

Focal Peripheral Neuropathies

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Imaging, Neurological,
and Neurosurgical Approaches



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Preface

Management of peripheral nerve irritation and compression syndromes needs interdisciplinary concepts to find the exact diagnosis and to choose the most suitable surgical procedure. During the last few years, imaging techniques have revolutionized our diagnostic capabilities. Of course, clinical and neurological evaluation remains principal in regard to diagnostic efforts. Meanwhile, however, neurological disciplines have increasingly applied high resolution ultrasound techniques to peripheral nerve structures and lesions. Therefore, it is one of the purposes of this book to focus on these new developments and to assess their special value when applied to each individual focal neuropathy.

Microsurgical techniques could decisively improve results of repair of traumatized peripheral nerves. Although the introduction of microsurgery started 50 years ago, it has taken several decades for all surgical disciplines to accept its value. In contrast to that, if microsurgery was merely understood in terms of intraneural surgery, its utilization on nerve entrapment syndromes would invariably remain an exception.

Nevertheless, younger surgeons who start dealing with peripheral nerve lesions need to first understand which degree of intraneural lesion and which kind of reactive tissue fibrosis can occur due to nerve compression or even damage. Their next step will then be to make an assessment of the nerve lesion

when confronted with a real case. At the same time, they must learn to handle a nerve structure as gently as possible in order to ensure reduction of neural damage and avoidance of new extra- or intraneural scarring. We apologize if we repeat knowledge and facts which have already been reported prior to this work.

A further purpose of this book is to help younger physicians focus increasingly on important differential-diagnostic questions in order to avoid unnecessary or even damaging surgery. There exists a surprisingly large field of degenerative, genetic, or inflammatory mono- or poly-neuropathies. Likely depending on individual lack of experience, the surgeon might easily suppose a false diagnosis, and consequently begin surgery which is really not indicated. We are optimistic that the new imaging techniques will help us more and more to discover all these focal neuropathies which should never be surgically treated.

We have to realize new tendencies in peripheral nerve surgery, especially ‘key hole’ approaches. More patients wish to get surgery resulting in a skin scar as small as possible. It will not be the purpose of this book to favor these special techniques. We expect them to be far more expensive than normal open surgical methods and we are aware that expensive and specialized tools are not available everywhere. Although criticism from specialized centers will possibly arise, everyone needs to realize that severe nerve irritation syndromes occur everywhere and normally do not require specialized treatment centers.

The latter argument gives us reason to somewhat emphasize the capacities of neurosonography imaging techniques in our presentation and – likely a subject of further criticism – to slightly neglect the equally important extensive development of MR imaging of nerves, which, until now, has been reserved for specialized centers.

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My gratitude has to be extended to Springer and its staff, who expressed enough confidence to publish our work. Of course, without their help this book would not have been completed.

Special thanks go to my wife, Ortrud, who once more spent many hours writing and correcting the text.

Hannover, Germany

GötzPenkert

Abbreviations

AB	Adductor brevis muscle
ABP	Abductor pollicis brevis muscle
ADC	Apparent diffusion coefficient
ADM	Abductor digiti minimi muscle
AIN	Anterior interosseus nerve
AL	Adductor longus muscle
ALS	Amyotrophic lateral sclerosis
AM	Adductor magnus muscle
ASIS	Anterior superior iliac spine
CEUS	Contrast enhanced ultrasound
CIDP	Chronic inflammatory demyelinating neuropathy
CMAP	Compound muscle action potential
CMT	Charcot-Marie-Tooth Disease
CRPS	Complex regional pain syndrome
CSA	Cross sectional area
CSF	Cerebrospinal fluid
CSS	Churg-Strauss syndrome
CT	Computed tomography
CTS	Carpal tunnel syndrome
DADS	Acquired demyelinating symmetrical neuropathy
DML	Distal motor latency
DTI	Diffusion tensor imaging
DWI	Diffusion-weighted MR imaging
EDB	Extensor digitorum brevis muscle
EDX	Electrodiagnostic examination

EIP	Extensor indicis proprius muscle
EMG	Electromyography
EO	External oblique muscle
FA	Fractional anisotropy
FCU	Flexor carpi ulnaris muscle
FDP 2	Flexor digitorum profundus muscle of the second digit
FOV	Field of view
FPL	Flexor pollicis longus muscle
GCS	Guyon's canal syndrome
HMSN	Hereditary motor-sensory neuropathy
HRUS	High-resolution ultrasound
IO	Internal oblique muscle
LFCN	Lateral femoral cutaneous nerve
MA	Magic angle artefact
MADSAM	Multifocal acquired demyelinating sensory and motor neuropathy
MCN	Musculocutaneous nerve
MIP	Maximum intensity projections
MMN	Multifocal motor neuropathies
MNCV	Motor nerve conduction velocities
MPR	Multiplanar reformats
MRI	Magnetic resonance imaging
MRN	Magnetic resonance neurography
MT	Magnetisation transfer imaging
MUAP	Motor unit action potential
NCS	Nerve conduction studies
PAN	Polyarteritis nodosa
PD(W)	Proton density weighted
PEC	Pectineus muscle
PIN	Posterior interosseus nerve
PMP	Peripheral myelin protein
PNS	Peripheral nerve stimulation
PQ	Pronator quadratus muscle

SNAP	Sensory nerve action potential
SNCV	Sensory nerve conduction velocity
SPACE	Single slab three-dimensional sequence
SPAIR	Spectral adiabatic inversion recovery
SPIR	Spectral presaturation with inversion recovery
sPNS	Subcutaneous peripheral nerve stimulation
SRN	Superficial radial nerve
STIR	Short-tau-inversion-recovery
TA	Transverse abdominal muscle
THI	Tissue harmonic imaging
TMS	Transcutaneous magnetic stimulation
TOS	Thoracic outlet syndrome
TR	Repetition time
TSE	Turbo spin echo
TTLD	Median-thenar to ulnar-thenar latency difference
TTS	Tarsal tunnel syndrome
UNE	Ulnar neuropathy at the elbow
WG	Wegener's granulomatosis

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