

Purpose: Magnetic Resonance Imaging is the clinical imaging modality of choice in many diagnostic imaging studies, including the spine. Diagnostic cervical spine MRI image quality depends on both scanner and patient variability factors. Determining the source of poor image quality is useful information during clinical evaluation.

Methods: A cervical spine reference phantom was designed and fabricated for use with a clinical GE Signa 1.5 Tesla MRI scanner and a spine surface coil. Patients were imaged using the reference phantom during routine clinical scanning. More than one thousand images were collected, evaluated, and analyzed. The performance of the reference phantom was evaluated by a team of radiologist and multiple software tools.

Results: The primary result of this research was the creation of a film-based MRI reference phantom. The research correlated subjective results with the reference phantom measurements and performance. The following three parameters were evaluated: spatial resolution, contrast detectability, and signal-to-noise ratio. A significant sample of degraded spin-echo and gradient-echo MR images were collected. Using both quantitative and qualitative techniques these images were evaluated. Patient-induced variability factors were found to be the primary cause of image quality degradation. Scanner-induced variability factors did not contribute significantly to the image quality degradation observed.

Conclusion: A clinically useful phantom was developed and employed on a daily basis to obtain MRI quality information. The reference phantom successfully identified and isolated a selected set of scanner and patient variability factors providing useful quality information during clinical interpretation of cervical spine images.