MRI of the Neck: What Pulse Sequences to Use
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Learning Objectives:

1. To describe the indications, advantages and challenges of MRI in head and neck imaging
2. To review the role of common MRI pulse sequences utilized in clinical practice
3. To discuss the potential role of advanced MRI techniques in evaluation of neck pathologies

MRI is often used a problem solving modality in evaluation of head and neck pathologies. It can not only provide supplementary information to CT but also serve as the primary imaging modality in a number of clinical scenarios where its superior contrast resolution and exquisite demonstration of anatomy (for example, skull base foramina) help in making crucial management decisions. Therefore, it is essential to understand the role of basic and advanced MRI sequences employed in neck imaging.

For example, in a patient presenting with head and neck cancer, the pre-contrast T1-weighted axial image is important to demonstrate obscuration or displacement of normal fat planes, which may otherwise not be identified on the post-contrast T1-weighted images due to similar signal intensity of fat and enhancing tumor after contrast administration. The T2-weighted image provides an estimate of how cellular the lesion is; the greater the cellularity and the nuclear to cytoplasmic ratio, the lower is the T2 signal. The post-contrast T1-weighted images tell us about the vascularity of the tumor, possible infiltration into important adjacent spaces and if performed with fat saturation, can show the true enhancement by suppressing the surrounding fat. The plane of evaluation is also important since certain structures can be visualized better on some planes but not on others. Perineural invasion into the foramen rotundum and Vidian canal can be better recognized on coronal imaging while the nasopharyngeal roof and sphenoid sinus invasion are easier to evaluate on sagittal imaging.

Some of the newer advanced pulse sequences that are increasingly employed in neck imaging in the clinical setting, as a research tool or both include diffusion weighted imaging, perfusion MRI and dynamic MR angiogram. There is a great deal of enthusiasm about these new techniques pertaining to biologic or functional imaging as they may be able to serve as surrogate markers for tumor cellularity or microvascularity, which are important for prognostication and deciding appropriate lines of therapy in head and neck cancer.

Conclusion: Knowledge of the indications and challenges of head and neck MRI, and the role of each MRI pulse sequence for evaluation of pathologies are important for knowing how to protocol and perform a study and maximize clinical benefit.