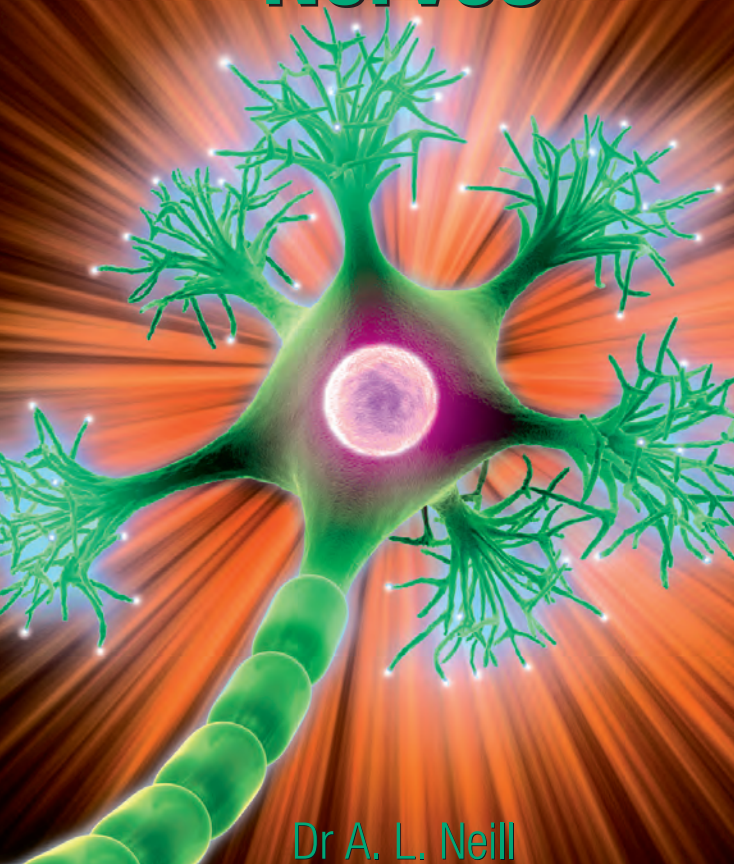
The A to Z of Peripheral Nerves



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Introduction

This is the first major update of the ***A to Z of Peripheral Nerves*** – and as can be seen by the title, there has been a greater emphasis placed on the clinical section, which has occurred in most of the A to Zs. This is due to feedback which plays an important role in the structure of the all A to Zs. As the original book was so big it was not possible to include more pathological considerations and they are to make up a new book on the failure of the nervous system one of the many in the new series of the ***A to Z of the failure of***... The first of which is the *A to Z of Bone & Joint Failure*.

Acknowledgement

I would like to thank Aspenpharmacare Australia: Mr Greg Lan CEO, and Mr Robert Koster and all those who helped in the contribution of this edition and in the feedback of the other books in this series.

Dedication

Things move on. Hopefully for the better but whatever they move on – for my A to Z, and Q & J too.

How to use this book

This book is an alphabetical listing of all the peripheral nerves. It contains diagrams of their pathways sensory, motor supply and is cross-referenced with all the A to Zs but in particular with the ***A to Z of Skeletal muscles*** and the ***A to Z of Surface Anatomy***, and The ***A to Z of Bones, Joints, Ligaments & the Back***. After the Common Terms section, is the illustrated section on the Components of the basic structures in the nervous system; followed by a Summary of the neurological examination. The main bulk of the book is the listing and illustration of each peripheral nerve.

The back cover has been modified as in the new editions of all the books – so that it serves as a means of identifying the book on the shelf (i.e. the fold over has the title down the "spine") and as a bookmark which can be folded flat against itself if it not to be used

Thank you

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Table of contents

Abbreviations

A = actions /movements of a joint
A = anterior
adj. = adjective
aka = also known as
alt. = alternative
AM = arachnoid mater
ANS = autonomic nervous system
ant = anterior
art = articulation (joint w/o the additional support structures)
AS = Alternative Spelling, generally referring to the diff. b/n British & American spelling
BBB = blood brain barrier
bc = because
BP = brachial plexus
BS = blood supply
b/n = between
C = cervical / carpal
c.f. = compared to
CN = cranial nerve
CNS = central nervous system
Co = coccygeal
CoP = coccygeal plexus
collat. = collateral
CP = cervical plexus
Cr = cranial
CSF = Cerebrospinal fluid
CT = connective tissue
DH = dorsal horn (of the spinal cord)
dist. = distal
DM = dura mater
e.g. = example
EC = extracellular (outside the cell)
ext. = extensor (as in muscle to extend across a joint)
fl. = flexor (as in muscle to flex across a joint)
Gk. = Greek
GM = grey matter
IC = intracellular / intercostal
IC = intercarpal
IMC = intermetacarpal
jt(s) = joints = articulations
L = lateral

L = left / lumbar
LL = lower limb
Lt. = Latin
lig = ligament
M = mater
MC = metacarpal
med = medial
MN = myelinated nerve
nMN = non-myelinated nerve
N = nerve
NS = nervous system/nerve supply
NT = nervous tissue
NTr = nerve tract / trunk
P = plexus
P = posterior
PaNS = parasympathetic nervous system
pl. = plural
PM = pia mater
PN = peripheral nerve
post. = posterior
proc. = process
prox. = proximal
R = Right
RC = radiocarpal
S = sacral
sing. = singular
Sc = spinal canal
SC = spinal cord
SN = spinal nerve
SP = spinous process
SyNS = sympathetic nervous system
T = thoracic
TP = transverse process
UL = upper limb, arm
V = vertebra
VB = vertebral body
VC = vertebral column
VH = ventral horn (of the spinal cord)
WM = white matter
w/n = within
w/o = without
& = and

Common terms in Neurology

Action potential	the generation of a N impulse through stimulation and depolarizing of the N cell membrane
Aetiology	the cause of ...the study of causes of illnesses of deficits
Afferent	incoming - as with sensory fibres *see Sensory*
Anasthesia	loss of sensation
Ansa -	a loop like structure
Ante	before , in front - anterior = ventral as in anterior horn = ventral horn
Aperture	an opening or space between bones or within a bone.
Articulation	joint, which is a point of contact b/n 2 opposing bones / relating to a joint. - hence *articular branches* of a nerve supply the joint described.
Association fibres	those N fibres (artic- = arthro-) which connect cortical areas of the brain ipsilaterally (as opposed to commissural fibres)
Astrocytes	hold neurons together, and repair their membranes (*see Glia*)
Axial	refers to the head & trunk (vertebrae, ribs & sternum) of the body.
Axon	N process carrying material away from the cell body to the target organ, each neuron has only one axon
Axon collaterals	branches of the axon
Basilar	relating to the base or bottom of structures
Basiocranium	bones of the base of the skull
Bipolar	neurons with 1 dendrite + 1 axon (*see unipolar, multipolar*)
Blood brain barrier	= BBB the barrier protecting the brain from certain substances found in the BS
Canal	tunnel / extended foramen as in the carotid canal, at the base of the skull adj canular (canicular - small canal)
Carotid	to put to sleep; compression of the common or internal carotid artery causes coma. This refers to bony points related to the carotid vessels
Cavity bones	an open area or sinus w/in a bone or formed by two or more (adj. cavernous), may be used interchangeably with fossa. Cavity tends to be more enclosed fossa a shallower bowl like space (Orbital fossa-Orbital cavity).
Caput	relating to the skull
Cephalic	pertaining to the head
Cerebrospinal fluid	= CSF fluid - fluid surrounding the brain and SC formed by the ependymal cells from filtered blood. It is part of the BBB, and contains sugar, urea and protein - approx 125mls and flows around the brain and SC at any time.
Chiasma	(Gk = X) used for the crossing of the Optic fibres
Cochlea	a snail hence snail-like shape relating to the Organ of Corti in the middle ear (adj. cochlear)
Commissural fibres	those N fibres crossing the Median plane (e.g. ant commissure)
Commisure	a decussation or crossing of large groups of fibres
Condyle	a rounded enlargement or process possessing an articulating surface.
Cranial Nerve (CN)	N coming directly from the brain not the SC
Cranium	the cranium of the skull comprises all of the bones of the skull except for the mandible. adj cranial pertaining to the skull cranial nerves coming out from the skul directly from the brain as opposed to the SC for spinal nerves.

Crest Prominent sharp thin ridge of bone formed by the attachment of muscles particularly powerful ones eg Temporalis/Sagittal crest

Cutus skin - hence *cutaneous branches refer to the nerves supplying the skin and adnexae*

Decussation a crossing of nerve fibres inside the CNS

Dendrite nerve process bringing communication to the cell body (from **dendro** = tree, bc of the tree-like shape of the dendrites).

Depolarization the loss of the potential across the cell membrane of a N due to stimulation and formation of a N impulse (*see repolarization*)

Dermatome the cutaneous innervation of a SN

Dislocation a displacement of any part particularly of bone = luxation /partial dislocation = subluxation

Dermatome the cutaneous distribution of the Spinal nerve root

Distal further away from the axial skeleton (*opposite of Proximal*)

Dorsal to the back from dorsum -back (= posterior, as in dorsal horn = posterior horn)

Efferent outgoing as in Motor nerves - *see Motor*

Endocranium refers to the interior of the "braincase" adj. endocranial divided into the 3 major fossae anterior (for the Frontal lobes) middle (containing Temporal lobes) and posterior (for the containment of the Cerebellum).

Endoneurium innermost of the CT coverings of a PN fibre (*see neurium, perineurium and epineurium*)

Epineurium outermost of the CT coverings of a PN fibre (*see neurium, perineurium and endoeurium*)

Ependymal cells line the ventricles and the central canal of the SC (*see Glia*) form the CSF

Extradural space space external to the Dura mater but w/n the skull or boney canal of the SC

Fascicle bundle, as in bundle of fibres in each PN there are a number of fascicles of nerve fibres

Foramen a natural hole in a bone usually for the transmission of blood vessels and/or nerves.*(pl. foramina).*

Fornix an arch

Fracture = #, broken bone

Funiculus cord-like structure (generally on the surface of the brain)

Ganglion collection of N cell bodies outside the SC (also isolated islands of N cells w/n in the white matter of the brain) (from ganglia = swelling)

Glia / Glial cells associated supporting cells of the NS connective tissue and immune functions, *types: astrocytes, oligodendrocytes, ependymal cells and microglia*

Grey Matter (AS Gray) N tissue in the brain and SC which contains mainly N cells, dendrites unmyleinated axons and glial cells (opposite to White matter which contains mainly myelinated axons)

Groove long pit or furrow

Gyrus a circle, hence a coil of brain cortex.

Horn projection of grey matter in the SC (anterior and posterior horns are for motor and sensory Ns respectively) - also called dorsal and ventral horns respectively

Impulse	a depolarization of the N membrane resulting in the promulgation of a signal along the N process.
Inter	between
Interneurons	act between motor and sensory neurons in a reflex - transferring the signal from the sensory to the motor w/o higher imput
Intra	within
Introitus	an orifice or point of entry to a cavity or space.
Lacerum	something lacerated, mangled or torn eg foramen lacerum small sharp hole at the base of the skull often ripping tissue in trauma.
Lacrimal	related to tears and tear drops. *(noun lacrima)*
Lambda	from the Greek letter a capital 'L' and written as an inverted V.*(adj. lambdoid)* and used to name the point of connection between the 3 skull bones Occipital and Temporals.
Lamina	a plate as in the lamina of the vertebra a plate of bone connecting the vertical and transverse spines *(pl. laminae)*
Leminiscus	ribbonlike, flat band of N fibres (e.g. medial leminiscus)
Lesion	deficit or injury - lack of function arising from this pathology
Linea	a line as in the Nuchal lines of the Occitipum
Locus	a place (c.f. location, locate, dislocate).
Lumbar	pertaining to the back particularly the lower back as in lumbago - pain of the lower back.
Magnum	large pl magna
Medulla	middle
Meninges	coverings of the brain and SC made up of 3 layers - Dura (hard) mater on the outer to protect the NT; Arachnoid (spidery) mater in the middle to support the BS and Pia (soft) mater, the inner coating to coat the NT and act as a barrier to foreign substances. CSF flows b/n the inner 2 coverings.
Microglia	phagocytic cells of the NS *(see Glia)*
Mixed N	a nerve containing both sensory and motor components most peripheral Ns are mixed
Motor / motor N	causes muscle contraction. these Ns are *efferent* or moving away from the SC
Multipolar	referring to a neuron which has many dendrites + 1axon (*see unipolar, bipolar)*
Myelin	the phospholipids produced by Schwann cells to insulate the axons of PNs and allow impulses to travel for longer and faster to the target organ
Myotome	the muscular innervation of a SN
"Nerve" (N)	**N cell (neuron) capable of transmitting or firing off a signal caused by ion transfer - excitable cell** **N process - generally Axon carrying the impulse to the skeletal muscle site general term meaning either the neuron(s), process(es) or part of a bundle of neurons, either cranial, spinal or peripheral**
Neurilemma	layers of Schwan cell membranes coating axon processes
Neurium	general term for the CT covering of a PN fibre *(see endoneurium, perineurium and epineurium)*
Neurocranium	refers only to the braincase of the skull.
Neuron	**Nerve cell**

Neurotransmitter substances in vacuoles at the foot of the nerve process which are released to induce a nerve impulses or in response to a nerve impulse.

Nucha the nape or back of the neck *adj.- nuchal.*

Occiput the prominent convexity of the back of the head Occipitum = Occipital bone *adj. occipital.*

Oligodendrocytes in the CNS only, become Schwann cells in the PNS and SC, act as a barrier and insulator of axons and neurons.

Pars a part of.

Pathway general term indicating a path of defined N fibres.

Perineum body cavity inferior to the the pelvis adj perineal - pertaining to the perineum.

Perineurium middle of the 3 CT coverings of a PN fibre *(see neurium, perineurium and epineurium)*

Peripheral N (PN) coming from the SC, - often the combination of 1 or moreSNs or part thereof and not the brain directly (cranial N) *see Spinal N*

Peroneal pertaining to the lower leg - particularly the Fibula.

Plexus knot - a knot or web of nerves.
pl plexi - from tangle or network as in brachial plexus or tangle of nerves involved in the innervation of the arm.

Polarization the maintenance of an unequal charge across the membrane of the N, allowing the cell to be stimulated - all excitable cells have a polarized membrane.

Posterior behind, at the back often used interchangebly with dorsal.

Process a general term describing any marked projection or prominence as in the mandibular process, in neurology the nerve process either Dendrite or Axon depending upon the direction of the Nl.

Projection fibres axons which connect the Cerebral cortex with the Brainstem or SC

Propioception sense of position of the body particularly the limbs or digits in space.

Proximal closer to the axial skeleton (*opposite of distal*)

Pure N a N which is either only sensory or motor not both (as in mixed N)

Ramus branch pl. Rami/branches - 2 main branches Ventral supplying all structures in front of the SC and Dorsal supplying al structures behind the SC - the Rami are mixed N

Reflex referring to the Reflex arc of sensory impulse - going to the SC and causing a motor or efferent response w/o imput from the brain or other higher centres.

Refractory period time b/n depolarization and repolarization, where the N cannot be restimulated in part to stop the impulse from traveling in both directions.

Repolarization impulse restoration of the resting potential after transmission of a N *(see depolarization, polarization).*

Resting potential the charge difference across the cell membrane of the N created by ionic imbalance.

Ridge elevated bony growth often roughened.

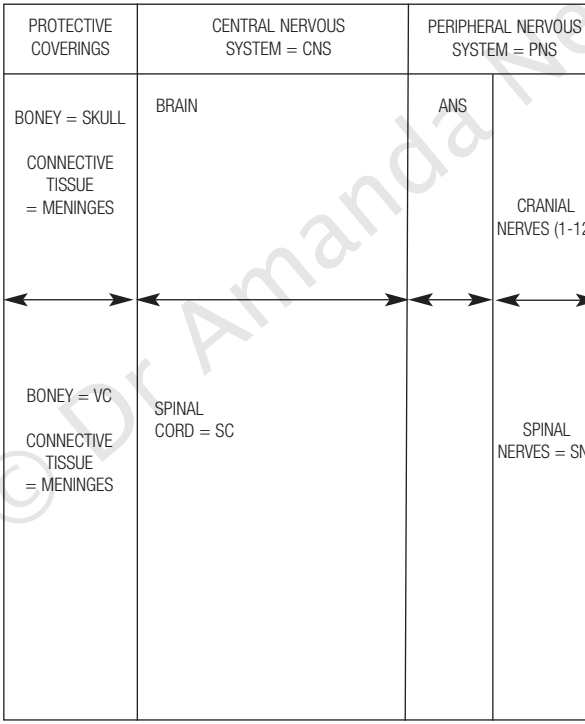
Root the segment(s) of origin of the PN from the SN. N roots are pure either motor or sensory and made up of several rootlets arising directly from the dorsal or ventral horns of grey matter in the SC.

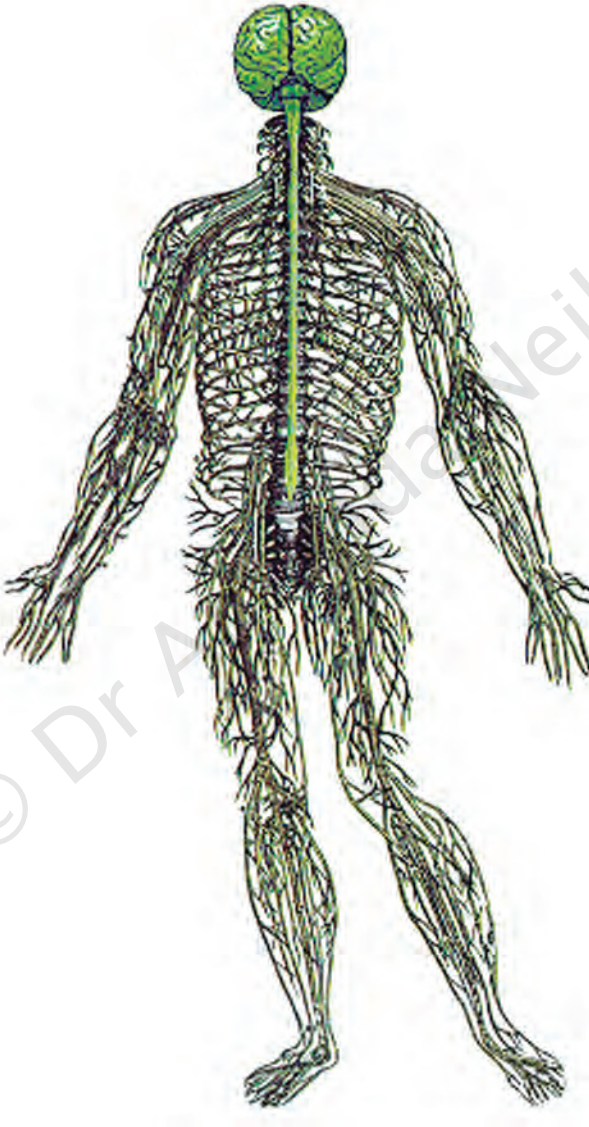
Sagittal	an arrow, the sagittal suture is notched posteriorly, making it look like an arrow by the lambdoid sutures; the anatomical plane from anterior to posterior
Sensory	pertaining to input - which goes to the SC and then to the brain &/or reflex
Schwann cells	cells supplying phospholipid coat - insulation to the axons to preserve the N impulse in the PNS - role of the oligodendrocytes in the CNS.
Spinal Cord (SC)	extension of the brain protected by the VC, PN come from here
Spinal Nerve (SN)	N coming directly from the SC not the brain
Spine	a thorn *adj. - spinous* descriptive of a sharp, slender process/protrusion.
Splanchocranium	the splanchocranium refers to the facial bones of the skull.
Stimulation	events which lead to the formation of a N impulse.
Subdural space	space beneath the Dura mater external to the Arachmoid mater
Subluxation	partial dislocation, particularly in the VC, term used to explain any mechanical impediment to nerve function.
Sulcus	long wide groove often due to a BV indentation – space b/n the gyri of the grey matter in the brain
Sulcus	long wide groove often due to a BV indentation.
Sural	pertaining to the lower leg.
Suture	the saw-like edge of a cranial bone that serves as joint between bones of the skull.
Synapse	the gap at the joining of N and nerve process, N and N, process to process or N and muscle for transmission or inhibition of an impulse via neurotransmitters - presynaptic before the synapse (where the neurotransmitter is released) / post synaptic after the synapse (where the neurotransmitter is received).
Telodendria	axon terminal branches
Temporal	refers to time and the fact that grey hair (marking the passage of time) often appears first at the site of the temporal bone.
Thorax	relating to the chest area adj thoracic.
Tract	vertical columns of axons, generally myelinated in the SC &/or brain
Trunk	when SNs join together as large combined large Ns to supply specific anatomical regions (e.g. BP) but again must re-organize to become PNs
Ventral	to the front, used interchangeably with anterior, relating to the chest
White matter	N tissue which consists mainly of myelinated axons *(see Grey matter)*

The Nervous system

The nervous system is made up of: the CNS = Brain + SC, the PNS = Ns exiting from the CNS - CRANIAL directly from the brain (12 PAIRS) and from the SC (31 PAIRS), the protective coverings of the tissue are made up of - connective tissue - the MENINGES of which there are 3 layers, the outer or DURA MATER and the inner often fused 2 layers THE ARACHNOID & PIA MATERS for the diffusions of CSF and blood around the Brain and SC, and boney coverings, the Skull around the brain and the vertebral column (VC) around the SC.

In the PNS the Ns form 2 separate divisions the voluntary and the autonomic (ANS). The ANS is made up of the Sympathetic exiting from the thoracic region and Parasympathetic Ns, depending upon the region of the SC, and these nerves may travel with the PNs.

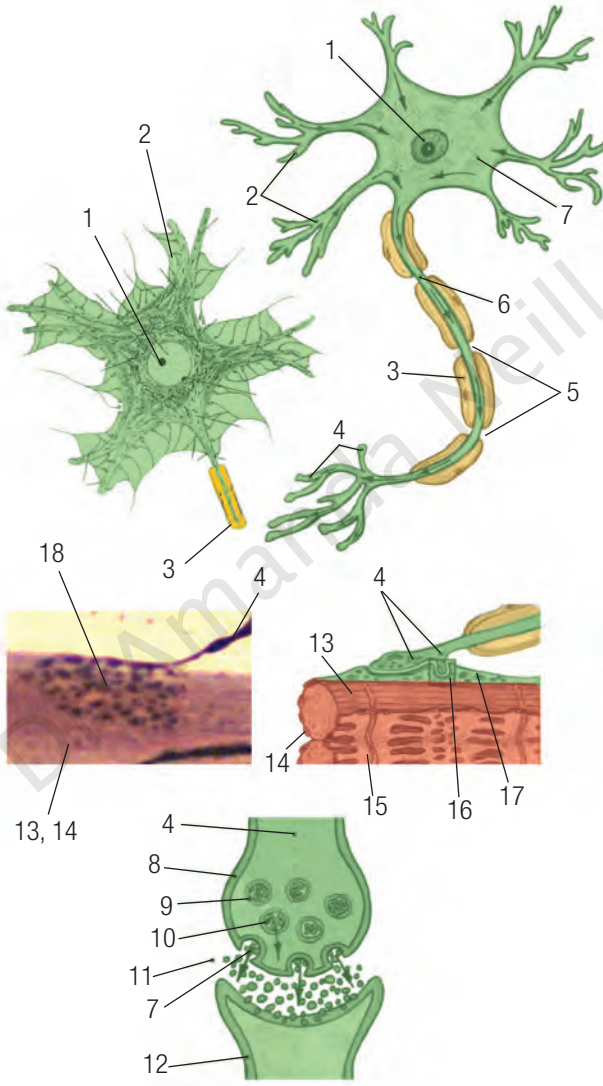




The Nerve Cells

The basic functioning cell of the NS is the NEURON(E) = NERVE CELL. Most are multipolar meaning that they have multiple dendritic (2) processes, which feed impulses into the nerve cell body (7). All neurons only have one axon (6), taking an impulse away from the cell body. They may be insulated on their axons so that the nerve impulse can travel faster and longer by a myelin sheath (3) a white phospholipid material, produced by the Schwann cell - a connective tissue cell which supports the N and protects it from outside influences. The impulse terminates on to the target organ - generally skeletal muscle in the PNS via a neuromuscular junction located in the muscle-end-plate (18), or on another N via a synapse.

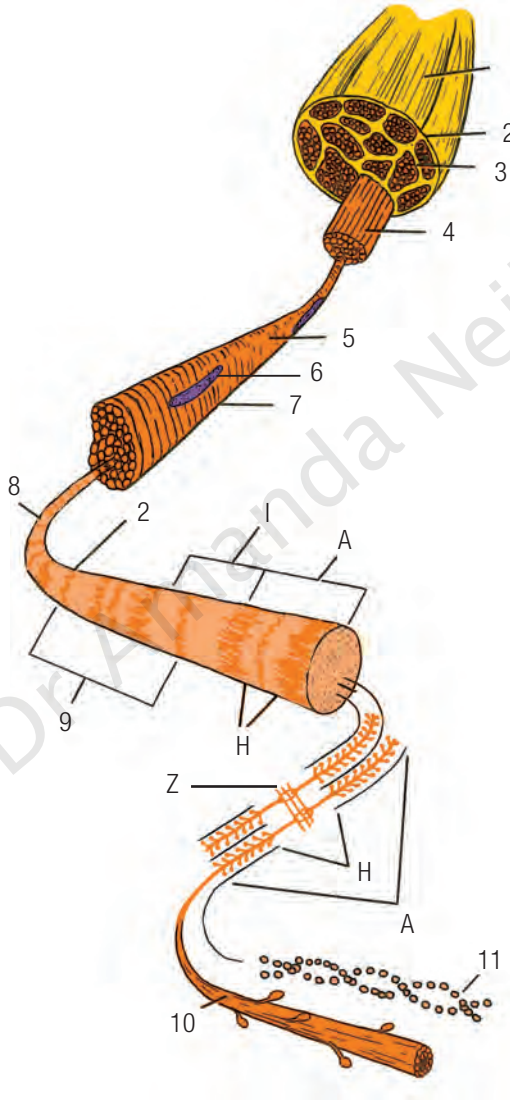
1 nucleus and nucleolus
2 dendrites
3 neurilemma - protective myelin sheath from Schwann cells
4 axon terminal branches / telodendria
5 nodes of Ranvier
6 axon and base of axon - axon hillock
7 N cell body plasma with neurofibrils, Nissl bodies, mitochondria, Golgi & ribosomes
8 presynaptic membrane
9 synaptic vesicles
10 neurotransmitter
11 synaptic cleft
12 postsynaptic membrane on dendrite or N cell body
13 myofibril of skeletal muscle
14 sarcolemma - cell membrane of the skeletal muscle cell
15 sarcoplasm - plasma of the skeletal muscle cell
16 subneural clefts
17 mitochondria
18 muscle end plate



Structure and Substructure of Skeletal muscles

1 muscle *eg. Biceps*
2 epimysium *surrounding a whole muscle*
3 perimysium *surrounding a muscle fascicle*
4 endomysium *surrounding each muscle fibre*
5 muscle fibre
6 nucleus *(note the muscle cell is multinucleated)*
7 sarcolemma *around each myofibril*
8 myofibril
9 sarcomere *basic contractile unit of the muscle*
10 myosin filament
11 actin filament

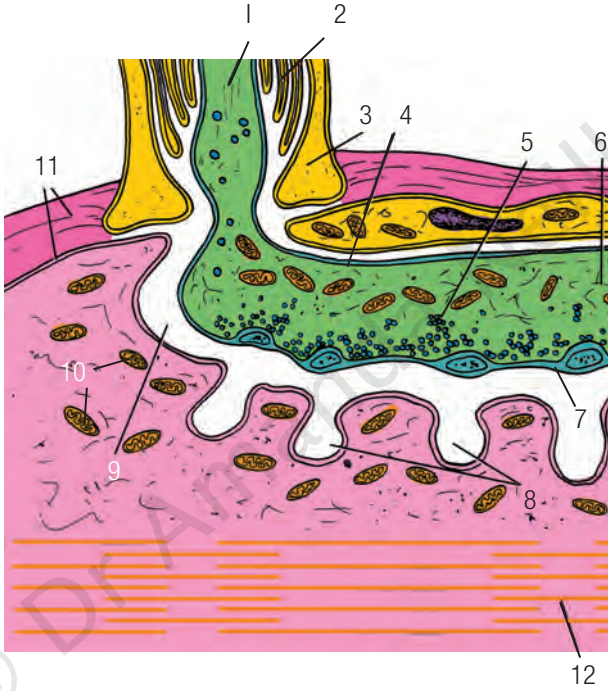
A band - myosin to myosin filaments
H band – myosin only segments *minimum in contraction*
I band - actin only segment maximum in relaxation
Z line - line of attachment of the actin filaments



Neuromuscular Junction –

Nerve end attaching to Skeletal muscle
longitudinal

1 axon - *sheathed*
2 mylein sheath – *multiple lipid layers*
3 Schwann cell
4 axonlemma – *axon membrane*
5 pre-synaptic vesicles
6 axon – *unsheathed / naked*
7 presynaptic membrane
8 junctional folds *(in sarcolemma)*
9 synaptic cleft *(~20nm)*
10 mitochondria
11 sarcolemma
12 myofilaments *in muscle fibre*



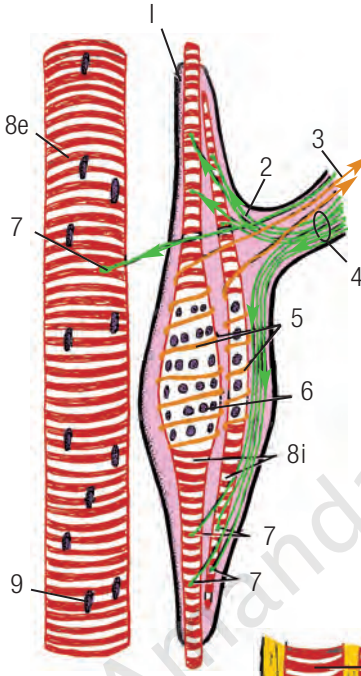
Neuro-Muscular Spindle –

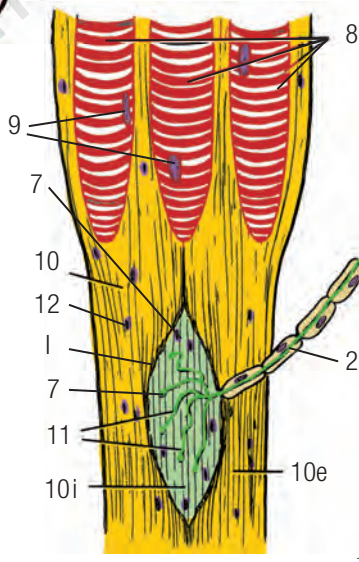
feedback loop to stop overextension in Skeletal muscle

Neuro-Tendinous Spindle –

feedback loop to stop overextension in the tendon

1 capsule of spindle
2 myelinated motor fibres
3 myelinated sensory fibres
4 unmyelinated motor fibres
5 annualospiral fibre endings
6 bag of nuclei *in intrafusal muscle*
7 motor end plates
8 muscle fibres i = intrafusal e = extrafusal
9 skeletal muscle nuclei
10 tendon fibres i = intrafusal e = extrafusal
11 naked axons
12 nuclei in tendon



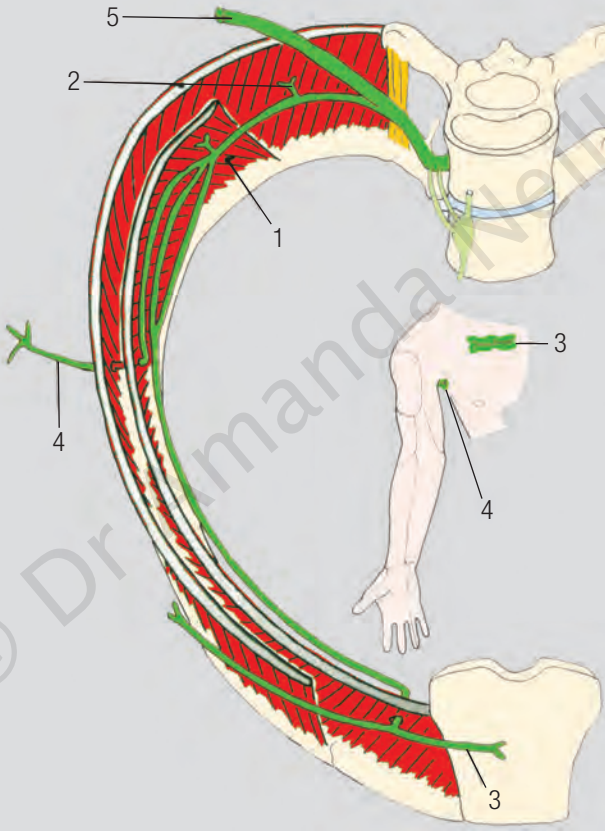


First Thoracic Intercostal Nerve

part of BP

Spinal Roots	T1
Nerve type	mixed = motor + sensory
Muscular branches	to intercostal muscles (1-2)
Articular Branches	costovertebral joints and sternocostal joints
Cutaneous branches	to skin overlying the 1st IC space anteriorly and axilla (3-4)
LESIONS	radicular pain over 1st IC space
typical aetiologies	neck and BP injuries of the Median and Ulna nerves
associated lesions/losses	unable to fully assess injuries to BP with injury to this N - unless associated with other IC nerve injuries

1 N to internal intercostal
2 N to external intercostal
3 to skin overlying the 1st IC space anteriorly and Manubrium.
4 to skin overlying the axilla
5 branch to BP

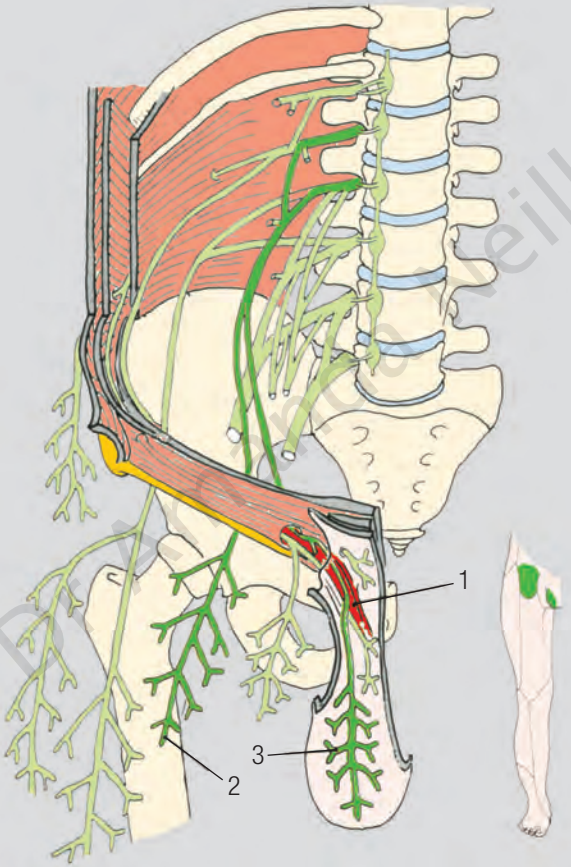


Genitofemoral nerve

LP (emerges from the anterolateral border of Psoas major)

Spinal Roots	L1, L2
Nerve type	mixed = motor + sensory
Muscular branches	to Genital area (cremaster muscle in males)
Articular Branches	NONE
Cutaneous branches	to femoral triangle to genital area
LESIONS	loss of cremaster reflex / parasthesia over area described
associated lesions/losses causes	iatrogenic - cut in appendectomy

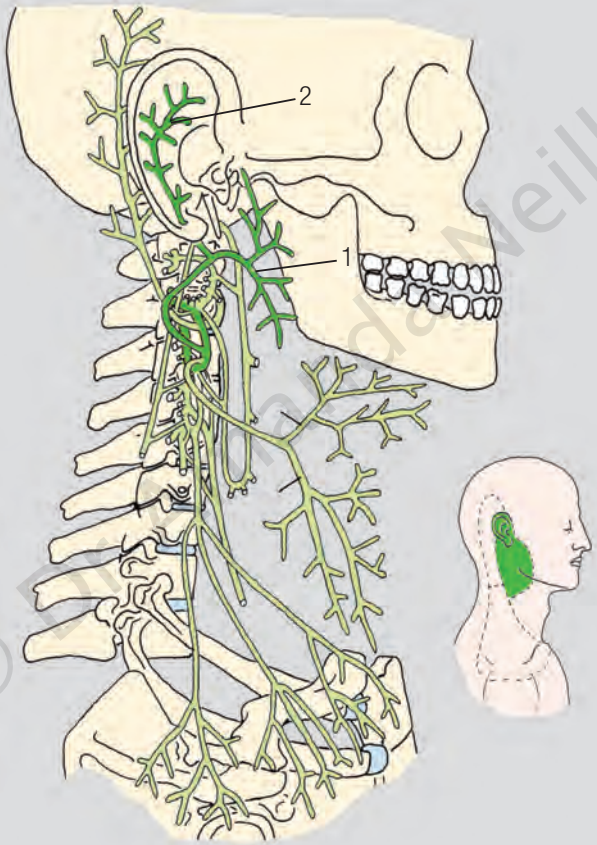
1 Genital branch
2 Femoral branch
3 Genital branch (cutaneous)



Greater Auricular Nerve

CP (superficial branches)

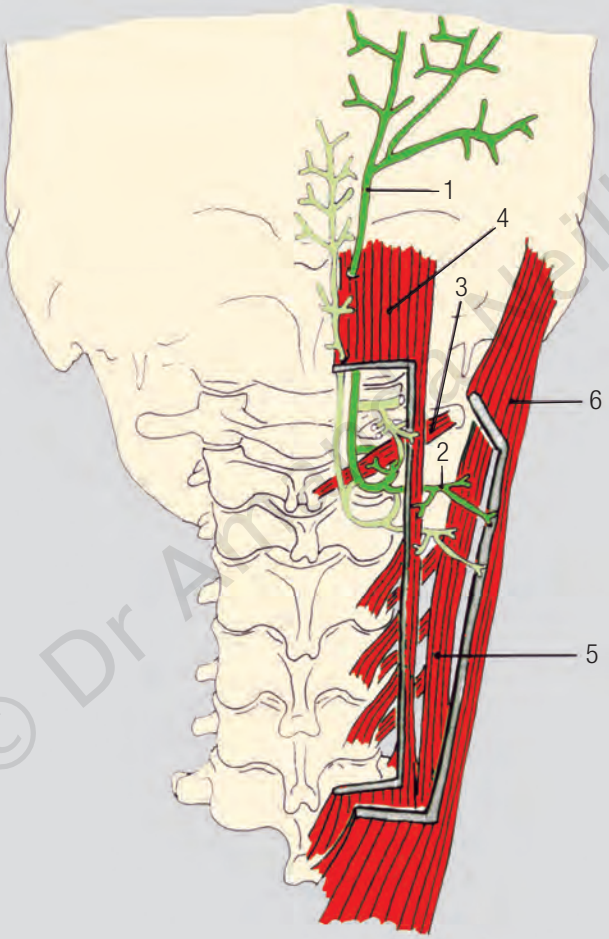
Spinal Roots	C2, C3
Nerve type	sensory
Muscular branches	NONE
Articular Branches	NONE
Cutaneous branches	skin over the Parotid Gland (1) skin over the mastoid process and the back of the ear (2)
LESIONS	loss of sensation on the area described



Greater Occipital Nerve (second dorsal ramus)

Spinal Roots	C2 cervical dorsal ramus
Nerve type	mixed = motor + sensory
MAJOR BRANCHES	Medial and Lateral branches
Muscular branches	to the capitus muscles in the neck / head (3-6)
Articular Branches	to the atlanto-occipital and atlanto-axial joints
Cutaneous branches	to the dorsum neck and head to the level of the ear
LESIONS	parasthesia to the back of the head in occipital region
typical aetiologies	whiplash injuries to the neck in car accidents
associated lesions/losses	injury to sternocleidomastoid / occiptal nerves often overcompensate and cause muscle spasm and headaches (seen several weeks after the accident)

1 Medial branch
2 Lateral branch
3 to Obliquus capitus inferior
4 to Semispinalis capitus
5 Longissimus capitus
6 to Splenius capitus



Iliohypogastric nerve

LP (emerges from the lateral border of Psoas major)

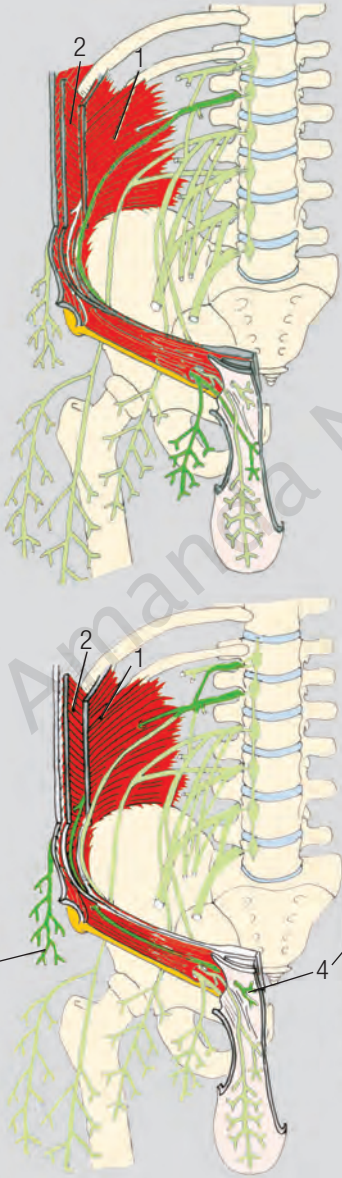
Spinal Roots	T12, L1
Nerve type	mixed = motor + sensory
Muscular branches	to Transversus Abdominus to Internal abdominal oblique *(also see intercostals - lower T7-12, and ilioinguinal n)*
Articular Branches	NONE
Cutaneous branches	lateral cutaneous branch anterior cutaneous branch
LESIONS	weakening of abdominal wall
associated lesions/ losses	iatrogenic - cut in appendectomy may develop a direct inguinal or abdominal hernia

Ilio-inguinal nerve

LP (emerges from the lateral border of Psoas major)

Spinal Roots	L1
Nerve type	mixed = motor + sensory
Muscular branches	to Transversus Abdominus to Internal abdominal oblique *(also see intercostals - lower T7-12, & iliohypogastric n)*
Articular Branches	NONE
Cutaneous branches	to groin / scrotum / mons pubis / labia majora
LESIONS	weakening of abdominal wall
associated lesions/ losses causes	iatrogenic - cut in appendectomy, nephrectomies / pfannenstiels excision may develop in large pregnancies a direct inguinal or abdominal hernia referred pain from Ureter and renal pelvis

1 to Transversus Abdominus
2 to Internal abdominal oblique
3 lateral cutaneous branch
4 anterior cutaneous branch

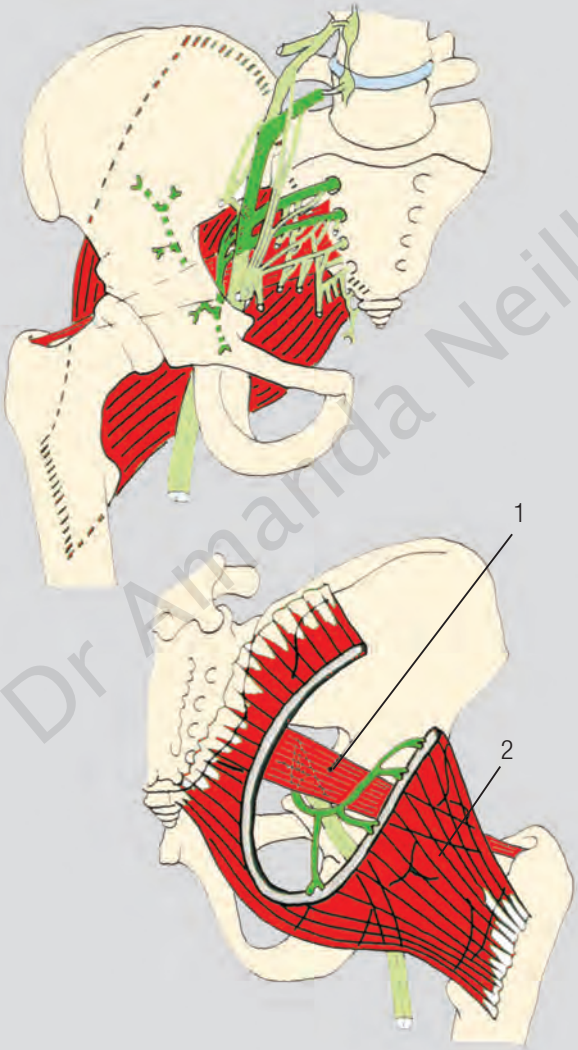


Inferior Gluteal nerve

SP (dorsal division)

Spinal Roots	L5, S1, S2
Nerve type	motor
Muscular branches	to GM (2)
Articular Branches	NONE
Cutaneous branches	NONE
LESIONS	difficulty running jumping and climbing stairs, rising from a seated position, skating
typical aetiologies	commoner than superior gluteal N injuries, but rare to be injured alone
associated lesions/losses	pelvic and back injuries

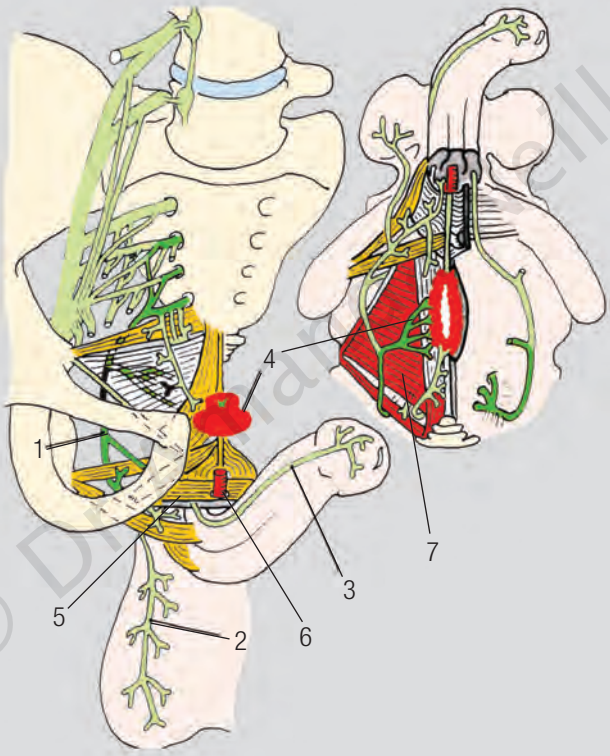
1 Pyriformis
2 to Gluteus Maximus



Inferior Rectal nerve
see also Pudenal nerve
SP (anterior division directly from SP)

Spinal Roots	S2, S3, S4
Nerve type	mixed = motor + sensory
MAJOR BRANCHES	from the PUDENAL nerve Perineal Posterior scrotal or Labial nerves Dorsal nerve to the Penis (Clitoris)
Muscular branches	to the levator ani, external anal sphincter & coccygeas
Articular Branches	NONE
Cutaneous branches	skin between the anus and the coccyx and lining the anal canal below the circumanal line
LESIONS	sagging of the pelvic floor / compromised rectal and bladder control (particularly in the female) cystocoele or rectocoele / prolapse of uterus in older females
typical aetiologies	pressure on the sacrum
associated lesions/losses	uterine prolapse / obesity / large abdominal mass

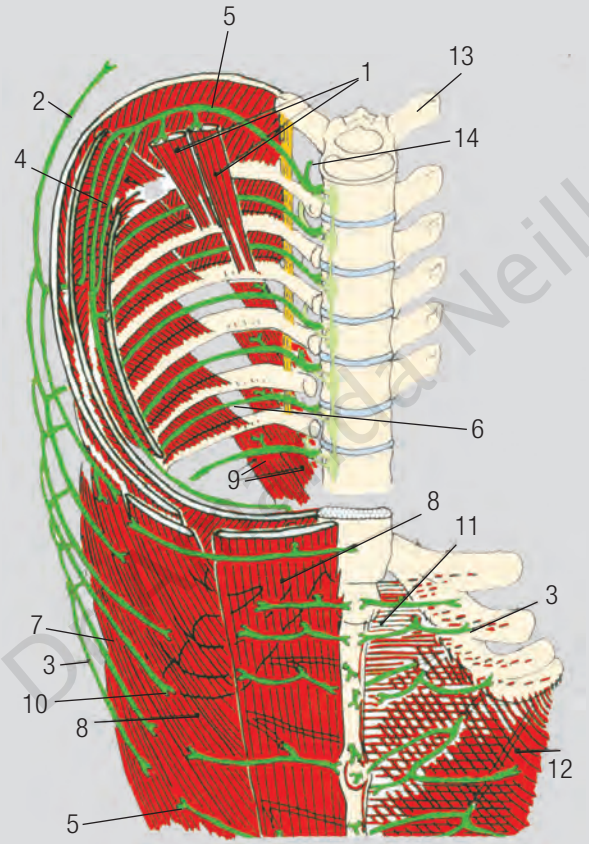
1 Perineal branch
2 Posterior scrotal / labial nerves
3 Dorsal nerve to penis / clitoris
4 to the external anal sphincter
5 Perineal diapragm
6 Urethra
7 Levator ani



Intercostal Nerves - Lower

Spinal Roots	T7-11 thoracic ventral ramus
Nerve type	mixed = motor + sensory
Muscular branches	to muscles of thorax and abdomen
Articular Branches	costovertebral joints and sternocostal joints *(ac)*
Cutaneous branches	supplies skin over the abdomen and latissimus dorsi and the costal surface of the diaphragm T10 supplies skin over the umbilicus
LESIONS	loss of sensation and movements of the rectus muscles with entrapment in the muscle of nerve and fat - abdominal muscles cannot move so contraction occurs unilaterally Clicking rib syndrome - subluxation of interchondral joints refers pain to the abdomen in areas described - "clicks" when moving thorax/abdomen in sitting up
typical aetiologies	osteoporosis / leukaemia thoracic vertebral fractures
associated lesions/ losses	peritonitis and other diseases of the viscera / trauma to the abdomen cause abdominal spasm and guarding

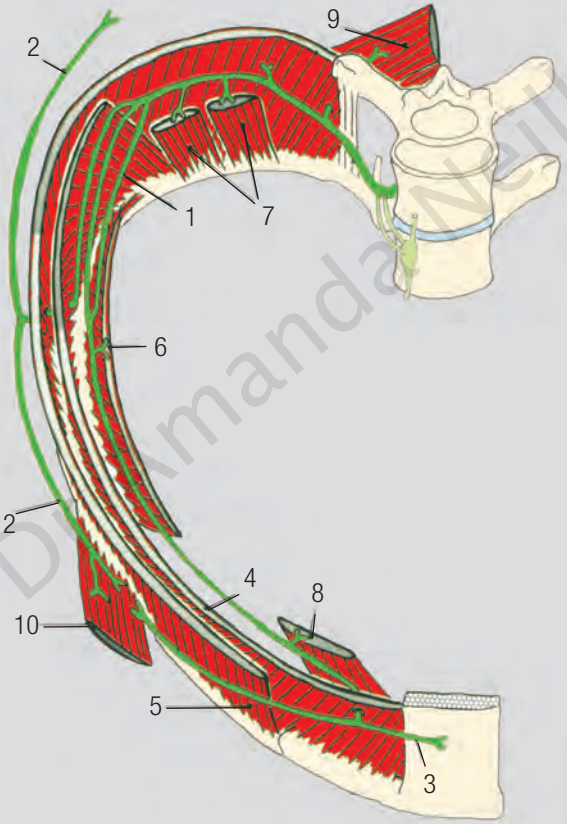
1 Collateral branches to Subcostalis
2 Lateral Cutaneous branch
3 Anterior Cutaneous branch
4 to Internal intercostals
5 N to external intercostals and the muscle attachment
6 to Intercostals intimi
7 External Oblique
8 Rectus Abdominus
9 N to Serratus posterior inferior
10 N to External Oblique
11 Transversus Abdominus
12 layers of the abdominal wall reflected - pieced and innervated by the lower intercostal nerves segmentally
13 transverse process of thoracic VB
14 dorsal ramus of thoracic N (supplies muscles, skin and joints of the VC and back)

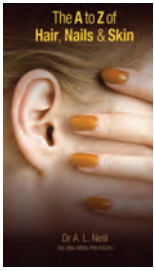


Intercostal Nerves - Upper

Spinal Roots	T3-6 thoracic ventral ramus
Nerve type	mixed = motor + sensory
NAMED BRANCHES	Collateral branches *(cb)* 1
-terminal	Lateral Cutaneous branches *(lc)* 2 Anterior Cutaneous branches *(ac)* 3
Muscular branches	to muscles of the chest and back (4-10)
Articular Branches	costovertebral joints and sternocostal joints *(ac)*
Cutaneous branches	supplies skin over the intercostal space anteriorly laterally and posteriorly *(lc, ac)*
LESIONS	loss of sensation in areas described - needs 2 or more intercostals nerves involved to be detected because of innervation overlap T4 corresponds to the nipple line T5,T6 pain in the same area as heart mistaken for angina pectoris / oesophageal spasm
typical aetiologies	osteoporosis / leukaemia thoracic vertebral fractures
associated lesions/ losses	thoracic vertebral damage / from trauma or disease

1 Collateral branches
2 Lateral Cutaneous branch with their anterior and posterior terminal branches
3 Anterior Cutaneous branch
4 to Internal intercostals
5 to External intercostals
6 to Intercostals intimi
7 to Subcostalis
8 to Tranverse thoracis
9 to Serratus posterior inferior
10 to External oblique





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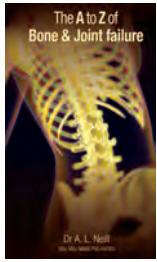

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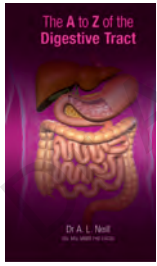

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The Digestive tract is one long tunnel from food to faeces – its components are individually illustrated, colour tagged and listed alphabetically along with many of its adjunct organs. Their structure and functions are also clearly described along with sectional overviews. In particular detailed descriptions of the intricacies of the oral cavity, the processes of swallowing are included in this book of 240 pages and 300 illustrations.

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interactions between the many muscular layers of this area, listing alphabetically and illustrating each muscle individually in one section – then examining the individual bones and teeth in the same manner. The skull is also illustrated as a unit, in this book of 280 pages and 300 illustrations.

See more A-Z books on page 230

Lateral Cutaneous Femoral nerve

LP (emerges from the lateral border of Psoas major)

Spinal Roots	L2-3
Nerve type	sensory
Muscular branches	NONE
Articular Branches	NONE
Cutaneous branches	supplies skin of thigh and gluteal region (1-2)
LESIONS	parasthesia to area described
associated lesions/losses causes	iatrogenic - cut in surgery

The A to Z of Surface Anatomy

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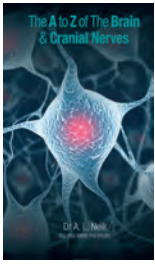
The surface anatomy of all anatomical regions and structures are illustrated at several levels form superficial to deep. Methods of locating structures deep in the body using common landmarks are illustrated cross referenced and listed alphabetically. Proportions and relations between limb and regional sizes are charted extensively. Photographs as well as detailed graphics are used extensively, in this book of 240 pages and 300 illustrations.



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The A to Z of Peripheral Nerves

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The A to Zs

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