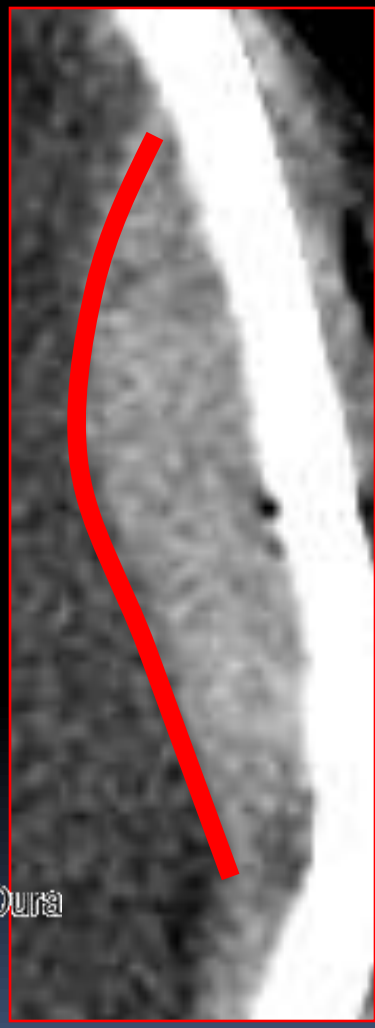


SUB

EXTRA

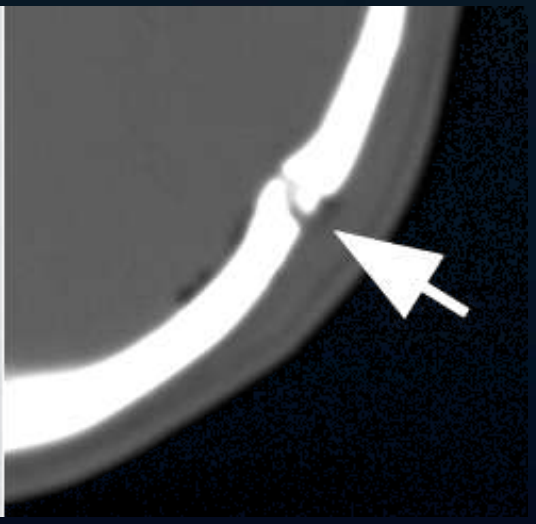




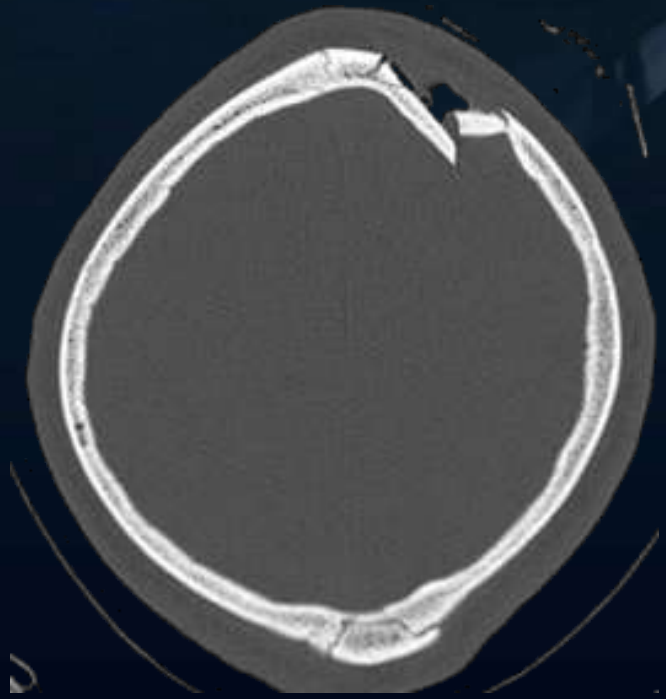


Skull Fractures

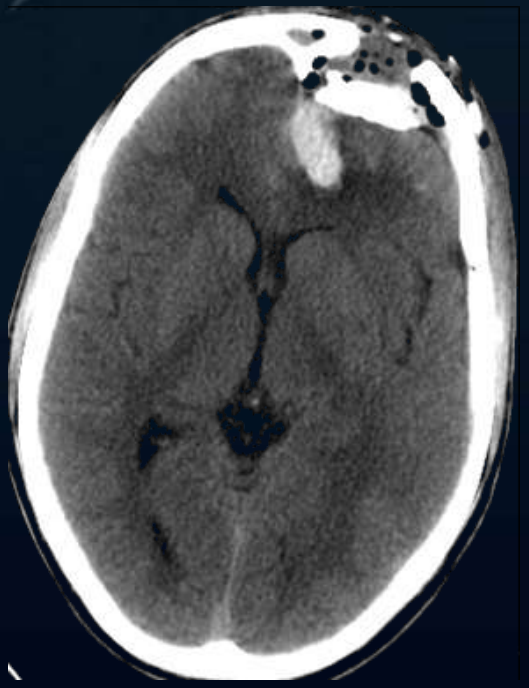
Fissure

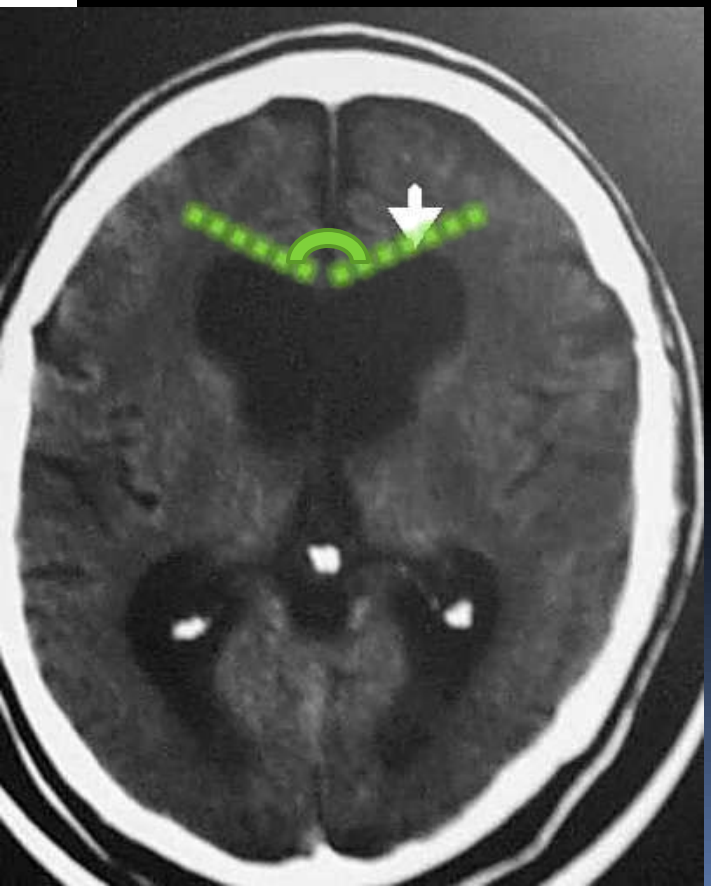


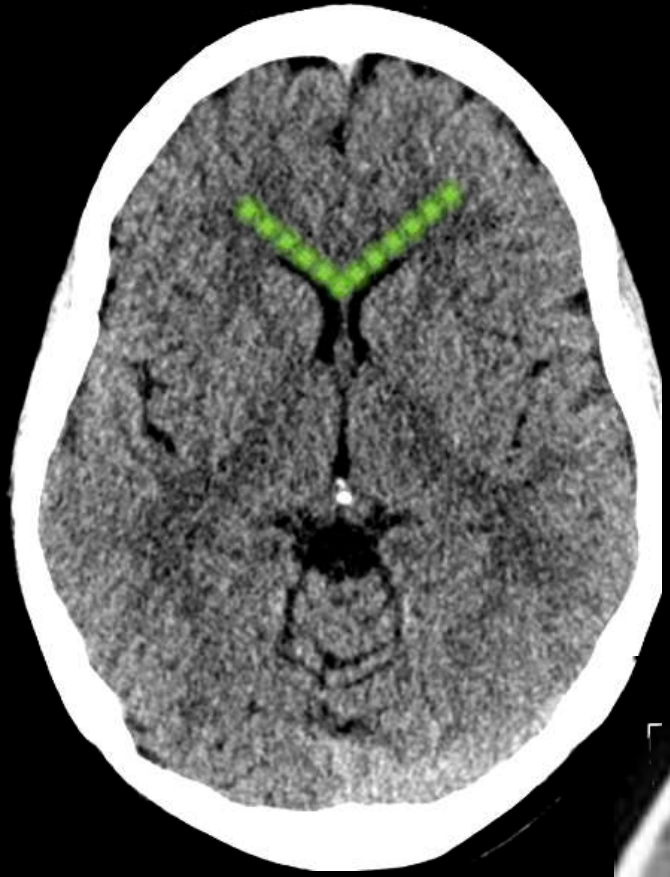
Depressed

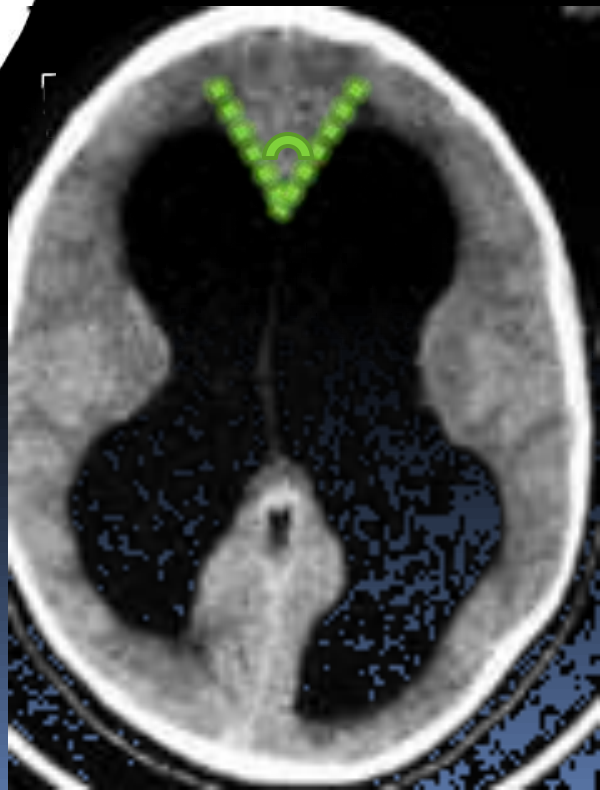


Comminuted









Contrast Enhancing CT

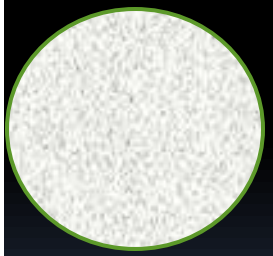
Is Mandatory

BRAIN TUMORS DIAGNOSIS or Follow up

Patterns of contrast enhancing :

Non enhancing

ENHANCING



HOMO

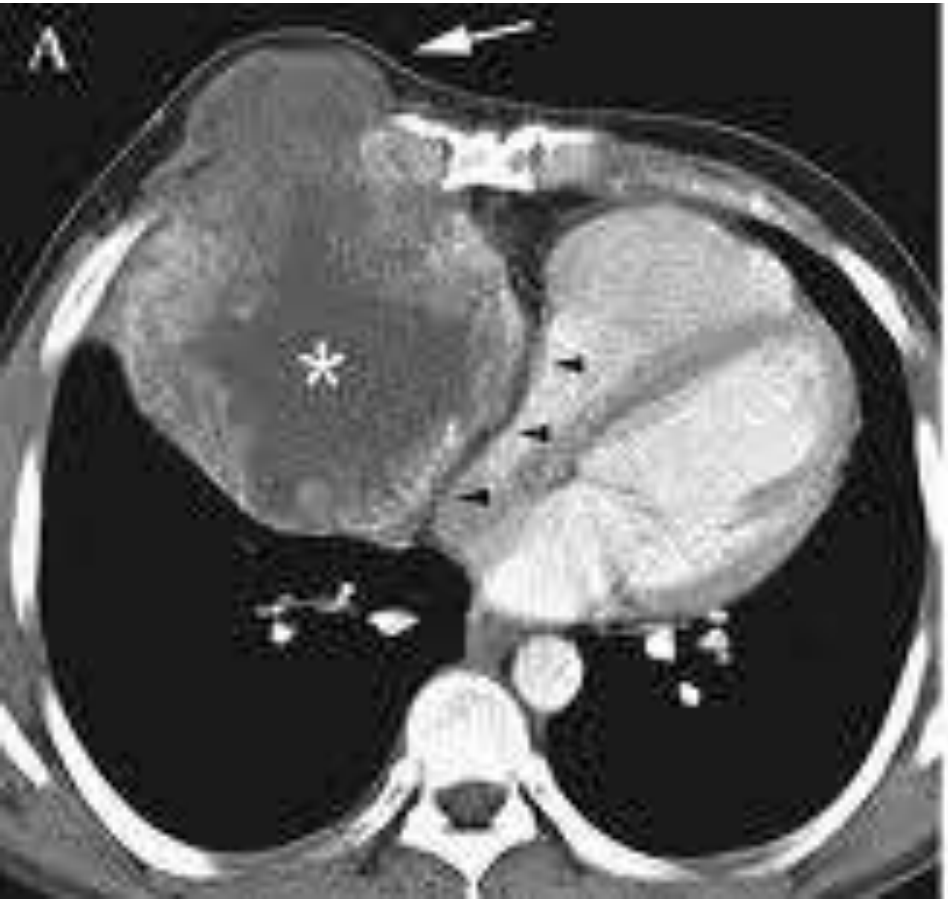
HETERO

Uniform

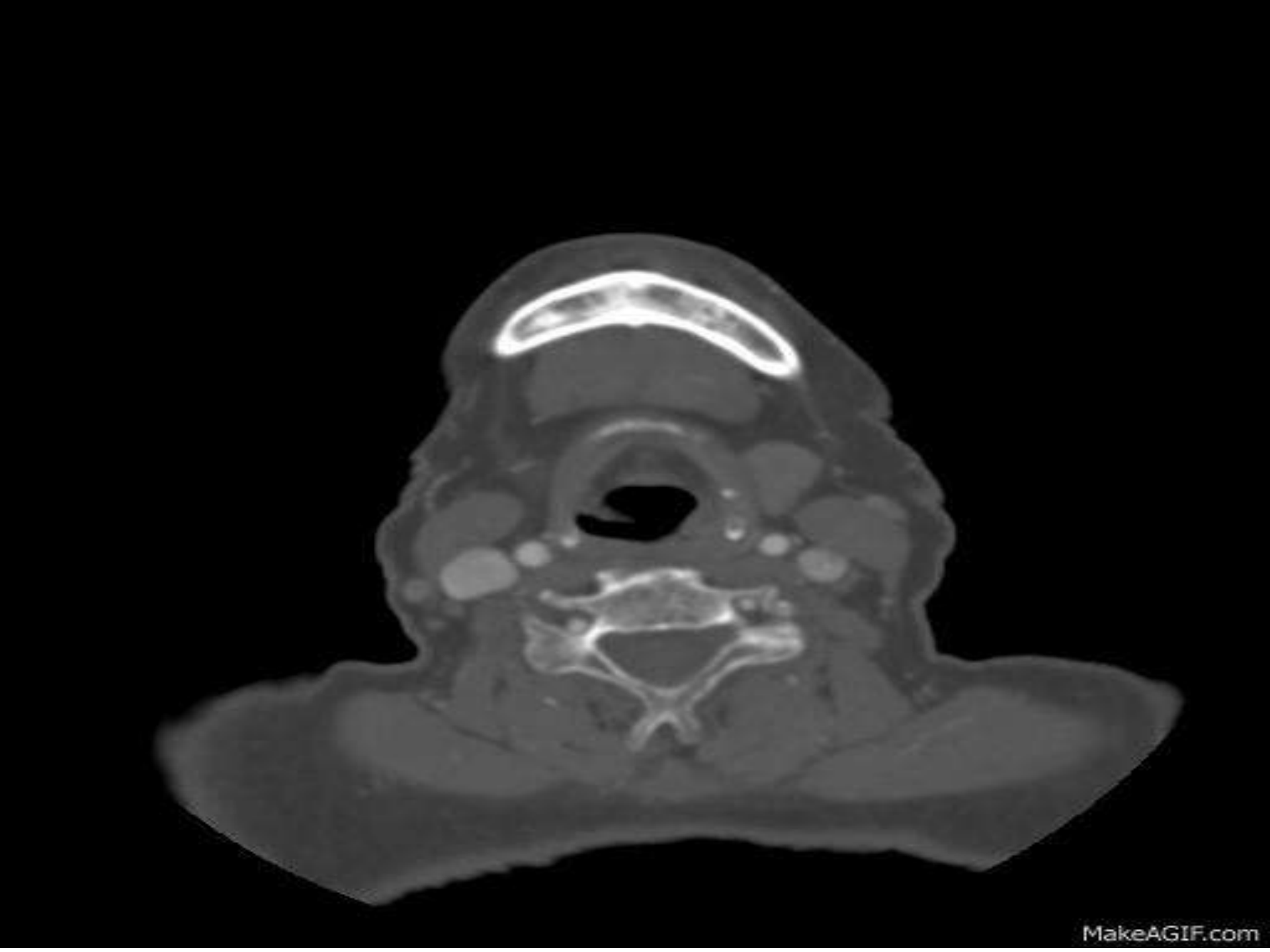
Non Uniform

MARGINAL

LUNG WINDOW VS MEDIASTINAL WINDOW

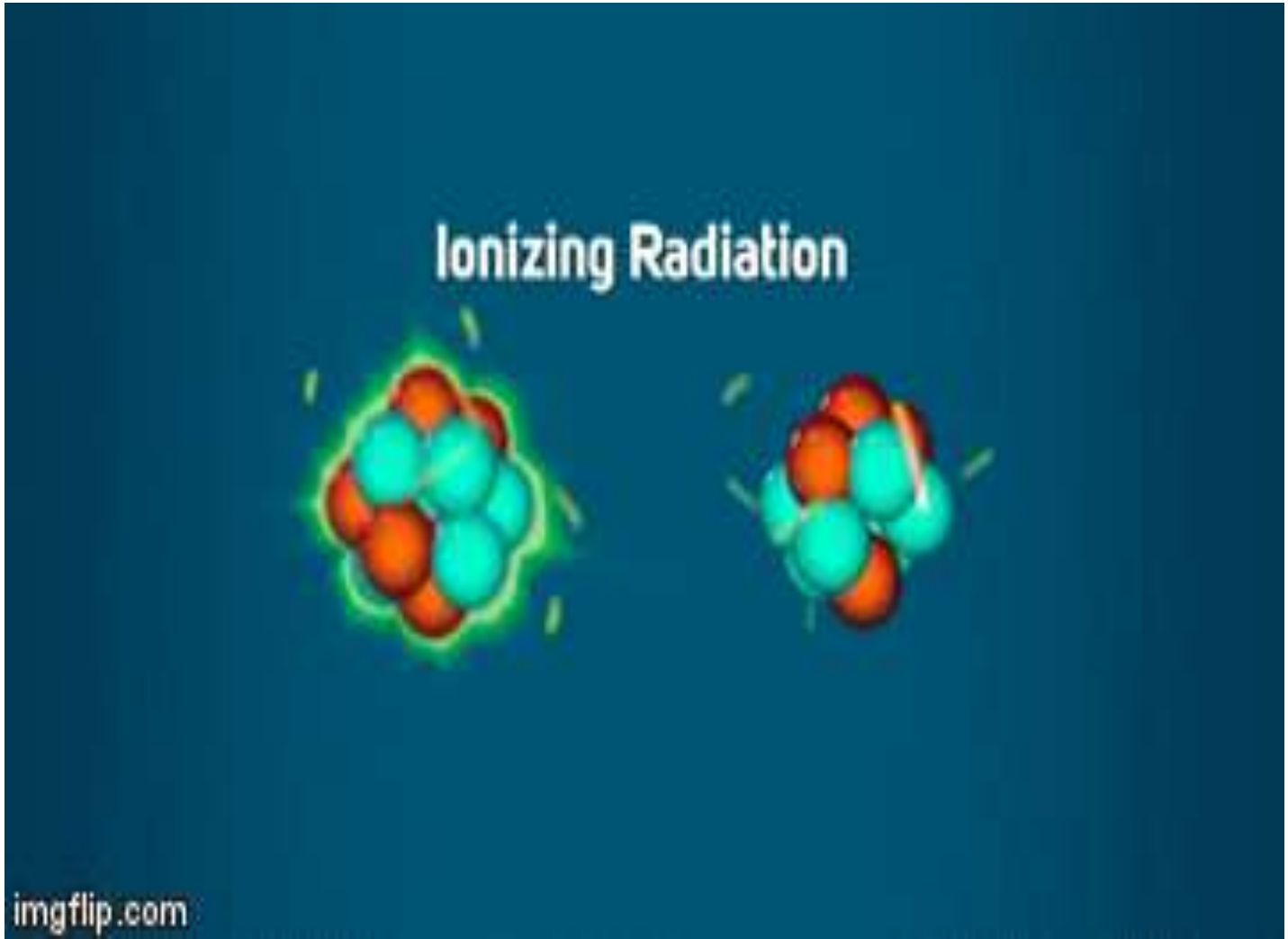



Compressed 7 :1
IM: 91 SE: 5
cm


MakeAGIF.com

3D CT Images


AR
5 cm
A
L
F


CAUTION
X-RAY
RADIATION
Ionizing Radiation
imgflip.com


DNA MUTATION

X ray

CT

CAUTION

X-RAY IN USE

If you are pregnant or unsure, notify staff immediately.

4

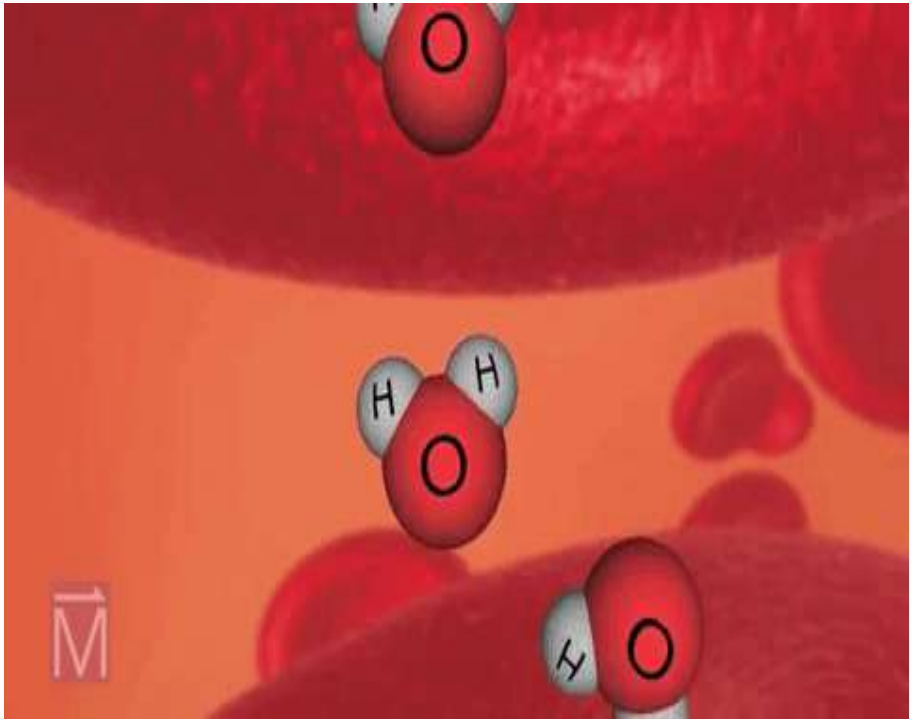
BASICS OF Magnetic Resonance Imaging

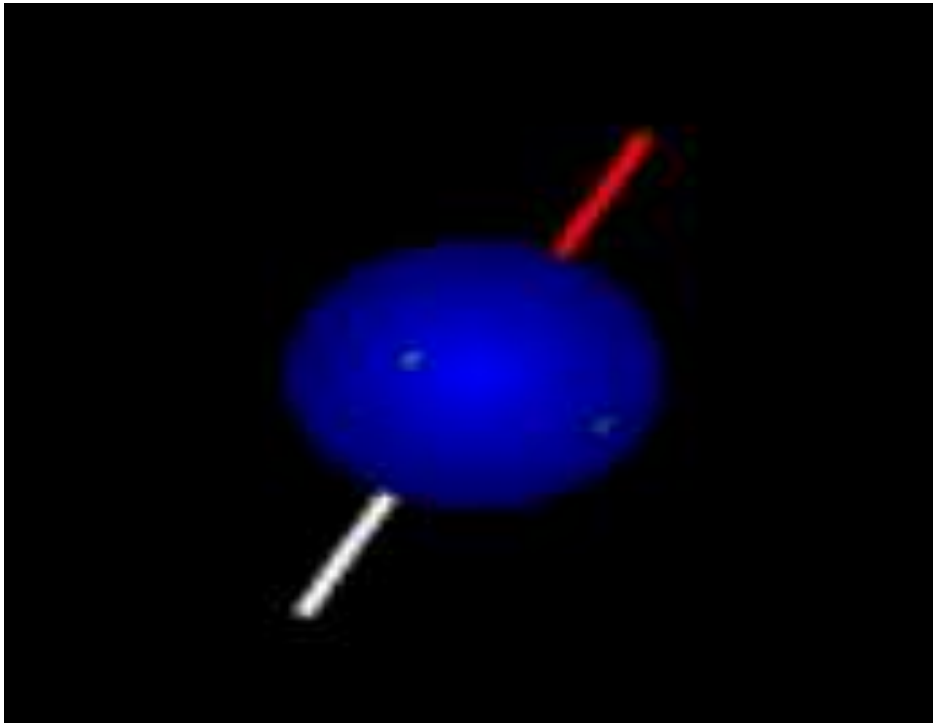
INVENTORS

- **1946** - **Felix Bloch** and **Edward Purcell** → magnetic resonance phenomena .
- until the 1970s MRI was being used for **chemical and physical** analysis.
- **1971 Raymond Damadian** showed that nuclear magnetic relaxation times of tissues and tumors.

IDEA

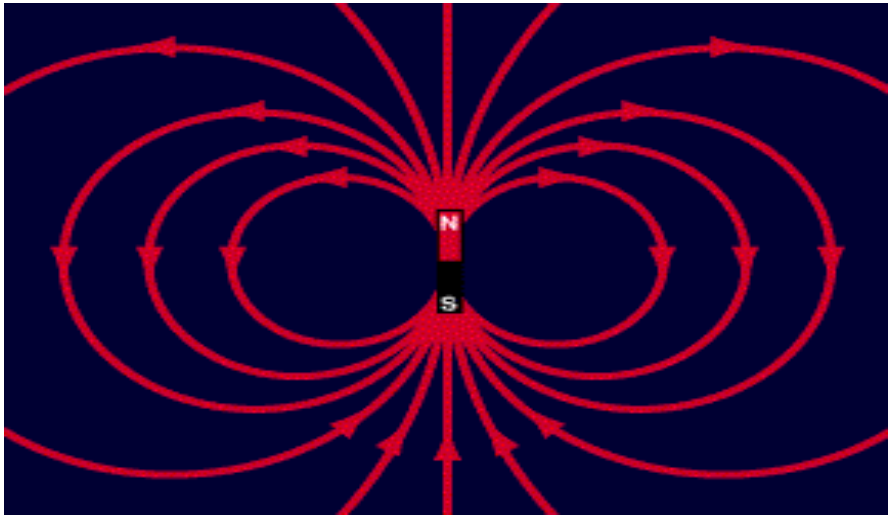
Magnetic Resonance Phenomena





ENERGY

STRONG MAGNETIC FIELD

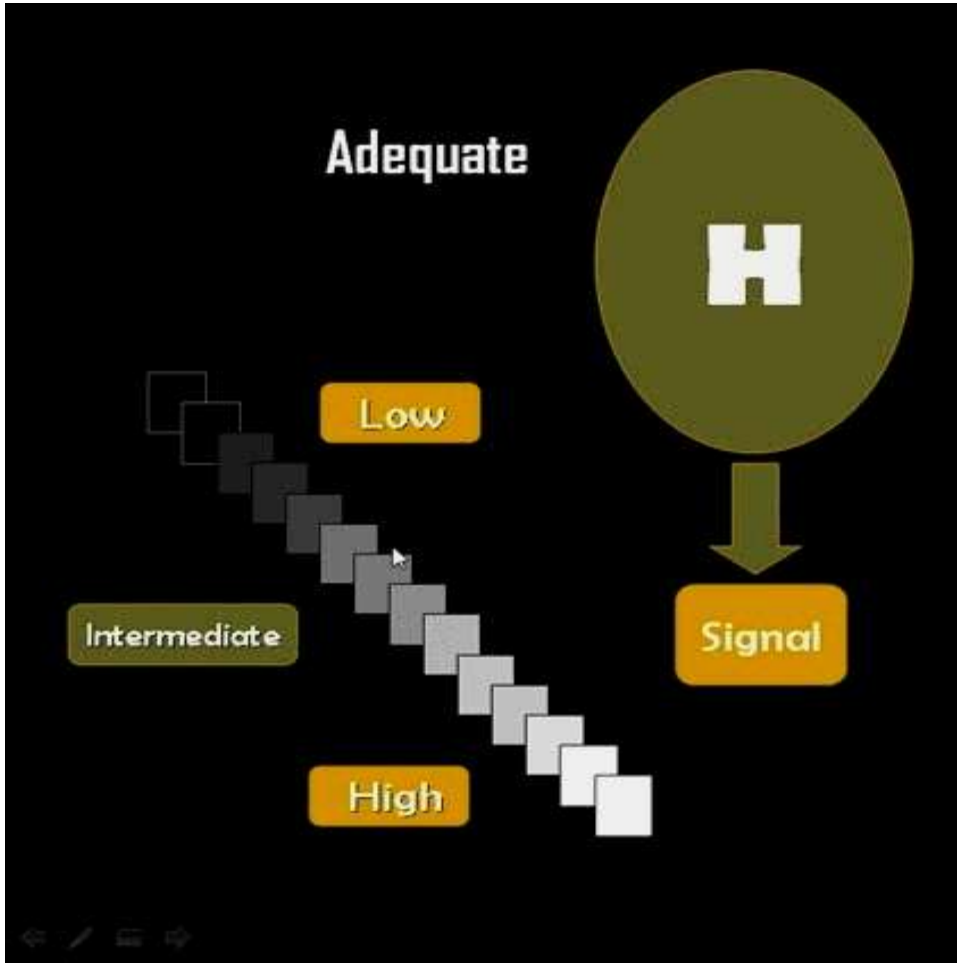


RADIO FREQUENCY

KEY WORD……SIGNAL INTENSITY

MRI

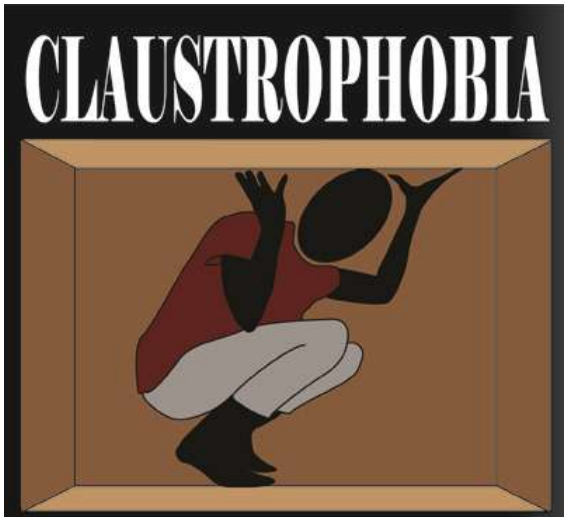
- Hyper
- Iso → Intense
- Hypo



TYPES OF MRI :

- **According to shape:**
  - Open
  - Closed
  - Dynamic
  - Extremity
- **According To type of magnet:**
  - Fixed
  - Electric
  - Superconductive

CLOSED MRI



OPEN MRI


MAGNETOM C!
VS

EXTREMITY MRI

DYNAMIC MRI

Contraindications Of MRI

No Iron or Magnetic objects

- *Iron* Processes.
- Iron F.B.
- Firearm
- **Pacemaker.**
- Vascular **metallic clips.**

DANGER

STRONG MAGNETIC FIELD

Magnet is always on.

Notify the MRI technologist or radiologist if:

1) You have any metallic, electronic or magnetic implants or devices in your body

2) You have been exposed to metal shavings from operations like grinding or sawing as part of your occupation

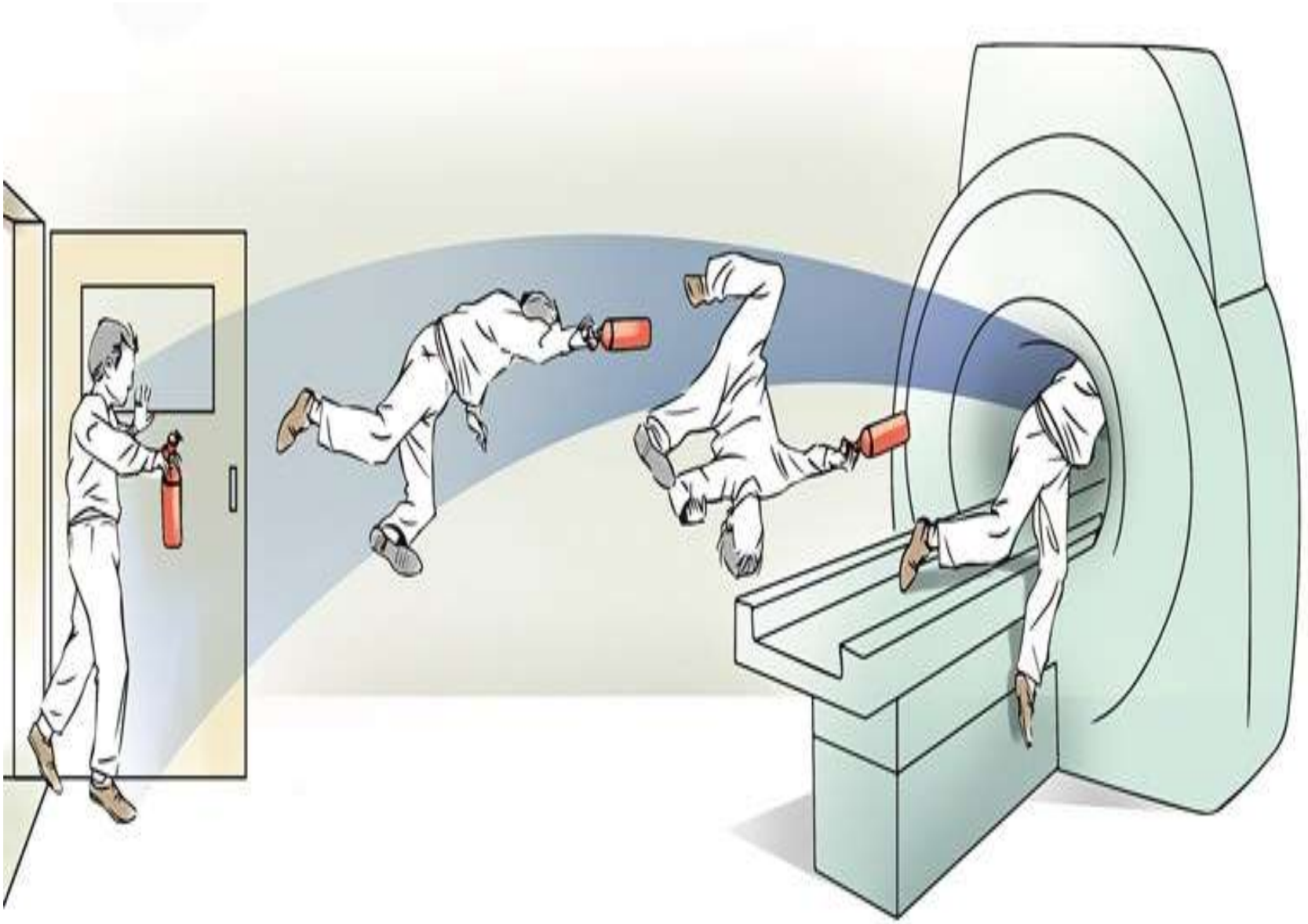
3) You have metal embedded in your body due to injury

4) You have any object which may contain metal or metallic parts (cell phones, scissors, watches, hearing aids, tools or keys)

Failure to follow these instructions could result in serious injury or death.

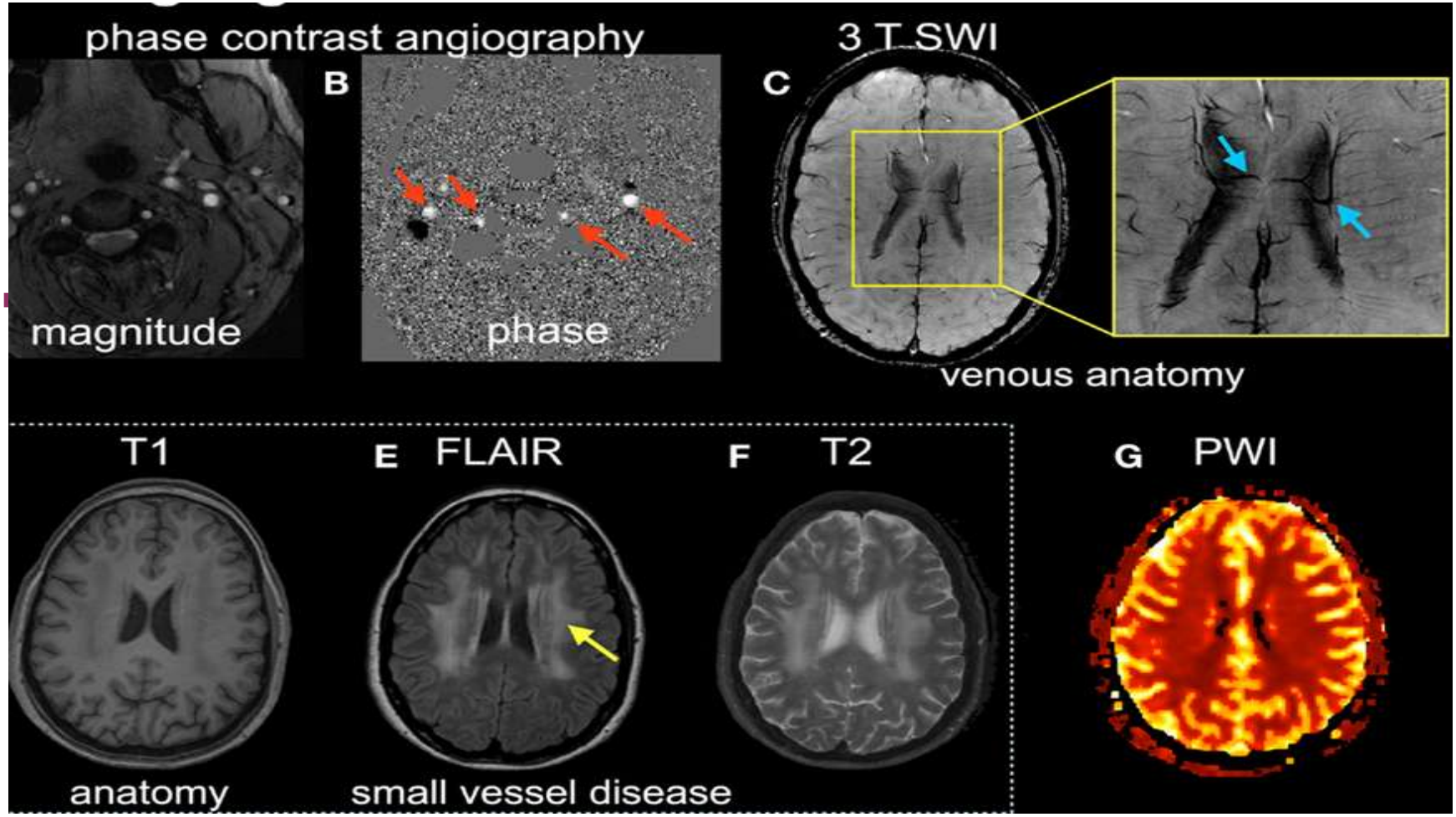

JANITOR

Contra-indications to MRI

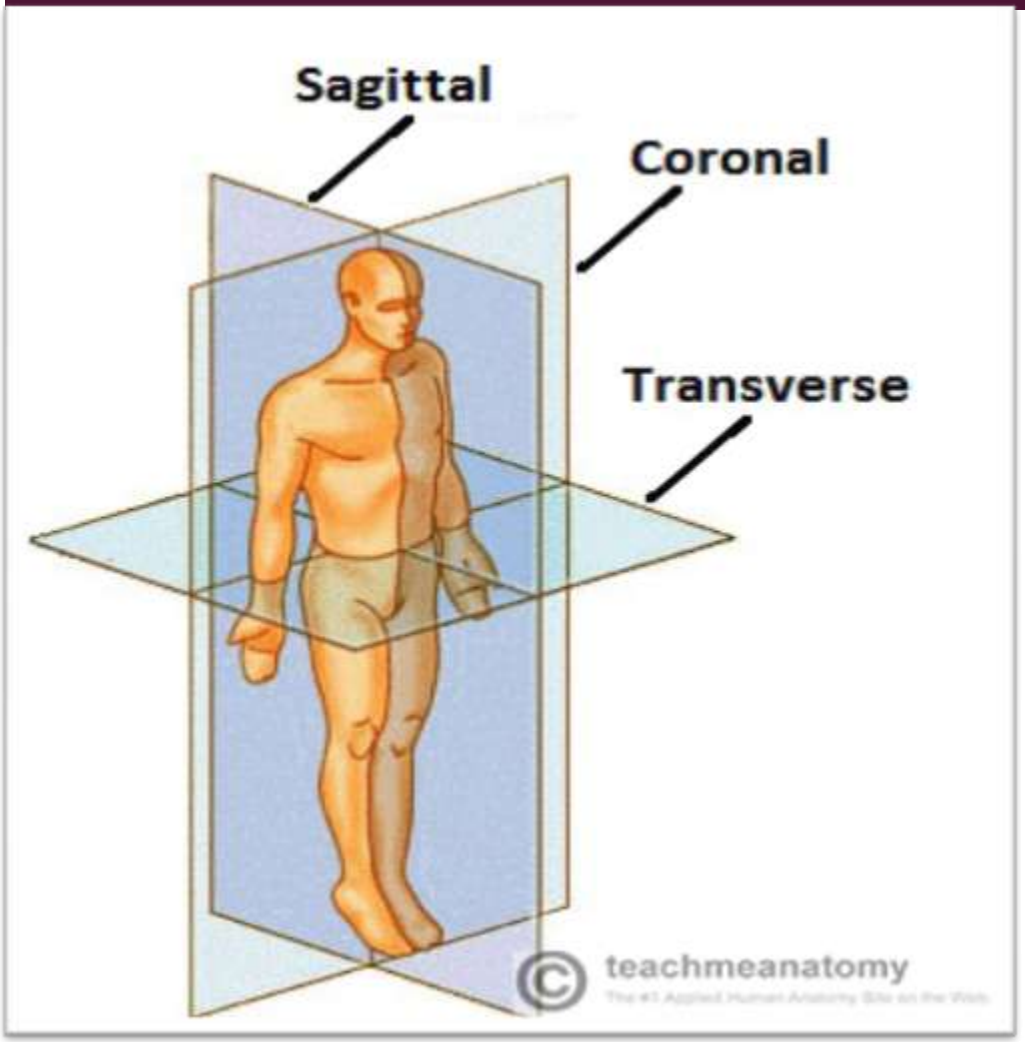


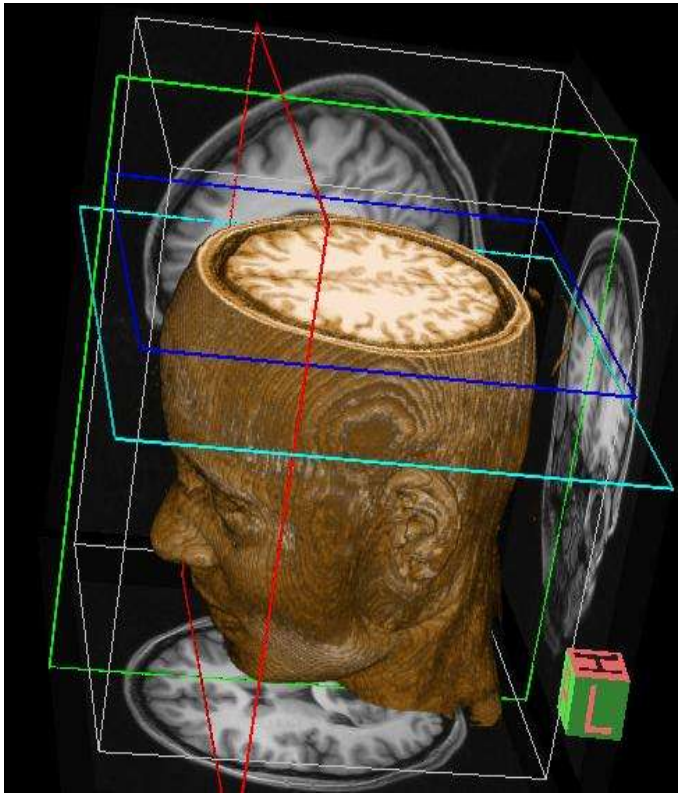

TCM.ONEWS
make a gif.com

MRI ….MULTI SEQUENCES



….Multi Planner



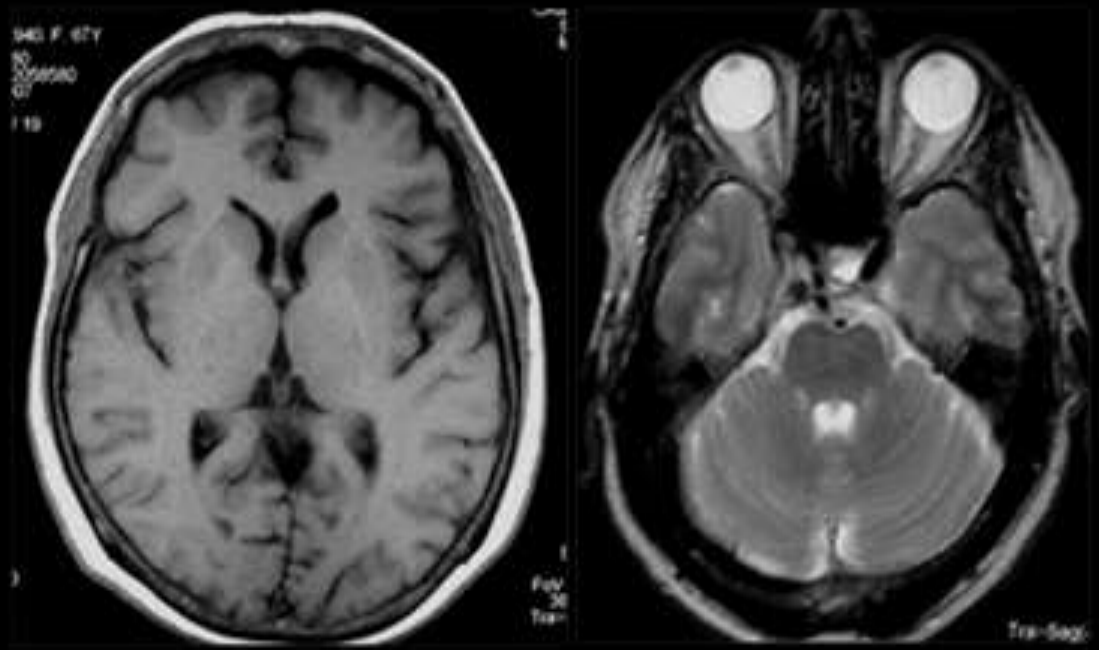


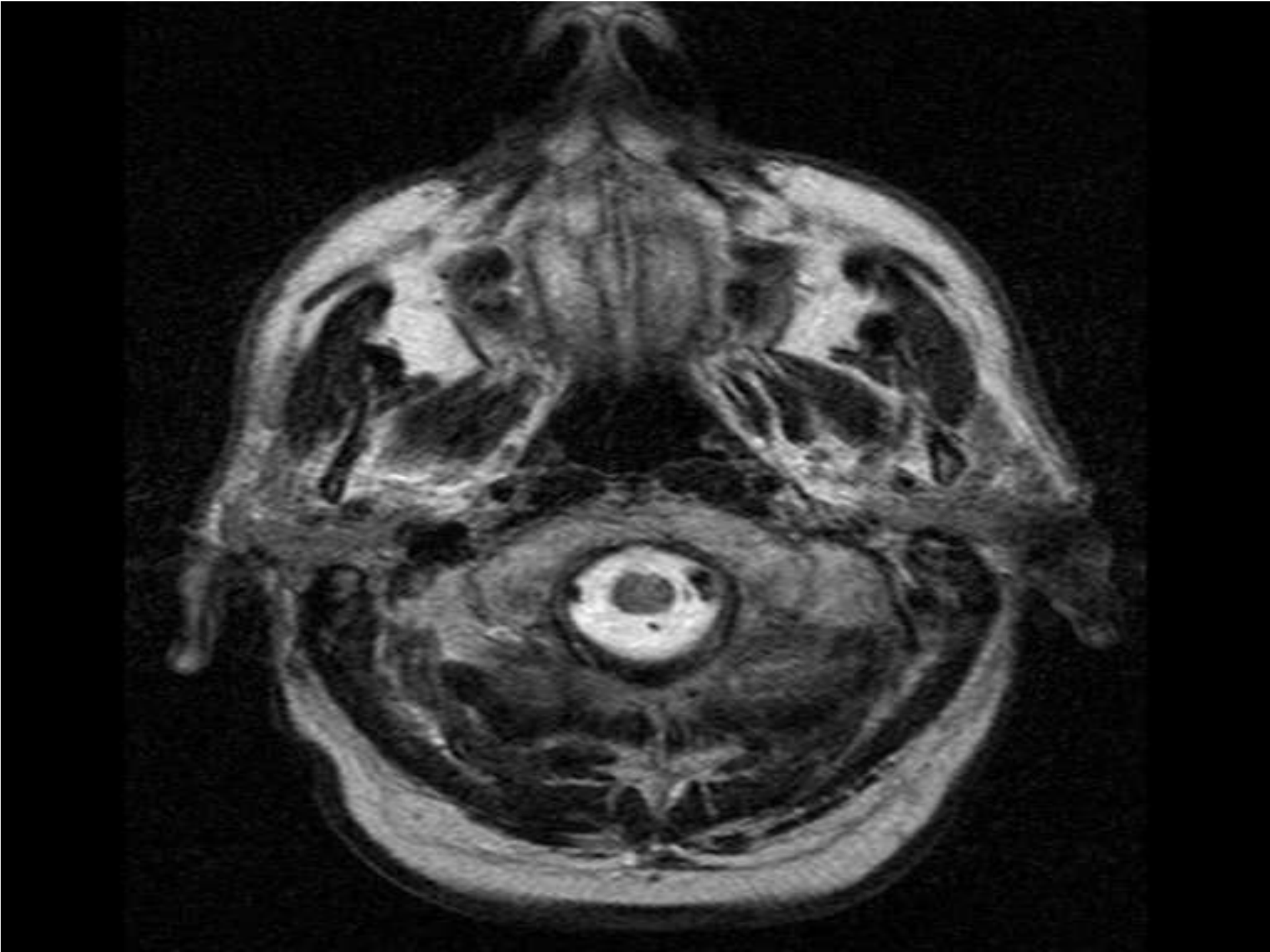

T1
T2
Low
Low
High
High
High
Low
Low
High

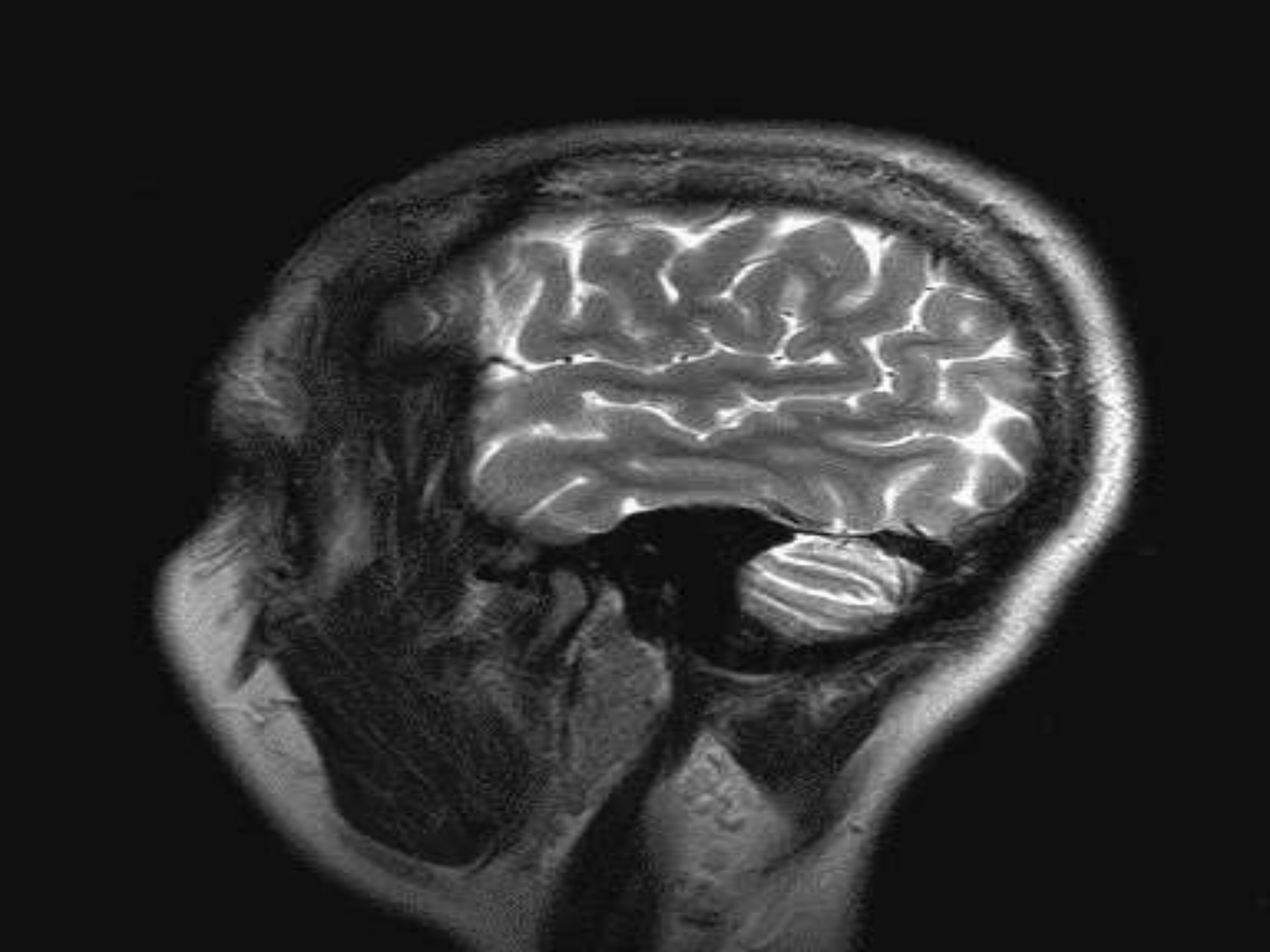
T1
Low signal

T2
High signal

- Fluid [CSF , effusion , ascites , urine , vitreous , ...]





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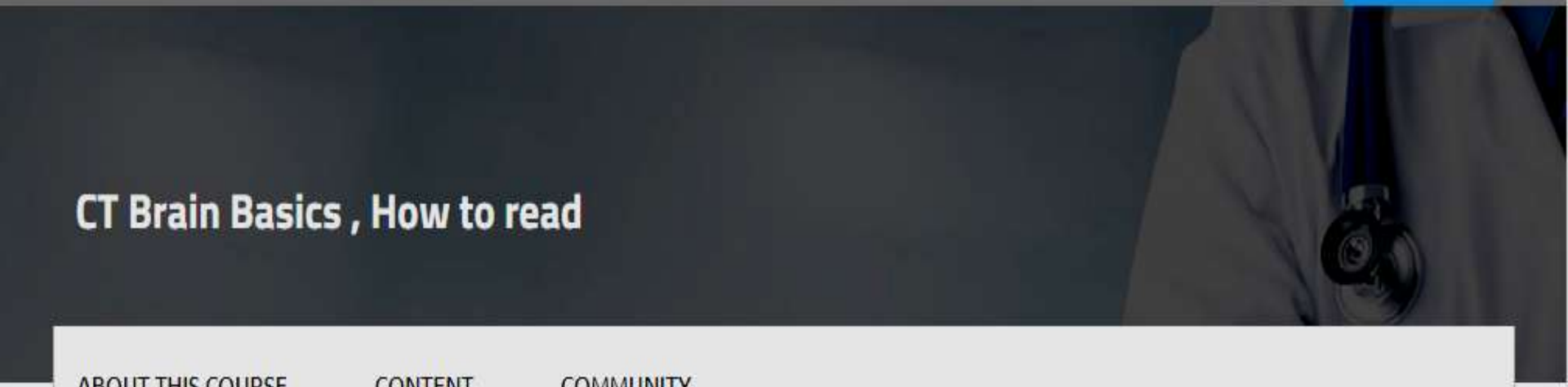


CT Brain Basics , How to read

Introduction

A brain computerized tomography (CT) scan is an important diagnostic tool to guide physicians in different disease diagnosis.

Basics of brain CT scan should be known by every medical student, resident, and physician

Join this introductory lecture to learn these basics.

Main theme

Free

Take This Course

Certificat Available

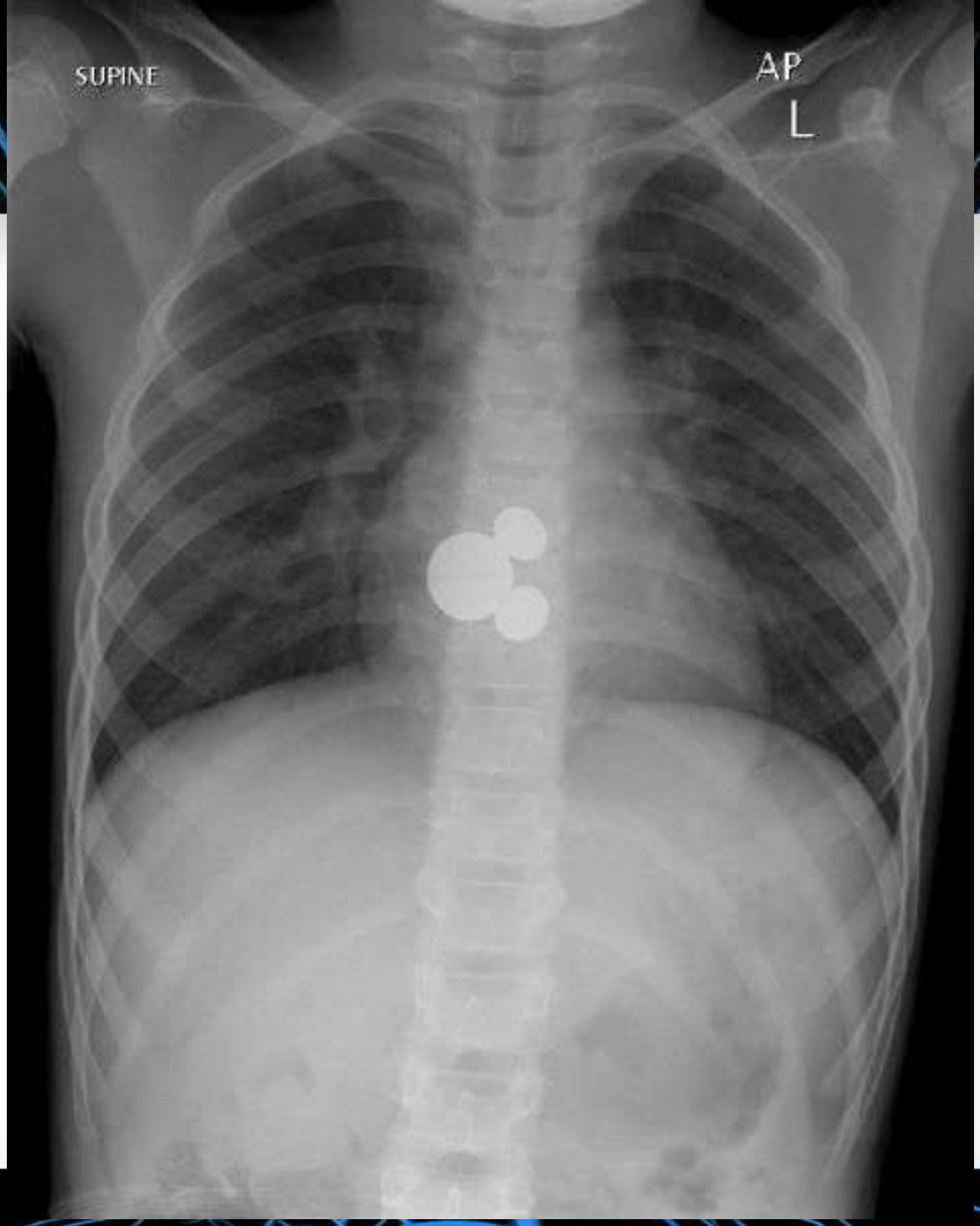
Online Recorded

298

Support


BBC earth
QUIZ ?
BLUE PLANET II

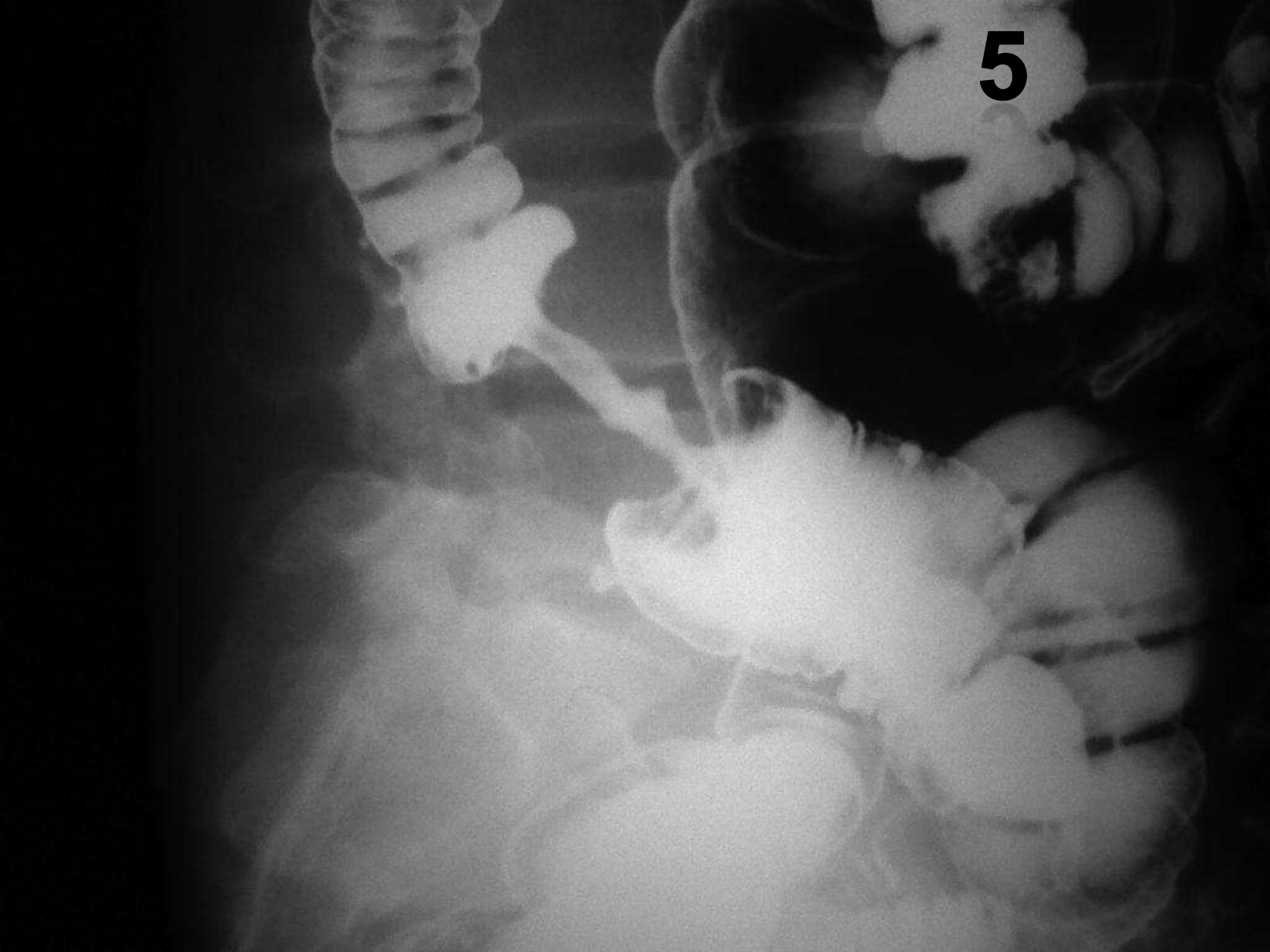
1



2

3

4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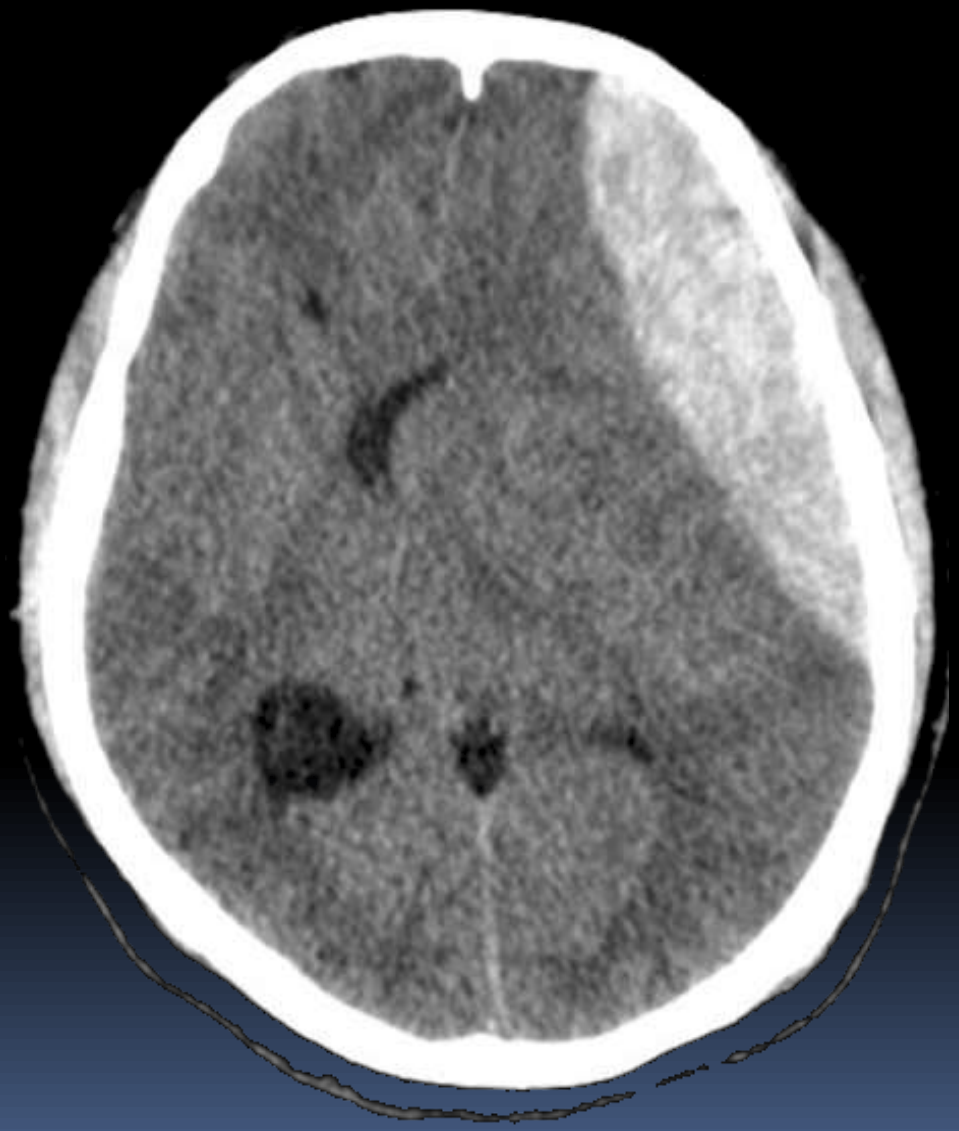
6



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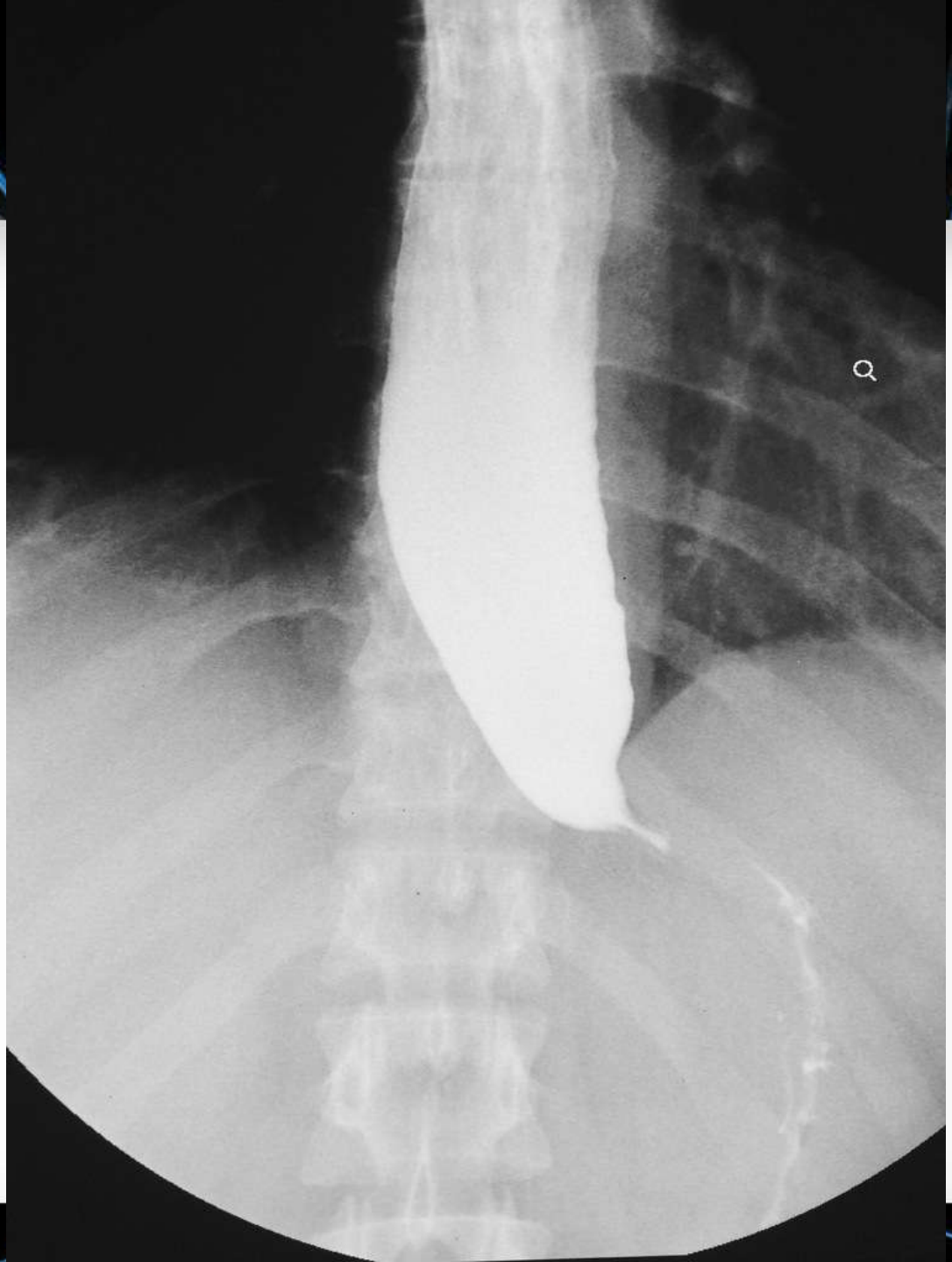
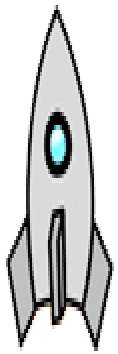


Answers



1. CXR - FB inhalation
2. IVU - Lt ectopic Kidney
3. Plain X ray Abd , erect - Multiple air-fluid levels
4. CXR - Air Under diaphragm
5. Br. Enema – **Apple Core Colon Stricture**
6. CT Brain - EDH
7. Br. Swallow - Achalasia

For Further Reading

- https://www.medicalacademy.org/portal/event/view/922/CT-Brain-Basics-,-How-to-read

- Dr. Ahmad Mokhtar Abodahab Yotube Channel
  "Lectures for Medical Students"
- https://www.youtube.com/playlist?list=PLqU6GNJJ8xwkhCDPznBYkvG3_NXZt-B17

FOR MEDICAL STUDENTS & NON RADIOLOGIST


Thank You
A.M. Abodahab
Dec 2019