UGG, CT AND MRI - WHATS ON THE MENU

CONSULTANT RADIOLOGIST- SURAKSHA DIAGNOSTIC CENTRE, SAINI ENCLAVE

DR MONOJIT MONDAL
MBBS , MD , DNB
THREE COURSE MENU
COMPLIMENTARY NOT SUBSTITUTION
USG/CT/MRI

WHICH IS BETTER???

EQUIVALENT FRACTIONS

\[
\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}
\]

“I understand they all have the same value, but I have to tell you, the ones on the right feel like more bang for your buck.”

“Everyone is a genius but if you judge a fish on its ability to climb a tree, it will live its whole life believing it is stupid.” - Albert Einstein

ITS ALL ABOUT THE CLINICAL SCENARIO
ULTRASOUND

- EASILY ACCESSIBLE AND WIDELY AVAILABLE
- REAL TIME
- NO RADIATION (CT-Abdomen and Pelvis-500 chest x ray-Moderate 1 in 1000 to 1 in 500 additional lifetime risk of fatal cancer from examination)
TYPICAL USES

• SCREENING

• ABDOMINAL PATHOLOGIES

If you can't afford a doctor, go to an airport - you'll get a free x-ray and a breast exam and; if you mention Al Qaeda, you'll get a free colonoscopy.
ANTENATAL

LEVEL I

LEVEL II

LEVEL III

If you earn your bread well, there will always be people around you to apply butter.
ADVANCES IN OBS USG

NOT ALL D’S ARE BAD
**5D NT**

5D NT confirms fetal mid-sagittal view automatically from volume data, and the fetal nuchal translucency thickness is measured with simple and efficient semi-automatic operation.

---

**5D Stereo Cine**

With 5D Stereo Cine, life-like 3D images can be displayed on Samsung 3D Smart TVs for parents-to-be, families, and friends to view more realistic images of the fetus at home.

---

**5D CNS (Fetal Brain Measurement)**

5D CNS is a fetal brain measurement. It offers 6 measurements (BPD, HC, OFD, VP, TCD, CM) from 3 transverse planes of fetal brain which are the key indicators for intuitive fetal brain visualization.

---

**5D Heart (Fetal Heart Examination)**

5D Heart is a tool that efficiently obtains 9 essential planes, which helps in quick cardiac diagnosis.
PELVIC USG
5D Follicle (Follicle Measurement)

• 5D Follicle finds follicles automatically and measures size and status of each follicle, leading to improved clinical workflow.
BREAST USG
Elasto Scan for Breast

Users obtain automatic calculated strain ratio between target and reference area with just one selection of region-of-interest (ROI) on breast ElastoScan image, providing efficiency and intuitiveness.
VASCULAR USG

“Cholesterol is a good thing. It keeps your arteries from collapsing when you've got the weight of the world pressing down on you!”
MISSC. APPLICATIONS

- MSK USG
- TESTIS/LOCAL PART USG
Limitations of USG

• Limited field of view.

• Trade off between FOV and spatial resolution.

• Lack of characterisation of pathologies.

• Operator dependent.

• Cant image bony pathologies.
COMPUTED TOMOGRAPHY

Anatomy of a CT scan

CT scanners give doctors a 3-D view of the body. The images are exquisitely detailed but require a dose of radiation that can be 100 times that of a standard X-ray.

Computed tomography scans are made by rotating an X-ray beam around the patient, imaging the body in a series of slices that a computer stitches together.
BENEFITS OF CT

• Image bone, soft tissue and blood vessels all at the same time.
• CT scanning provides very detailed images of many types of tissue as well as the lungs, bones, and blood vessels.
• CT examinations are fast and simple; in emergency cases, they can reveal internal injuries and bleeding quickly enough to help save lives.
• CT is less sensitive to patient movement than MRI.
• CT can be performed if you have an implanted medical device of any kind, unlike MRI.
Multi detector CT
BENEFITS OF MDCT

• TRUE ARTERIAL PHASE SCAN
• PURE PHASE VASCULAR STUDIES
• LESS CONTRAST-LESS RISK OF NEPHROPATHY.
• LESS SCAN TIME.
• GREATER Z AXIS COVERAGE.
• CARDIAC CT.
All intravascular iodinated contrast agents are based on a tri-iodinated benzene ring.

A major advance was the development of nonionic compounds they are designated low-osmolar contrast media (LOCM) (Omnipaque).

Iso-osmolar contrast media (IOCM)- toxicity of contrast agents decreases as osmolality approaches that of serum. (Visipaque).

Circulatory half life is 1–2 hours, assuming normal renal function.
SCREENING BEFORE CONTRAST MEDIA

- Iodinated contrast can exert a nephrotoxic effect. A cut-off below 1.5 mg/dL classify individuals with normal renal function. Serum creatinine measurement within 1 month of the proposed dose of contrast.

- Allergies—A history of allergies doubles the risk of an adverse reaction.

- Asthma—A history of allergic asthma increases the risk of reaction up to five times.
• Cardiac Disease—Severe cardiac disease carries an increased risk of reaction.
• Dehydration—Dehydration has the potential to increase nephrotoxicity, particularly in patients with impaired renal function or multiple myeloma.
• Diabetes
• Previous Contrast Reaction
• Metformin- Patients who receive iodinated contrast may resume metformin 48 hours after the iodinated contrast
• Multiple Myeloma, Pheochromocytoma.
**CONTRAST REACTIONS**

*Anaphylactoid reactions* are identical to an anaphylactic reactions reaction, can occur even the first time contrast is administered and severity of a reaction is not dose-related; therefore a test dose is of no value in their manifestations. Patients who are at increased risk for an anaphylactoid reaction benefit from premedication. Methylprednisolone: DOSE: 32 mg by mouth 12 and 2 hours before contrast.
• Acute renal failure is defined when the serum creatinine raises 25–50 percent or 0.5–1 mg/dL.
• Most effects are temporary and completely reversible. In mild cases, serum creatinine returns to normal in 2 weeks. When severe, dialysis may be necessary
DAY TO DAY

SPINE AND LIMBS HEAD, PNS ORBIT

DAY TO DAY

NECK

PELVIS FOR GYNAE MALIGNANCY

DAY TO DAY

ABDOMEN INCLUDING TRIPLE PHASE

DAY TO DAY

LUNG, HRCT
**DRAWBACKS AND LIMITATIONS**

- Exposure to radiation - one chest CT gives an effective dose of radiation equivalent to that of about 400 posteroanterior chest films and CT pulmonary angiography equals 750 chest X-rays.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Risk Level</th>
<th>Approximate additional risk of fatal cancer for an adult from examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computed Tomography (CT)-Abdomen and Pelvis</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Computed Tomography (CT)-Abdomen and Pelvis, repeated with and without contrast material</td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td>Computed Tomography (CT)-Colonography</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Intravenous Pyelogram (IVP)</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Computed Tomography (CT)-Head</td>
<td></td>
<td>Very Low</td>
</tr>
<tr>
<td>Computed Tomography (CT)-Head, repeated with and without contrast material</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Computed Tomography (CT)-Spine</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>CHEST: Computed Tomography (CT)-Chest</td>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>

**Note:** These risk levels represent very small additions to the 1 in 5 chance we all have of dying from cancer.
• Children are more sensitive to radiation than middle-aged adults by a factor of 10.

• FEMALE PATIENTS-10 DAY RULE.

• Soft tissue characterisation- MRI demonstrates subtle differences between different kinds of soft tissues.
MRI Scanner Cutaway

- Radio frequency Coil
- Gradient Coils
- Magnet
- Scanner
- Patient Table
- Patient
WHY DO I NEED MRI??

• MRI is particularly useful for the scanning and detection of abnormalities in soft tissue structures in the body like the cartilage tissues and soft organs like the brain or the heart.

• There is no involvement of any kind of radiations in the MRI, so it is safe for the people who can be vulnerable to the effects of radiations such as pregnant women or babies.
• They can provide information about how the blood moves through certain organs and blood vessels, allowing problems with blood circulation, such as blockages, to be identified. (ANGIO WITHOUT CONTRAST)

• MRI scans have specific advantages over X-rays, as they can show swelling and inflammation.
CONTRAINDICATIONS

- Strong static magnetic fields-ferromagnetic interactions-projectile effect-helium or oxygen cylinders, ventilators, wheelchair.

  Metallic splinters, vascular clips, and cochlear implants may be dislodged
**DON'T’S**

- **Vascular clips** - If clip is made of titanium or titanium alloy, the examination can be performed.
- **Metal foreign body** - a metallic splinter in the eye. X ray should be taken before the MR.
- **Implanted pacemakers and ICDs** should still be considered a strong relative contraindication to routine MRI and is discouraged. (Under special circumstances, if there is no other diagnostic tool available and the potential benefit for the patient outweighs the risk, MRI might be performed in an experienced centre with expertise in MRI and cardiology.)
- **Cochlear implants** represent a relative contraindication to MRI and only after careful evaluation of the individual risk can an MRI possibly be performed.
MRI CAN BE DONE!!!

- Coronary and peripheral artery stents
- Aortic stent grafts
- Prosthetic heart valves and annuloplasty rings
- Vena cava filters and embolisation coils
- Pregnancy and postpartum-MRI has been used to evaluate obstetric, placental, and fetal abnormalities in pregnant patients.
MRI AND CONTRAST AGENT

- Today, MR contrast media are administered in 40–50% of all MRI examinations.

- Nephrogenic systemic fibrosis (NSF) is a sclerosing disorder found in patients with impaired renal function after MRI examinations with gadolinium based contrast agents (GBCA); symptoms usually develop up to 4 weeks after exposure. All patients with impaired renal function are at risk of retaining GBCA after exposure.
USES

ANGIOGRAPHY

MSK

BRAIN & SPINE

GYNAE.

ABDOMEN & MRCP
DISADVANTAGES

• TIME CONSUMING.

• CLAUSTROPHOBIC

• INFERIOR SPATIAL RESOLUTION

• EXPENSIVE

• PRONE TO MOTION ARTIFACTS.

• SICK PATIENTS- CHALLENGE
THANK YOU