



# Peripheral Nerve Disorders: Chapter 8. Imaging of the peripheral nervous system (Handbook of Clinical Neurology)

*Guido Stoll, Einar Wilder-Smith, Martin Bendszus*

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This chapter summarizes progress in the evaluation of peripheral nerve (PN) lesions and disorders by imaging techniques encompassing magnetic resonance imaging (MRI) and nerve ultrasound (US). Due to the radiation exposure and limited sensitivity in soft tissue contrast, computed-tomography (CT) plays no significant role in the diagnostic work-up of PN disorders. MRI and US are complementary techniques for the evaluation of peripheral nerves, each having particular advantages and disadvantages. Nerve injury induces intrinsic MRI signal alterations on T2-weighted sequences in degenerating or demyelinating nerve segments as well as in corresponding muscle groups exhibiting denervation which can be exploited diagnostically. Nerve US is based on changes in the nerve echotexture due to tumor formation or focal enlargement caused by entrapment or inflammation. Both MRI and US provide morphological information on the precise site and extent of nerve injury. While US has the advantage of easy accessibility, providing images with superior spatial resolution at low cost, MRI shows better soft tissue contrast and better image quality for deep-lying nerve structures since imaging is not hindered by bone. Recent advances have remarkably increased spatial resolution of both MRI and US making imaging indispensable for the elucidation of causes of nerve compression, peripheral nerve tumors, and focal inflammatory conditions. Both MRI and US further guide neurosurgical exploration and can simplify treatment. Importantly, imaging can reveal treatable conditions even in the absence of gross electrophysiological alterations, illustrating its increasing role in clinical practice. In experimental settings, novel molecular and cellular MRI contrast agents allow in-vivo assessment of nerve regeneration as well as monitoring of neuroinflammation. Depending on further clinical development, contrast-enhanced MRI has the potential to follow cellular responses over time in vivo and to overcome the current limitations of histological assessment of nerve afflictions. Further advances in contrast-enhanced US has the potential for developing into a tool for the assessment of nerve blood perfusion, paving the way for better assessments of ischemic neuropathies.

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