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Q1: How protons do help in MR imaging?

Ans: MR imaging is also known as proton imaging. It imaging in basis of proton. In our body is made up water it present and water have hydrogen. For imaging purpose the hydrogen nucleus (a single proton is used because of it's abundance in water and fat.

When a body is faced in strong magnatic field, such as an MRI scanner. the protons ares all line up. This uniform alignment creates a magnatic vector orient along the axis of the MRI scanner. MRI scanners come in different field stiengths, usually between 0.5 and 15 tesla.

The Radio wave frequency that causes the hydrogen nuclei to resonate is dependent on the element sought and the stienght of magnatic field.

Q2: Differentiate between longitudnal and transverse magnatization.

Transverse	longitudnal
① Magnatic field can measured directly.	① Magnatic field cannot be measured directly.
② Along x-y axis.	② Along Z axis
③ Reduction in magnitude	③ Recovered in magnitude and established new transverse magnatization.
④ 90° angle with respect to the direction of magnatic field. perpendicular.	④ parallel to direction of the field.
⑤ Due to the spins of individual protons getting more or less into phase after RF pulse.	⑤ Due to difference in the number of spins in parrallel and anti-parrabl befor RF pulse.
⑥ It appears due to phase coherence, except for a 180. degree flip angle.	⑥ During excitation it decrease.
⑦ The magnatic movement of the nuclei only move in alignment with or against m.f strength. i-e low or high energy state.	⑦ It is null magnatization

Q3: Write a note on gradient field?

Ans:

Gradient field:

- Gradient field are needed to encode the signal spatially.
- They produce a linear variation in magnetic field intensity in a direction in space.
- This variation in magnetic field intensity is added to the main magnetic field which is far more powerful.
- The variation is produced by pair of coils, placed in each spatial direction.
- The direction of the magnetic field is not modified.
- By adding them to B0, a linear variation is produced in the total magnetic field amplitude in the direction to which they are applied.
- Their action is considered as homogeneous on a plane perpendicular to the direction of application.
- It's modifies resonance frequency in proportion to the intensity of magnetic field to which they

are submitted.

= This variation in lamor frequency also causes a variation and dispersion of spin phases.

= Their maximal amplitude which determines maximal spatial resolution.

= Their slew rate, corresponding to their switching speed. high slew rates and low rise time are required to switch gradients quickly and allow ultra-fast imaging sequences such as echo planer.

= Their linearity, which must be as perfect as possible within the scanning area.

Moreover, gradient switches produce Lorentz forces causing vibration in the gradient coils and their supports. These vibrations are the main source of the characteristics MRI noise.

Q4:- Describe four basic steps of MR Imaging.

Ans:- **Four basic steps:-**

1. placing the patient into magnet.
2. Sending Radiofrequency (Rf) pulse by coil.
3. Receiving signal from the patient by coil.
4. Transformation of signals into image. to computer for processing to get image.

Q5:- Write the typical value of long and short TR/TE in spin echo sequence and gradient echo sequence

Ans:-

TR is always lesser than TE

TR/TE	Spin_echo-sequence	Gradient echo sequ
Short TR	300 – 800	< 50
Long TE	> 60	> 10
Short TE	10 – 25	1 – 5
Long TR	> 2000	> 100

Qb:- Define the following terms

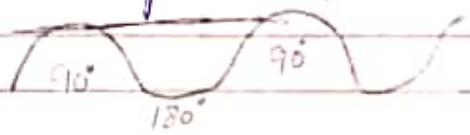
(a) TR (b) TE (c) Transverse relaxation (d) longitudinal relaxation (e) T1 weighted images (f) T2 weighted images (g) proton density images.

(a) TR:-

Time to repeat.

The time taken by start of one RF pulse to start of next RF pulse.

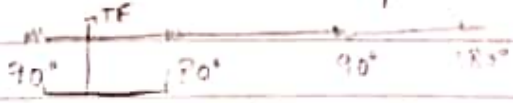
Time interval between begnings of 90 degree pulses is TR.



(b) TE:-

Time to Echo

Time taken between start of RF pulse and reception of the echo.



(c) Transverse Relaxation:-

When RF pulse is switched off and transverse magnatization reduces is known as Transverse Relaxation.

(d) Longitudinal Relaxation:-

When RF pulse is switched off Transverse magnatization reduce and longituidnal magnatization increase is known as longitudinal Relaxation.

(e) T_1 weighted images:-

When When TR is kept short and TE also short It will give T_1 weighted images.

(f) T_2 weighted images:-

When When TR is kept long and TE also long It will give T_2 weighted image.

(g) proton density images:-

When TR kept long and TE is short It will give proton density images.