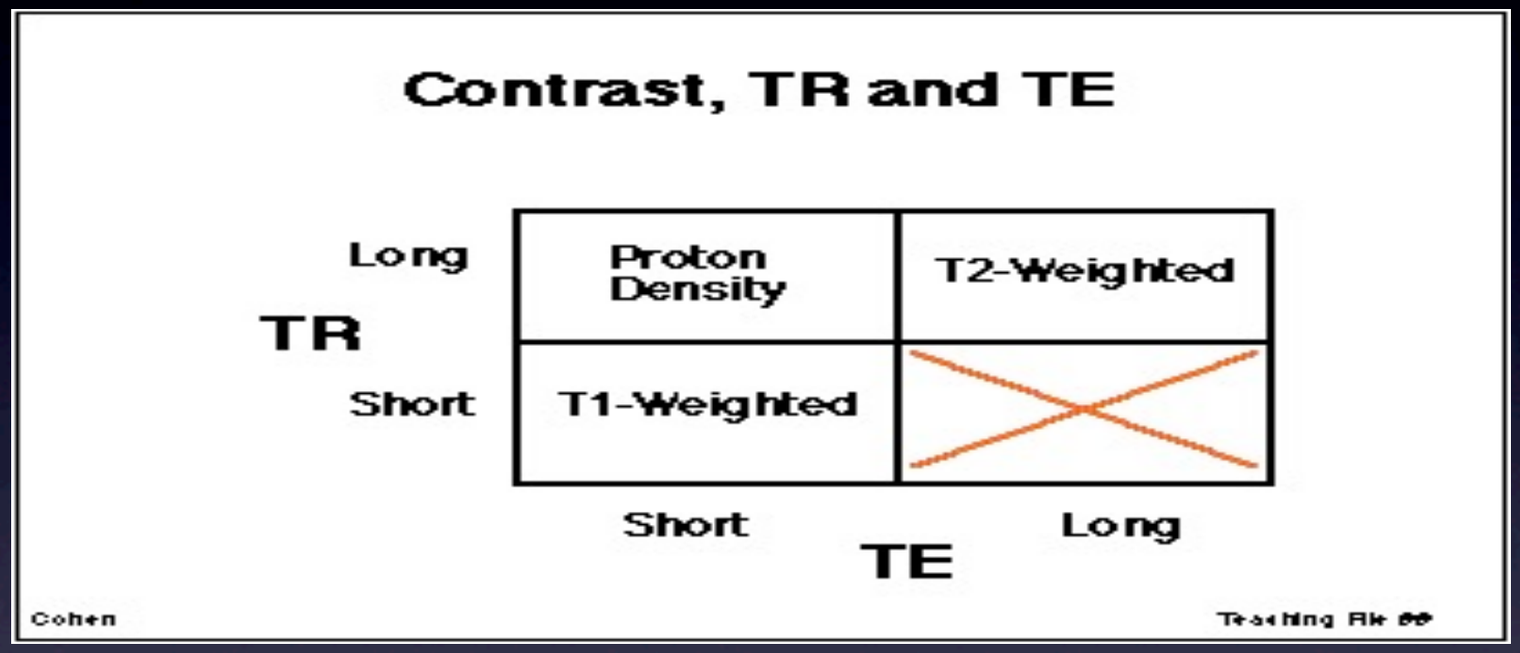
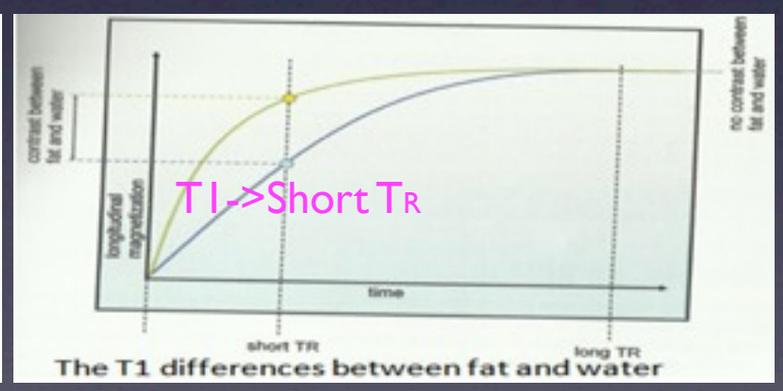
Repetition Time , Echo Time and Pulse Sequence: accentuating differences in tissues e.g. fat & water

Ask Mish



The T2 differences between fat and water



The T1 differences between fat and water

- To enhance T2 among various tissues we have to wait long time btw Radio Pulse refer as long TR and a long time to listen for the return signal or echo refer to as long Te. P+ in the fat tissue will first start quickly to desynchronize and become phase shifted (short T2) while the more energetic p+ in water will take longer time to become out of phase (long T2).
- To enhance T1 btw fat and water, we need to apply a short TR and read the signal quickly (short TE). Fat p+ will lose E quickly, returning to the low E level or longitudinal magnetization (short T1) A quick reapplied pulse will produce a transversal magnetization and a strong signal on T1 weighted image (WHITE)
- In highly energetic water, the process of giving back the energy is much slower so a quick new RP will find the p+ still in transversal magnetization. (long T1). What can the new E do is to flip back in the high E state more p+ from the low E state, process known as 180 degree pulse. No new transversal magnetization occurs so the signal is weak for water p+ on T1 weighted image in comparison w/ signal from fat p+.

- The image in btw T1 and T2 weighted w/ long TR and short TE is called PROTON DENSITY. Long TR minimizes T1 and short TE minimizes T2 so the image resulted gives information only about the p+density.