

Page # 1

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subject # MRI Procedure

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Q

1

write down MR Spectroscopy? its usage in Clinical Practice?

Ans

1

Spectroscopy:-

Def: Spectroscopy is deal with the study of interaction among any form of matter and radiated energy

OR

It is a non-invasive diagnostic test use for the measuring biochemical change in the brain.

→ MR spectroscopy use may also be used to detect tissues changes in stroke and epilepsy.

→ MR Spectroscopy synthesizes molecules such as hydrogen ions or protons.

→ Proton spectroscopy is more commonly used.

→ Some several metabolites of metabolism; can be measured to distinguish among tumor types.

→ Amino acid

→ Lactate

→ Alanine

→ Choline

→ Creatine

→ Lipid.

→ The frequency of these metabolites is measured in units called parts per million (ppm)

→ MRS also known as nuclear magnetic resonance (NMR) spectroscopy.

→ Even the MRS can be performed by 0.5 Tesla or above.

→ A field strength of 1.5 Tesla or above to improved spectral separation and ~~enhance~~ SNR.
more

Usage in clinical practice of MR Spectroscopy

Glioma:

MR Spectroscopy can help ~~enhance~~^{rise} our capability to predict the situation.

→ This grade ~~enhances~~ rise NAA and creatine less and Choline, lipids and lactate rise.

→ The margin of Contrast enhancement of gliomas, Choline will be elevated back. in keeping will cellular information.

Radiation effects:

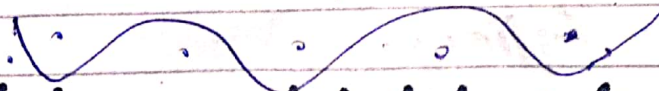
→ Difference radiation change and tumor recurrence can be problematic.

→ In previous tumor Choline will be decrease.

Ischemia and Infarction:

→ ~~at~~ Lactate will rise as the brain switches to anaerobic metabolism.

→ when infarction takes place then lipids are released and peaks appear.



Q 2 Write a detailed note on contrast media and how it effects image details?

Ans 2 Contrast Media:-

→ It is some time called contrast agent or contrast material.

→ It is used to improve image quality inside of the body.

→ Contrast agent are use to differentiate normal from abnormal.

→ Two types of Contrast media.

① Positive Contrast media

② Negative Contrast media.

① Positive Contrast media

→ Positive Contrast media is radioopaque.

→ Positive Contrast agent have high atomic number.

→ ~~at~~ white on film.

② Negative Contrast Media:

- Negative Contrast agent is radio-lucent.
- Low atomic Number.
- Black on film.

Paramagnetic Substances:

- It have small magnetic field.
- It can cause shortening of the relaxation times of T_1 and T_2 of protons.
- This shortening called proton relaxation enhancement.
- Under normal Circumstances the body contain paramagnetic substances.
- such as Degradation products of hemoglobin.
 - Deoxyglobin
 - methemoglobin
- MR contrast, Gadolinium is a paramagnetic substance.
- Trade name of Gadolinium is Magnevist (Gd-DTPA)
- Gadolinium is toxic free state, because it is bound to DTPA in a certain way known as

Chelation.

-> Chelation solves the problem of chelation.

Contrast media effect on image details

Some Contrast media effect on image detail are given below:

=> The effect of Contrast media on both signal intensity of T_1 and T_2 .

-> T_1 shorten and the T_2 the respective curves are shifted towards the left.

-> More signal for TR.

-> Less signal of TE.

-> Signal intensity of two tissue is illustrated.

-> The IV administered Gadolinium-DTPA enters to ~~tissue~~ the one tissue.

-> The T_1 tissue become shorter and T_2 curve is shifted to the left

-> TR is longer

-> TR is stronger.

-> The two tissue can be

better differentiated, because there is better contrast
→ Vasculatured tumor tissues are enhanced.
→ Contrast media improve lesion detection and diagnostic accuracy of MRI.

Q

3

How can we determine or select a certain slice thickness and from where does the signal come from?

Ans

3

Determine or Select a certain slice thickness

- Select a different slice thickness in two ways.
- One solution is sent is not only one specific frequency.
- But RF pulse that has a range of frequencies.
- The large range of frequencies, the thicker the slice in which proton will be excited.
- When RF pulse with frequencies from 64 to 65 MHz, we will get a

a slice like this.

→ Therefore we only use frequencies from 64 to 64.5 MHz; the protons in a smaller slice will show resonance.

→ Another way of to select a various slice thickness.

→ Used a gradient field.

→ Therefore have a steeper gradient field.

→ i.e. One has more distinguish in field strength over a specific distance.

→ The precision frequencies will also vary to a larger degree.

→ The same range of radio frequencies, the same band width as it is called, slice thickness can be identified by the slope of the gradient field.

Signal Come from:-

→ After, Now we have selected position and thickness of our slice.

→ But how can we find out, from what

point of our slice or certain signal is coming from - information that we must have to construct an image?

→ This technique is similar to the slice ~~the~~ selecting gradient which is turned on only during application of the RF pulse.

→ None proton in the slice selected.

→ Now After the RF pulse is sent in total of them precess with the same frequency.

→ We now apply another gradient ~~field~~ field which in our example decreases from left to right.

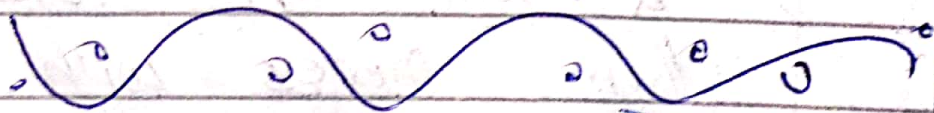
→ So the precession frequency of the protons will also decrease from left to right.

→ In the end of that the protons in the ~~different~~ different columns eject their signals with these different frequencies.

→ The gradient applied is thus also called the frequency encoding gradient.

Page # 10

- All protons have the same frequency.
- After the RF pulse the protons are in phase is "whipping".
- After now we apply a magnetic gradient along this column for a short time.
- This cause the proton to be speed up their precession according to the strength of magnetic field.
- Then become exposed.



The END.