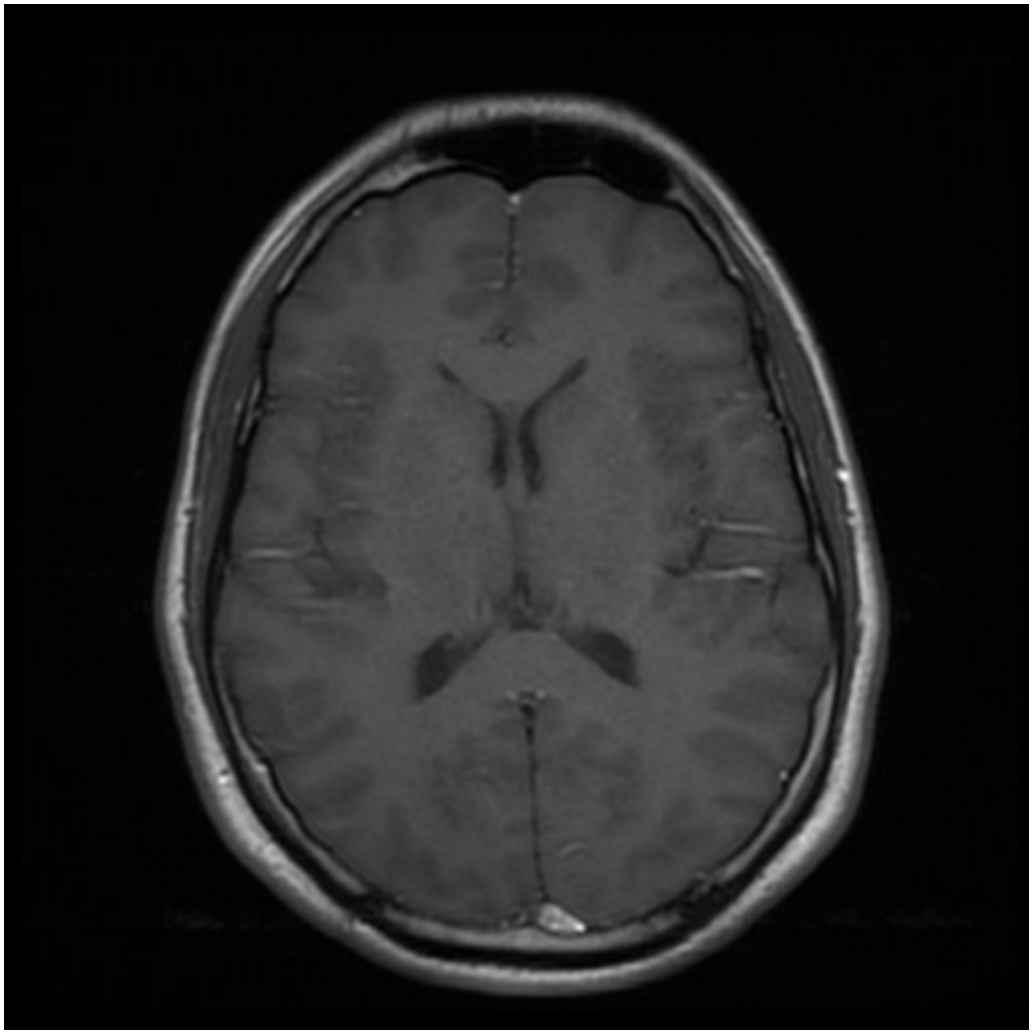
Time to Repeat (TR)

What is TR?

Time to Repeat (TR) is the time between successive excitation pulses in the same slice. It is a user selectable parameter that primarily controls the amount of longitudinal relaxation allowed to occur within a pulse sequence. Appropriate TR's depend on the particular pulse sequence and contrast, so each will be addressed separately below.

TR in Fast Spin Echo

In an FSE sequence TR primarily controls the amount of T1 weighting allowed to influence image contrast. Shorter TR's (400-700) will increase T1 contrast by saturating tissues with long T1 times, and long TR's (3000+) will reduce T1 weighting by allowing all tissues time to recover most of their longitudinal magnetization. Secondarily, the TR will affect the maximum number of slices per TR and the maximum ETL. Longer TR's will allow for more slices and longer ETLs, while shorter TR's will require slices be broken up into multiple acquisitions. SNR will also be affected by TR selection; as TR is increased, more longitudinal magnetization is recovered and available to be converted into transverse magnetization. This effect can be seen even within relatively short TR ranges. In the images below, TR is increased from 400 to 4000ms; note how both SNR and image contrast evolve. Further, notice how the CSF signal remains relatively dark until almost 4000ms.



- T1 weighting: 400-700ms
- Proton Density weighting: 3000ms+
- T2 weighting: 3000ms+
- T2 FLAIR: 9000ms+
- T1 FLAIR: 1800ms+
- STIR: 3000ms+

Driven Equilibrium/Restore Pulse