

# Index

- aberrant nerve pathways  
 accessory deep peroneal nerve, 98–9  
 Martin–Gruber anastomosis, 98–9  
 absolute refractory period, 12  
 accessory deep peroneal nerve, 98–9  
 acetylcholine (ACh) reactions, 14–15  
 action potential, 10  
 adenosine triphosphate (ATP), 16–17  
 afferent nerves, 4. *See also* sensory nerves  
 alpha motor neuron, 7–9  
 amplifier  
 differential, 19–20  
 filters, 20  
 anterior horn, 5  
 anterior horn cell, 1, 5, 6, 82, 84, 103  
 antidromic impulses, 13  
 averager, signal, 22–3  
 A-wave, 98–100  
 axon, 4  
 axon hillock, 6  
 axon reflex, 98–100  
 axonal degeneration, 27–28, 55  
 befilar electrodes, 19  
 bipolar cells, 45  
 capacitance, 11  
 carpal tunnel syndrome  
 conduction velocity and distal latency, 61  
 distal latency, 50  
 palm–wrist studies, 65–66  
 prognosis, 91  
 cathode, 48  
 collateral re-innervation, 30  
 common mode rejection ratio (CMRR), 20  
 complex repetitive discharges, 42–3  
 compound muscle action potential (CMAP), 28  
 conduction block, 64  
 conduction velocity  
 measurement principles  
 motor, 45  
 sensory, 45–6  
 constant current stimulator, 19  
 constant voltage stimulator, 19  
 continuous conduction, 12  
 cross-bridge cycling, 17  
 degeneration  
 defined, 27–8  
 nerve conduction studies (NCS), 55–9  
 peripheral neuropathy, 87–8  
 demyelination  
 defined, 27  
 nerve conduction studies, 60–7  
 peripheral neuropathy, 88–9  
 dendrites, 4  
 depolarisation, 11–12  
 differential amplifier  
 configuration, 19  
 distal latency  
 carpal tunnel syndrome, 50  
 measurement of, 50  
 dorsal columns, 5  
 dorsal root ganglion, 1, 56–7  
 dying-back neuropathy, 28, 55  
 efferent nerves, 5. *See also* motor nerves  
 electrical potential  
 characteristics  
 amplitude, 33–4  
 duration, 33–4  
 form, 33–4  
 electrode types, recording  
 belly-tendon recordings, 18  
 defined, 18  
 indifferent (reference), 18  
 concentric needle, 18  
 electrode types, stimulating  
 anode, 48  
 cathode, 48  
 defined, 18  
 electrodes  
 defined, 18  
 needle, 18  
 surface, 19  
 electromyography (EMG)  
 defined, 1, 29  
 myopathic consistency, 29  
 repeated sampling avoidance technique, 35  
 electromyography (EMG) and nerve conduction studies (NCS), clinical applications  
 median and ulnar entrapment neuropathies, 89–91  
 myopathy, 86  
 neuromuscular transmission defects, 72–81  
 peripheral neuropathy, 86–90  
 peroneal nerve lesions, 91–3  
 proximal lesions, 94–6  
 radial nerve lesions, 92  
 tarsal tunnel syndrome, 92–3  
 thoracic outlet syndrome, 97  
 electromyography (EMG), anomalies  
 myopathy masquerading as neuropathy, 101  
 neuropathy masquerading as myopathy, 100  
 electromyography (EMG), distinguishing pathologies  
 motor unit numbers, 35–7  
 motor unit size, 29–34  
 sound, 34  
 electromyography (EMG), spontaneous activity  
 complex repetitive discharges, 42–4  
 end-plate noise, 37–8  
 end-plate potential, 38–9  
 fasciculation potentials, 40  
 fibrillation potentials, 39–40  
 incomplete relaxation, 40  
 insertional activity, 37  
 myokymia, 42  
 myotonia, 41–2  
 positive sharp waves, 40  
 end-plate noise, 37–8

- end-plate potential, 38–9  
end-plate zone, 14, 32  
excitation–contraction coupling, 16–17  
excitatory post synaptic potentials (EPSPs), 6  
exocytosis, 14  
extracellular recording models, 24  
extrafusal fibres, 16  
extrafusal muscle fibre types summary table, 17  
type 1, 16  
type 2a, 16  
type 2b, 16
- fasciculation potentials, 40  
fibrillation potentials, 39–40  
full interference pattern, 35–6  
F-wave studies defined, 82  
variable latency, 82
- gamma motor neuron, 9  
grey matter brain, 4  
spinal cord, 29
- H-reflex studies defined, 84  
latency, 84–5  
hyperpolarisation, 11–12
- impedance, 18  
incomplete relaxation, 40  
inhibitory post synaptic potentials (IPSPs), 6  
initial segment, 6  
insertion activity, 37  
interference pattern, 35  
intrafusal muscle fibres, 16
- jitter, 70, 79–81
- Lambert–Eaton myasthenic syndrome (LEMS), 74–6
- Martin–Gruber anastomosis, 98–9  
membrane potential, 10  
mixed nerve action potential (MNAP), 45  
mixed nerves conduction distance effects on amplitude and form, 51–2  
defined, 5  
normal conduction, 48  
monosynaptic, 5, 8  
motor latency, 50  
motor nerves. *See also* efferent nerves compound muscle action potential (CMAP), 45  
conduction block, 64  
conduction distance effects on amplitude and form, 52–3  
defined, 1  
demyelination, 61–3  
impulse travel, 13  
normal conduction, 49–51  
as peripheral nerve type, 8–9  
motor system action potential, 6  
anterior horn, 5  
anterior horn cell, 5  
axon hillock, 6  
excitatory post synaptic potentials (EPSPs), 6  
inhibitory post synaptic potentials (IPSPs), 6  
initial segment, 6  
motor unit, 5  
neuromuscular junction, 14–15  
soma, 6  
spatial summation, 6  
temporal summation, 6  
motor unit, 5  
motor unit potential (MUP) defined, 21, 29  
myopathy, 29, 34  
neuropathy, 30–1, 34  
numbers and muscle strength, 35–7  
motor unit size and myopathy, 29  
motor unit size and neuropathy, 32  
muscle extrafusal fibres, 16  
intrafusal fibres, 16  
muscle contraction cross-bridge cycling, 17  
excitation–contraction coupling, 17  
muscle contraction EMG drawbacks, 37  
interference pattern, 35  
recruitment pattern, 35  
reduced pattern, 35, 37  
muscle fibre types summary table, 17  
type 1, 16  
type 2a, 16  
type 2b, 16  
muscle pathology patchy nature of, 27  
vulnerable fibres, 27  
M-wave, 82  
myasthenia gravis, 72–4, 80–1  
myasthenic syndrome (Lambert–Eaton myasthenic syndrome, LEMS), 74–6  
myelin defined, 4  
peripheral nerve structure, 10, 11  
myokemia, 42  
myopathy EMG general diagnosis, 86  
EMG specific diagnosis, 103  
masquerading as neuropathy, 101  
recruitment pattern, 37  
myotonia, 41–2
- nascent motor unit potentials, 70  
needle electrode pick-up area reduction bifilar electrodes, 19  
single fibre electrode, 19  
nerve conduction studies (NCS) aim of, 2  
factors influencing, 46–7  
principles underlying, 45–6  
stimulation concerns, 46  
nerve conduction studies (NCS), conduction block, 64  
nerve conduction studies (NCS), degeneration dying-back neuropathy, 55  
poor localising capacity, 56–7  
sensory nerve action potential (SNAP), 58–9  
sinking normal distribution curve, 56

- nerve conduction studies (NCS), degrees of pathology  
 illustration of process, 68–9  
 recovery monitoring, 69–71
- nerve conduction studies (NCS), demyelination  
 conduction block, 60–1, 64  
 peripheral nerve different effects, 60–1  
 slowed conduction in large diameter fibres, 61–3  
 slowed conduction in small diameter fibres, 61–4
- nerve conduction studies (NCS), lesion localisation  
 diluting effect of interelectrode distance, 64–5
- nerve conduction studies (NCS), normal  
 conduction distance effects  
 on amplitude and form, 51–3  
 mixed nerve, 48  
 motor, 49–51  
 sensory, 48–9  
 submaximal stimulation errors, 53–4
- nerve fibre types  
 classification, 8  
 summary table, 8
- nervous system parts  
 brain grey matter, 4  
 brain stem, 4  
 central nervous system, 4  
 peripheral nervous system, 4  
 soma, 4  
 spinal cord grey matter, 4  
 synapses, 4  
 white matter, 4
- neuromuscular junction  
 acetylcholine (ACh)  
 reactions, 14–15  
 basic structure and function, 14  
 end-plate zone, 14  
 exocytosis, 14  
 synaptic cleft, 14
- neuromuscular transmission  
 defects, tests  
 repetitive nerve stimulation (RNS), 72–6  
 single-fibre  
 electromyography (SFEMG), 76–81
- neuropathy  
 EMG localisation and pathology, 103–4  
 masquerading as myopathy, 100  
 recruitment pattern, 37–7
- neuropathy, clinical EMG  
 applications  
 degenerating, 87–8  
 demyelinating, 88–9  
 generalized peripheral, 86–7
- orthodromic impulses, 13
- oscilloscope display, trigger  
 and delay facility, 20–2
- pathology  
 degrees of, 68–9  
 muscle, 27  
 nerve, 27–8
- patient age and nerve  
 conduction, 47
- peripheral nerve function  
 absolute refractory period, 12  
 action potential, 10  
 continuous conduction, 12  
 depolarised node, 11–12  
 relative refractory period, 11–12  
 saltatory conduction, 12  
 sodium ions, 10  
 subthreshold stimulus, 10
- peripheral nerve pathology  
 axonal, 29–8  
 degeneration, 27–8  
 demyelination, 27  
 Wallerian degeneration, 27
- peripheral nerve structure  
 myelination, 10, 11  
 node of Ranvier, 11
- peripheral nerve types  
 fibre types, 7  
 motor nerves, 8–9  
 sensory nerves, 7–8
- peripheral nervous system  
 afferent nerves, 4  
 bipolar cells, 4  
 efferent nerves, 5  
 mixed nerves, 5
- peroneal nerve lesions, 91–3
- polyphasic motor unit  
 potential, 34
- positive sharp waves, 40
- pseudofacilitation, 76
- radial nerve lesions, 92
- radiculopathy, 94–6
- Ranvier, node of, 11
- recording electrode, 18–9
- recruitment pattern  
 muscle contraction, 35  
 myopathy, 35  
 neuropathy, 35  
 reduced pattern, 35, 37  
 relative refractory period, 11–12
- repetitive nerve  
 stimulation (RNS)  
 myasthenia gravis, 72–4  
 myasthenic syndrome (Lambert–Eaton myasthenic syndrome, LEMS), 74–6  
 neuromuscular transmission defects, 104
- safety factor, 15
- saltatory conduction, 12
- satellite potential, 31
- Schwann cells, 11
- sensory action potential (SAP), 45
- sensory nerve action potential (SNAP), 45
- sensory nerves. *See also* afferent nerves  
 conduction distance effects  
 on amplitude and form, 51–2  
 conduction  
 measurement, 45–6  
 degeneration, 27–8  
 demyelination, 27–8  
 impulse travel, 13  
 normal conduction, 48–9  
 as peripheral nerve type, 7–8
- sensory system  
 bipolar cells, 4, 5  
 dorsal columns, 5  
 main pathways, 5  
 signal averager, 22–3  
 single-fibre electrode, 19
- single-fibre electromyography (SFEMG)  
 neuromuscular transmission  
 defects, 76–81, 104  
 stimulated SFEMG (sSFEMG), 76–7  
 voluntary SFEMG (vSFEMG), 76–7

- sodium ion flow, 11, 12  
 sodium–potassium pump, 10  
 soma  
   components of, 6  
   defined, 4  
 spatial dispersion, 30, 32  
 spatial summation, 6  
 stimulator, constant  
   current, 19  
 stimulator, constant voltage, 19  
 subthreshold stimulus, 10  
 surface electrode, 18–9  
 synapses  
   information transmission, 4  
   monosynaptic, 8  
   synaptic cleft, 14  
 tarsal tunnel syndrome, 92–3  
 temperature effects  
   (NCS), 46–7  
 temporal dispersion, 30, 32, 52  
 temporal summation, 6  
 thoracic outlet syndrome, 97  
 trigger and delay technique  
   pattern recognition of motor  
   unit potentials, 22  
 polyphasic motor unit  
   potential, 21  
 ulnar nerve entrapment, 61–4,  
   67, 89–91  
 unmyelinated nerves, 4, 12  
 volume conduction  
   models, 24  
   motor nerves, 25–6  
   sensory nerves, 25  
   triphasic potentials, 25  
 voluntary SFEMG (vSFEMG),  
   76–81  
 Wallerian degeneration, 27  
 white matter, 4