MR neurography allows clear visualization of peripheral nerves

Shandong Medical Imaging Research Institute explores DWIBS for MR neurography in extremities

Dr. Wang, Shandong Medical Imaging Research Institute, PR China
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Patients with unexplained pain in the extremities often suspect a muscle, tendon or ligament injury, particularly when exams prove inconclusive. However, at times the actual culprit is pathology of the nerves. At Shandong Medical Imaging Research Institute (PR China), MR neurography is illuminating nerve pathology, making a clinical impact by adding significantly to the findings collected via ultrasound or electromyography.

"MR neurography has high spatial resolution and a large field of view, so it can help to confirm ultrasound findings when they are inconclusive.”
Dr. Wang notes that even when ultrasound or electromyography results in a conclusive diagnosis, MR can be useful to add information for surgical planning. “If ultrasound or electromyography cannot demonstrate the exact position of the lesion, it is difficult to do surgery,” he explains. “But after an MR examination, we can demonstrate the lesion’s position and shape which can help us determine which type of lesion it is. We give the MRI images to the surgeon to review before the operation.”

“MR neurography is also used for patients who have nerve damage as a result of trauma,” he adds. “When a patient presents with pain or paralysis, we try to pinpoint the cause.” In some cases, the patient history can be used to determine if the pain or paralysis was caused by trauma. “But in other cases, the problem cannot be traced back to a single incident,” Dr. Wang says. “In those cases, MR can sometimes help to visualize tumor or inflammation when ultrasound cannot.”

“If the patient has a tumor, surgery may be needed. If the pain is caused by inflammation or distortion of the nerve, there are drug treatments available,” he says. “The patient history is very important for a clinical diagnosis, but a physician cannot make diagnosis only on history.”

**Diagnosing twisted nerves**

Dr. Wang points to twisted nerves as a good example of how DWIBS contributes to diagnoses that were very difficult to make without MR neurography. “In cases in the past, we suspected something could be wrong with the nerve, but we didn’t realize it was twisted, because we couldn’t visualize that on images,” he says.
Tibial nerve schwannoma
A 31-year-old man with a painless mass in the right leg underwent MR neurography on Achieva 3.0T TX with 8-channel SENSE Knee coil, scan time 3:54 min. MIP in oblique lateral and anteroposterior projection shows extrinsic appearance of the mass (arrow) relative to a compressed and anteriorly displaced right tibial nerve (arrowheads). The common peroneal nerve (CP) is normal. The intraoperative photograph shows the proximal tibial nerve entering the mass and the distal tibial nerve exiting the mass and fascicles (arrowheads) running over surface of mass. Histology demonstrated tibial nerve schwannoma.

Two months after surgery, follow-up MR neurography in oblique lateral and anteroposterior projection show that it is difficult to differentiate the tibial nerve (arrowheads) from surrounding hypertense tissues in the surgical area.

Whole body MR neurography in neurofibromatosis
A 21-year-old woman with multiple masses and atrophy of upper and lower extremities. Plexiform masses along upper and lower extremity nerves and discrete masses in lower extremities are clearly displayed on the anteroposterior projection DWIBS image. Pathological diagnosis is neurofibromatosis (Achieva 3.0T TX).

“Radiologists are beginning to recognize that we can view disease with a new angle using MR neurography.”
“Before we started using DWIBS for MR neurography, we were using both T1 and T2 STIR,” he explains. “However, we were not satisfied with these STIR techniques for demonstrating lesions near nerves. Using DWIBS, we have even been able to image the ulnar nerve, over its full length, which is about 2 mm in diameter.”

**Achieva well-suited for MR neurography**

To date, Dr. Wang has studied 51 patients, as well as approximately 50 normal volunteers. All studies were conducted on the Achieva 3.0T TX system, with scan times of 3-5 minutes. Although Shandong has two other 3.0T systems, as well as a 1.5T system, Dr. Wang says that the Achieva 3.0T TX is the only one currently being used for MR neurography. “MultiTransmit helps to shortens scan times and avoid distortion. We get very good contrast between nerves and other soft tissues,” he says. Achieva features high gradient linearity, which is particularly important in diffusion weighted imaging for consistent contrast and low geometrical distortion.

“Radiologists are beginning to recognize that we can view disease with a new angle using MR neurography,” Dr. Wang concludes. “While ultrasound may always be used first, I think MR neurography can also become common clinical practice.”

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