69 Spine: Lumbar—Intrathecal (Part 2)

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This case presents MR scans from a 39-year-old man with von Hippel-Lindau syndrome who had resection of a pheochromocytoma in the distant past and reports ongoing cervical/upper lumbar back pain, extremity weakness, and paresthesias. In **Fig. 69–1**, axial postcontrast T1-weighted images acquired at 3 T using a 2-mm slice thickness are presented from the cervical (A) and lumbar spine (B to D). Depicted are multiple enhancing hemangioblastomas—three involving nerve roots and one involving the conus (arrows). Along with the advent of 3 T, there has been development of multicoil/multielement MR systems that allow for full spine imaging, without manual repositioning or coil reconfiguration between studies, and thus faster overall imaging

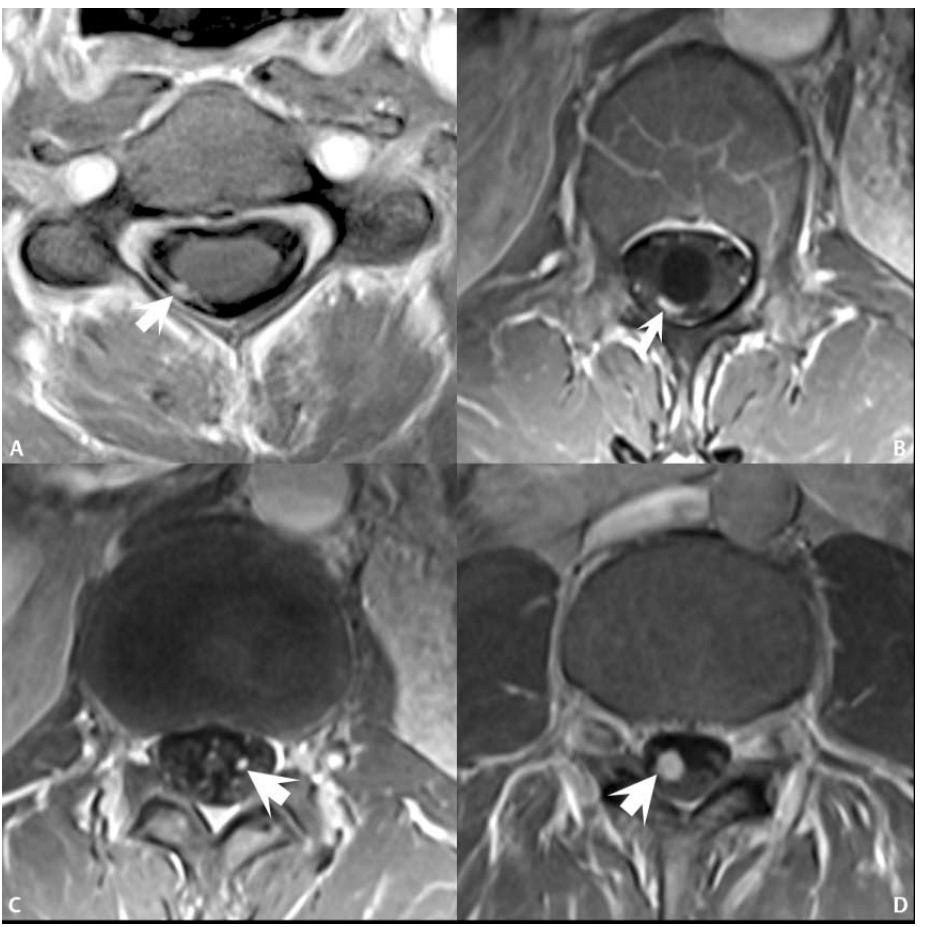

Figure 69–1

Figure 69–2

times. In this example, the patient's lumbar spine study was performed initially, followed by evaluation of the cervical cord. Between the lumbar and cervical scans, the patient table was repositioned from the operator's console, with less than a sec needed to transition between the two studies. **Figure 69–1B** demonstrates a syrinx cavity with enhancement along the right posterior margin, consistent with a hemangioblastoma involving the conus medullaris. **Figures 69–1A, 69–1C,** and **69–1D** depict min enhancing hemangioblastomas involving (A) a dorsal cervical root and (C, D) the nerves themselves within the cauda equina. 3 T provides for the first time the capability of routine 2-mm sections in the spine, whether cervical, thoracic, or lumbar, improving detection of small lesions such as that illustrated. As a correlate, this should dramatically improve the imaging and depiction of leptomeningeal metastatic disease.

Comparison of the lesion in the conus medullaris as depicted at 1.5 and 3 T is illustrated in **Figs. 69–2A** to **69–2D**. Both image sets demonstrate the anatomy of the conus lesion and its associated syrinx further. (A, B) are precontrast T2- and postcontrast T1-weighted sections at 1.5 T acquired using 4-mm slices and 0.8 mm^2 in-plane resolution, (C, D) are the equivalent images at 3 T acquired using 2.4-mm slices—in approximately

Figure 69–3

the same scan time (~4 mins), but with substantially better in-plane spatial resolution (0.3 mm^2). With new SAR reduction techniques and thin-section imaging capabilities, 3 T surpasses 1.5 T in the lumbar spine due to improved high-resolution imaging.

Figures 69–3A and **69–3B** compare two different techniques for the acquisition of sagittal thin-section T2-weighted images at 3 T. (A) was acquired with FSE technique using 2.4-mm sections (pixel dimensions of 0.6×0.5 mm^2), demonstrating the conus lesion together with another hemangioblastoma (arrow) further down within the cauda equina. (B) depicts the same portion of the lumbar spine acquired using SPACE (a 3D high-resolution low SAR FSE technique). The in-plane resolution for (B) is slightly inferior to that in (A), with the SPACE image acquired using a voxel size of $0.9 \times 0.9 \times 0.9$ mm^3. However, this permits high-resolution multiplanar reconstructions in any desired orientation. There is a slight difference in tilt between (A, B) the two sagittal acquisitions, with the spinal canal slightly oblique relative to the plane of acquisition for the SPACE image. However, this is of little consequence due to the small isometric voxel. **Figure 69–4** shows the reformatting capabilities with SPACE, demonstrating

Figure 69–4

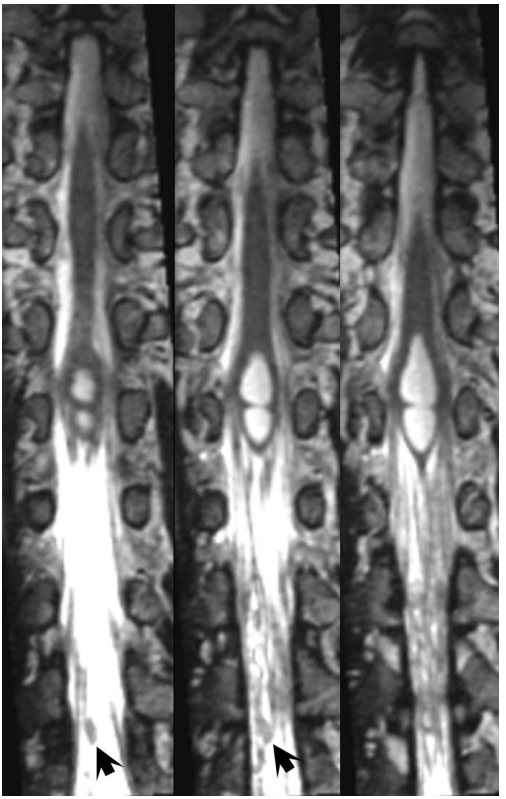

Figure 69–5

contiguous 0.9-mm sagittal sections, now slightly tilted to have the cord in plane. Of note, the small hemangioblastoma located in the lower lumbar canal is visualized on three contiguous slices (as opposed to on one slice of the 2D FSE scan).

The multiplanar reconstruction capabilities using a SPACE acquisition are further demonstrated with coronal reformats displayed in **Fig. 69–5**. On these images, both the lesion within the conus and that lower in the lumbar spine are again visualized.

In summary, the acquisition of high-resolution 3D data sets of the lumbar spine within an acceptable scan time is made possible with 3 T due to the inherent higher SNR. In combination with new multicoil, multielement magnet systems, the entire spine can thus be imaged with high resolution in an acceptable time with no patient manipulation or coil reconfiguration between studies. As SAR reduction strategies come more into practice at 3 T, further gains can be expected in spine imaging, specifically in terms of exam quality and scan time.