PARALLEL IMAGING

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HIGHLIGHTS

- Knowing your coil array's sensitivity pattern is crucial to maximizing acceleration with parallel imaging
- Parallel imaging creates new factors to consider when evaluating SNR
- Avoiding artefacts in parallel imaging requires thinking about how the coil array, field of view and direction of acceleration interact with each other.

TARGET AUDIENCE: Clinicians utilizing Parallel Imaging

OBJECTIVES:

- Identify key factors for achieving high image quality when using Parallel Imaging
- Recognise artefacts resulting from Parallel Imaging and how to avoid them
- Understand the trade-offs involved in the use of Parallel Imaging

Parallel Imaging is one of most important changes in the acquisition of MRI in the last ten years. Prior to the advent of parallel imaging, all of the spatial information in an image was determined through frequency and phase encoding by magnetic field gradients. The rate at which this encoding could be performed was limited by the rate at which gradients could be switched. This in turn is limited by biosafety concerns so that patients are not subjected to uncomfortable or painful stimulation of peripheral nerves. Thus, the rate at which images could be acquired could not exceed the gradient encoding limitation

Parallel Imaging gets around these limits by using coil arrays and their spatially varying sensitivity patterns to substitute for a fraction of phase encoding normally done by gradients. This has allowed large reductions in scan time to be achieved: two-fold reductions are routine and reductions as high as ten-fold can be achieved in some cases. This introduces valuable additional flexibility in image acquisition. However, it has also introduced a number of new considerations for achieving high quality imaging. Parallel Imaging is achieved entirely in the software that reconstructs the images and there are a few varieties of Parallel Imaging, so the strengths and weaknesses of different image reconstruction methods have to be considered. Image acceleration results in SNR loss, so how much acceleration can be used before SNR becomes too low? Answering this question requires some knowledge of how the coil array's sensitivity pattern and consideration of how the sensitivity is calibrated. Finally, Parallel Imaging introduces new types artefacts and new constraints on how images can be acquired to avoid these artefacts.

This talk will discuss the basics of how Parallel Imaging works in order to provide a framework for discussing the various factors that must be considered when introducing the use of Parallel Imaging into a clinical protocol.

REFERENCES

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