MRI SAFTEY

MRI= *M*ETAL RESULTS (IN) INJURY

MAGNETS

- Everyone has had some experience with magnets. You might place a note on a refrigerator or may have explored how magnets interact with metals in science class.

MRI SCANNER

- The MRI scanner is a large magnet (10,000 lbs.) with a tremendously strong magnetic pull. The magnet in the MRI scanner creates a force field which can affect objects that are close to it. As you approach the MRI scanner, the attractive force field increases rapidly.
- MRI scanners magnetic pull is 200 times greater than that of a refrigerator magnet.

MAGNETIC FIELD

- Magnetic field cannot be felt when entering the MRI suite, this making it extremely dangerous. (without metal object)
- The magnetic field is not just at the scanner, but in the entire scan room.
- Any *ferromagnetic object** brought into the MRI scanner room will become magnetized and can become a... **Dangerous Projectile!**

MAGNET IS ALWAYS ON!!!!
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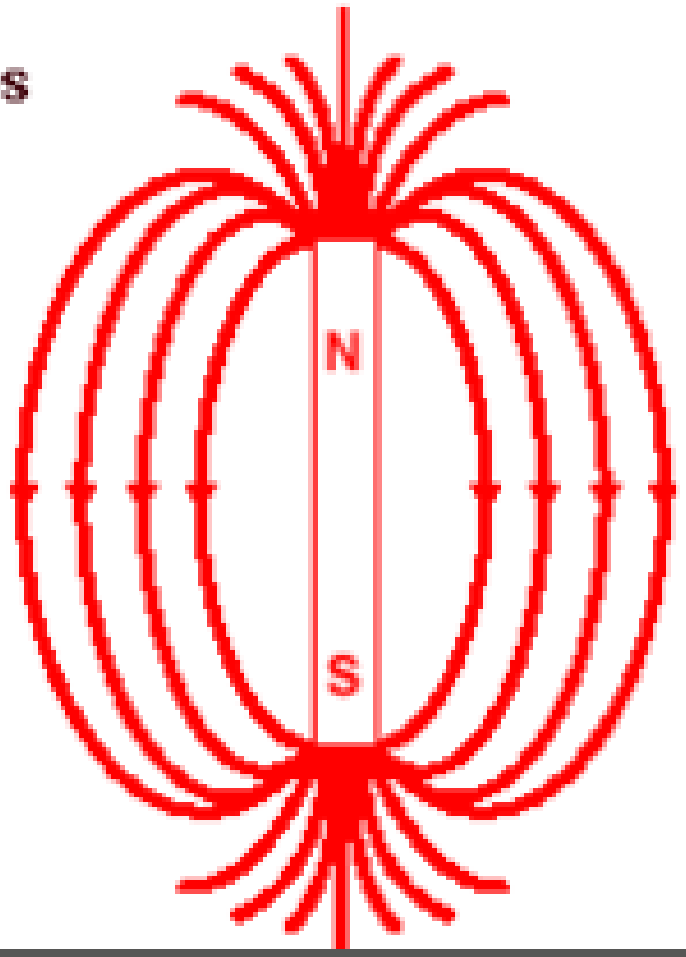
- STRONG MAGNETIC FIELD IS STILL THERE EVEN WHEN THE SCANNER IS NOT MAKING NOISE.

MAGNETIC FIELD

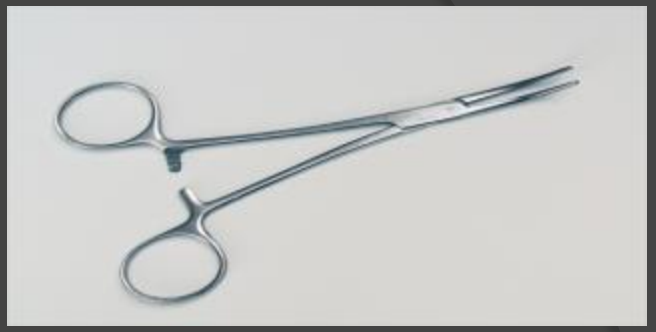
Where the lines are closest together is where the magnetic field is strongest



MRI + METAL = FLYING OBJECTS

- The "**missile effect**" refers to the capability of the MRI magnetic field to attract a ferromagnetic object into the scanner with considerable force.
- The "**missile effect**" can pose a significant risk to a patient in the scanner and to anyone who is in the path of the attracted object.
- Metal objects can become dangerous projectiles if they are taken into the scan room!

METAL OBJECTS



Employees of the Westchester Medical Center in Valhalla, N.Y., gather outside after learning of the deadly MRI incident. (ABCNEWS.com)

Hospital Nightmare

Boy, 6, Killed in Freak MRI Accident

abcNEWS.com

July 31 — A 6-year-old boy died after undergoing an MRI exam at a New York-area hospital when the machine's powerful magnetic field jerked a metal oxygen tank across the room, crushing the child's head.

The force of the device's 10-ton magnet is about 30,000 times as powerful as Earth's magnetic field, and 200 times stronger than a common refrigerator magnet.

The canister fractured the skull and injured the brain of the young patient, Michael Colombini, of Croton-On-Hudson, N.Y., during the procedure Friday. He died of the injuries on Sunday, the hospital said.

The routine imaging procedure was performed after Colombini underwent surgery for a benign brain tumor last week. Westchester Medical Center officials said he was under sedation at the time of the deadly accident.

Hospital Takes 'Full Responsibility'

Pictures of things that should not have been in a MRI suite.

WHAT CAN A METAL OBJECT CAUSE

- Delayed patient care...It takes 4 days to remove the object and to re-power the scanner!
- Possible injury or DEATH to patient and staff.
- Possible damage to the MRI scanner.
- Approximate cost due to each “missile effect” incident: **$250,000.**

SURGICAL IMPLANTS

- Displacement and Heating of Surgical Implants:
  - Cardiac pacemakers
  - Neurostimulators
  - Stents and aneurysm clips
  - Pain control pumps
  - Penile implants
- Displacement and heating of these implants may cause a life-threatening situation!

MAGNETIC FEILD INFERENCE WITH DEVICES

- Mechanically or electrically activated implants may stop or malfunction in the presence of the MRI magnetic field.
- Patients with pacemakers have died during or shortly after MRI exams due to disruption of pacemaker function by the MRI system.
- Hospital staff with pacemakers or other implanted electronic devices could also be affected, if they come within the strong magnetic field of the MRI.

ECG Leads

- ECG leads left on a patient during a MRI exam may result in burns.
- The leads when exposed to the changing magnetic field will heat up and could cause 3rd degree burns on the patient.
- Any ECG patches other than those that are marked MRI safe should be removed from the patient prior to their exam.

TRANSDERMAL PATCHES

- Some patients are now wearing trans-dermal patches for medication delivery.
- Many of these patches contain aluminum foil or other metallic components which can cause excessive heating, leading to burns in patients undergoing a MRI scan.

- **All patients with transdermal patches must have their patch removed before they have their MRI scan.**

BODY PEIRCING

- Risks for these patients include: Discomfort or painful sensations due to possible displacement (movement) of the jewelry.
- Patient burns are due to heat generated from the interaction between the jewelry and the electromagnetic fields.

- **All patients must be screened for body piercing and have ALL piercings removed prior to their MRI scan! NO EXCEPTIONS! Plastic spacers maybe used to keep hole patent.**

TATTOOS

- Many patients scheduled for an MRI scan will present with tattoos.
- These tattoos will be either cosmetic or decorative and can be located anywhere on the body.
- Some of these tattoos will contain ferromagnetic material which can cause heating, swelling, or burning at the tattoo site.
- **All patients must be screened for tattoos and have the potential risks explained to them.**

PREGNANCY

- *The Policies, Guidelines, and Recommendations for MRI Imaging, Safety and Patient Management* issued by the Safety Committee of the Society for MRI imaging states:

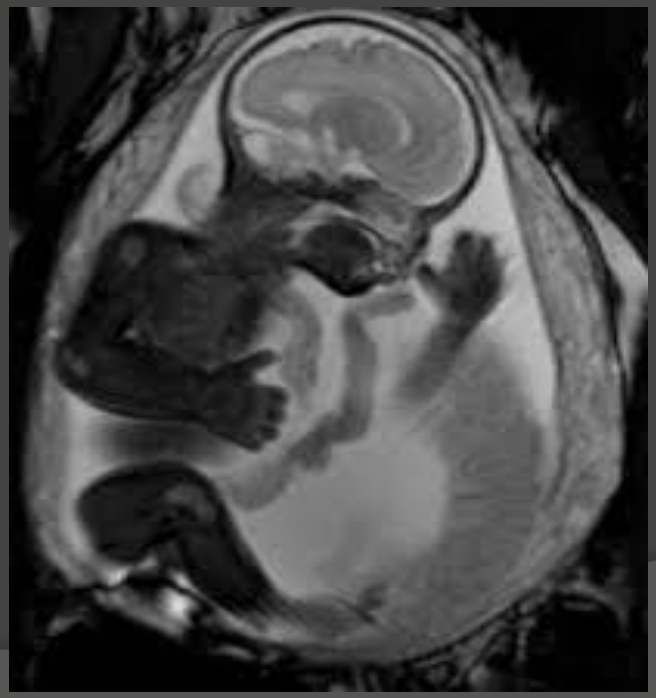
- *"MRI may be used for pregnant women if other non-ionizing diagnostic imaging is inadequate or if the MRI provides important information that would otherwise require exposure to ionizing radiation (CT, fluoroscopy, etc.)"*

PREGNANCY

- With that being said, there is no known effects of MRI to the fetus.
- Patient should not be scanned during their first trimester of pregnancy. Other than in cases where the referring physician and radiologist agree that the findings of the MRI has the potential to change or alter the care of the mother or fetus and that the benefit outweighs the risk.

PREGNANCY

- NO CONTRAST SHOULD EVER BE GIVEN TO A PREGNANT PATIENT!!!



SCREENING

- All patient that need a MRI performed, they will need to fill out a MRI screening form.
- Patients family going in the room should also fill out the MRI screening form if they are going to entire the room.
- NO PATIENT WILL BE SCANNED WITHOUT A SCREENING FORM!

SCREENING

- NO ONE SHOULD ENTER THE MRI SCANNING ROOM WITHOUT BEING SCREENED BY THE MRI TECHNOLGIST!!!
  - Nurses
  - Doctors
  - Etc.

ANOTHER DANGER IN MRI IS QUENTCH

- MR scanners are super cooled with inert gases such as helium.
- If these cryogens BOIL OFF either intentionally or unintentionally, a quench has occurred. THIS IS EXTREMELY BAD.
- An INTENTIONAL quench is done in an emergency to run the magnetic field to ZERO in order to remove a projectile/patient from the scanner in extreme emergencies.
- If a quench occurs, remove all staff from the room immediately

QUENCHING

QUENCH HAS THE POTENTIAL FOR CAUSING ASPHIXIATION AND FROST-BITE TO THE HEALTH CARE WORKER AND THE PATIENT.

WHAT TO DO WITH THE PATIENT DURING A QUENCH.

- If a quench happens, you must get the patient out of the room as quickly as possible.
  - Due to the negative pressure from the rapid loss of oxygen in the room. You may need to smash the window to the MRI suite with the baseball bat under the desk to enter the room.

WHAT TO DO DURING A CODE RED

- During a Code RED in MRI, only radiology and maintenance/security personnel should respond.
  - This is so that the risk of injury or death is minimized.
  - Only MRI safe fire extinguishers are permitting to be used near the MRI suite.
    - These MRI safe fire extinguishers should be marked MRI safe. They are located in radiology, outside the MRI truck, and inside the MRI truck.

WHAT TO DO DURING A CODE BLUE

- In the case of a Code Blue, the patient will be removed from the MRI suite before any treatment is performed.
  - If you arrive before the patient is removed, you must STOP, and remove all metal except glasses and earrings before entering the MRI suite.
  - Use MRI safe cart located on MRI unit for transfer
- The Code can be performed in the ED or in the cardiovascular suite in radiology on the 2nd floor.

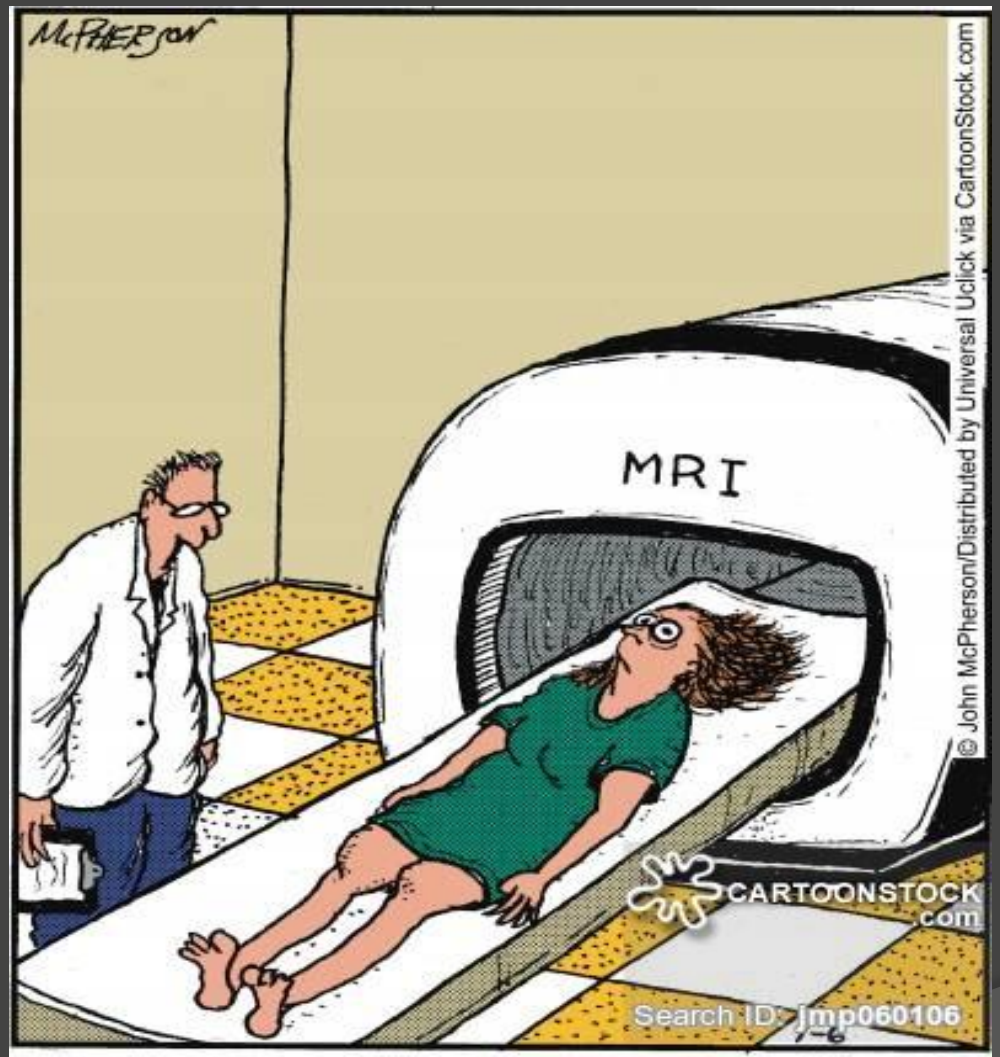
REMEMBER

- ALWAYS remove everything from your pockets and any looses metal from your body!!!
- Never take a patient with any metal, transdermal patches, and ECG leads/wires, and any type of patches into the MRI suite.

- MAGNET IS ALWAYS ON!!!

- MRI = Metal Results (in) Injury!!!

ANY QUESTIONS?



Resources

- Joint Commission. (2014). Preventing accidents and Injuries in the MRI suite [Sentinel Event Alert], 38. Retrieved from http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_38.htm
- MR Research Facility. (2007). MR Safety. Retrieved Nov 2, 2014, from http://www.mrc.wayne.edu/safety.htm
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