# Dynamic Cervical Magnetic Resonance Imaging

Dynamic MRI is useful to determine more accurately the number of levels where the spinal cord is compromised, and to better evaluate narrowing of the canal and intramedullary high-intensity signal (IHIS) changes. New information provided by flexion-extension MRI might change our strategy for CSM management [1)].

Imaging of the cervical spine in functional positions has so far been limited to conventional Cervical spine x ray examinations or the scarcely available open magnetic resonance imaging (MRI). An MRI compatible positioning device allows MRI examinations in various positions and even in motion. In combination with high-resolution T2-weighted MRI it allows detailed functional imaging of the cervical spine and nerve roots.

The combination of a mechanical positioning device and a high-resolution 3D T2-weighted sequence (SPACE) on a conventional 1.5 T MRI allows kinematic imaging of the cervical spine as well as high-resolution imaging in the end positions, even in the presence of metal implants. In this proof of concept study a good visualization of narrowing of the spinal canal in functional positions could be achieved, showing the potential of MRI in functional positions for clinical and research applications [2)].

The Dynamic Cervical Spine Magnetic Resonance Imaging demonstrated a major number of findings and spinal cord compressions compared to the static exam. The dynamic exam is able to provide useful information in these patients, but Nigro et al., suggested a careful evaluation of the findings in the extension exam since they are probably over-expressed [3)].

It is useful in correlating symptoms with the dynamic changes only noted on dMRI, and has reduced the incidence of misdiagnosis of myelopathy [4)].

In a study of Pratali et al., Dynamic cervical MRI was obtained using a standard protocol with the neck in neutral, flexion, and extension positions. The morphometric parameters considered were anterior length of the spinal cord (ALSC), posterior length of the spinal cord (PLSC), spinal canal diameter (SCD) and spinal cord width (SCW). Two observers analyzed the parameters independently, and the inter- and intra-observer reliabilities were assessed by the intraclass correlation coefficient (ICC).

18 patients were included in the study and all completed the dynamic MRI acquisition protocol. The inter- and intra-observer reliabilities demonstrated “almost perfect agreement” ($ICC > 0.9$, $p < 0.001$) for ALSC and PLSC in all positions. The SCD had inter- and intra-observer reliability classified as “almost perfect agreement” (ICC: 0.83-0.98, $p < 0.001$ and ICC: 0.90-0.99, $p < 0.001$, respectively) in all positions. The SCW had inter- and intra-observer reliability classified as “substantial agreement” (ICC: 0.73-0.94, $p < 0.001$ and ICC: 0.79-0.96, $p < 0.001$, respectively) in all positions. ALSC and PLSC in neutral, flexion and extension positions from the present study were significantly greater compared to the measurements previously published ($P < 0.001$).

The dynamic MRI protocol presented was safe and may allow a more complete evaluation of variations in the cervical spine in patients with CSM than traditional MRI protocols. The morphometric parameters based on this protocol demonstrated excellent inter- and intra-observer reliabilities [5)].

# References

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