

SUPERFICIAL ASPECTS OF THE POSTERIOR SURFACE OF THE BODY

Lecture 2 – Week 3 Semester 2

Development of dorsal and ventral rami
Cutaneous nerve supply of the torso
The sympathetic nerves and referred pain
Motor supply of limb girdle musculature

Thursday tutorial

ECTODERM

SURFACE ECTODERM

Epidermis of skin (& lining of mouth)

Anterior pituitary

Epidermal appendages

Hair

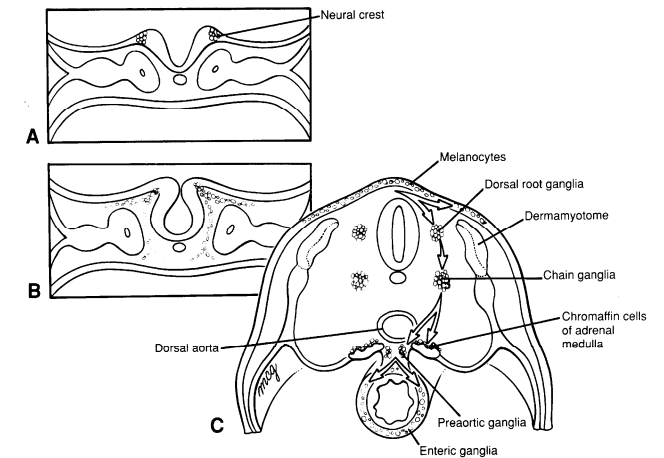
Nails

Sweat

Mammary

Enamel

Lens



NEURAL TUBE

Central Nervous System

Brain

Spinal cord

NEURAL CREST

Peripheral Nervous System

Dorsal root ganglia

Autonomic ganglia

Nerves

Adrenal medulla

Arachnoid and pia mater

Melanocytes

DEVELOPMENT OF THE TYPICAL SPINAL NERVE

Dorsal and ventral columns

1. Nerve cells in the neural tube
2. Dorsal = sensory
3. Ventral = motor
4. Will become dorsal and ventral horns of grey matter

Ventral roots

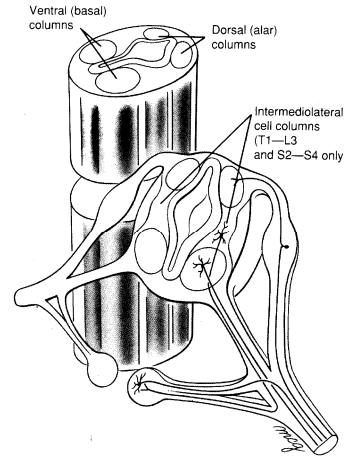
1. Axons sprout from ventral columns
2. They connect to developing muscle (in myotome)
3. They are the ventral roots

Dorsal roots

1. Axons sprout from cells in the dorsal root ganglia
2. They pass
 - a. To the dorsal columns
 - b. To the receptors in the skin (in the dermatomes)
3. They are dorsal roots

Dorsal and ventral roots unite to form the mixed spinal nerve

Autonomic nerves arise from the intermediolateral column of grey matter, they exit with ventral roots but synapse in autonomic ganglia (sympathetic - white rami communicans - preganglionic). Some postganglionic nerves that need to be distributed to the skin and muscles rejoin spinal nerves (grey rami communicans)

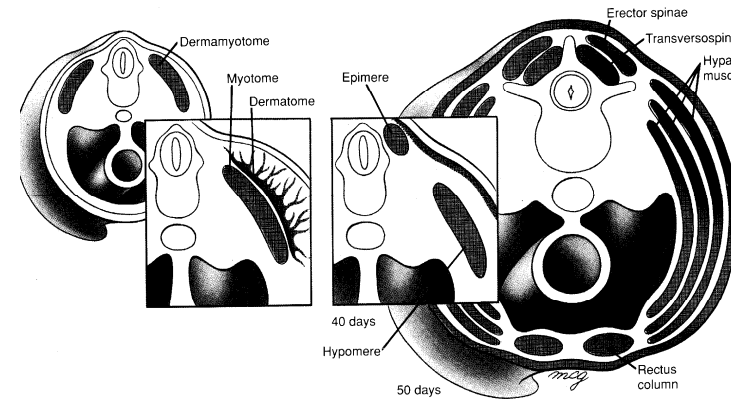


THE DERMOMYOTOME

Somites comprise

1. Sclerotome – Vertebral column
2. Myotome – Voluntary muscle
3. Dermatome - Dermis

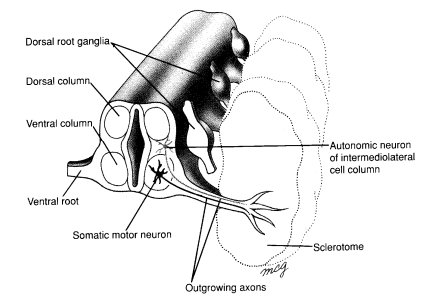
Dermatome cells migrate to the surface ectoderm of the corresponding segmental region. They form the skin in combination with the lateral plate mesoderm and ectoderm.



The myotome splits into:

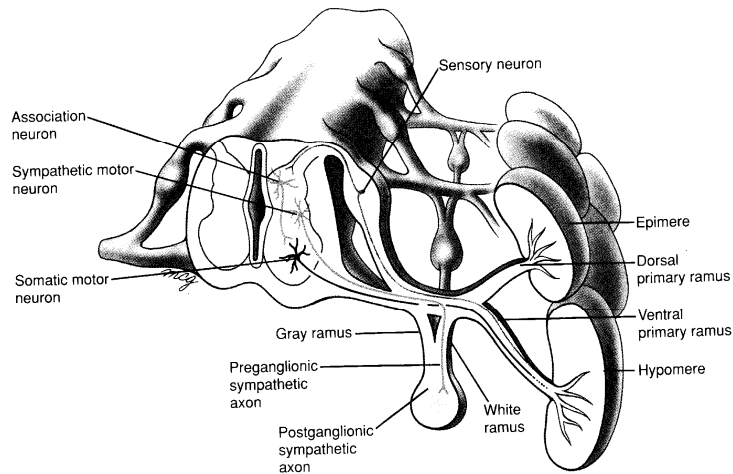
1. Epimere (dorsally)
2. Hypomere which migrates ventrally to form the body wall and limb muscles

The cells of the dermomyotome migrate. They have their own segmental nerve supply before this migration...



DORSAL AND VENTRAL RAMI OF SPINAL NERVES

The dorsal ramus of spinal nerves supplies the Epimere - parts of the dermatome and myotome that stay in the dorsal region



The ventral ramus of spinal nerves supply the Hypomere – parts of the dermatome and myotome that migrate ventrally.

This explains two important things about Anatomy

1. **The segmental innervation** has its basis in the original somites, each of which is connected (from the beginning) with a single spinal nerve (ie dermatomes and myotomes).
2. **The origin of dorsal and ventral rami**

TYPICAL THORACIC SPINAL NERVES

Typical spinal nerves are thoracic spinal nerves

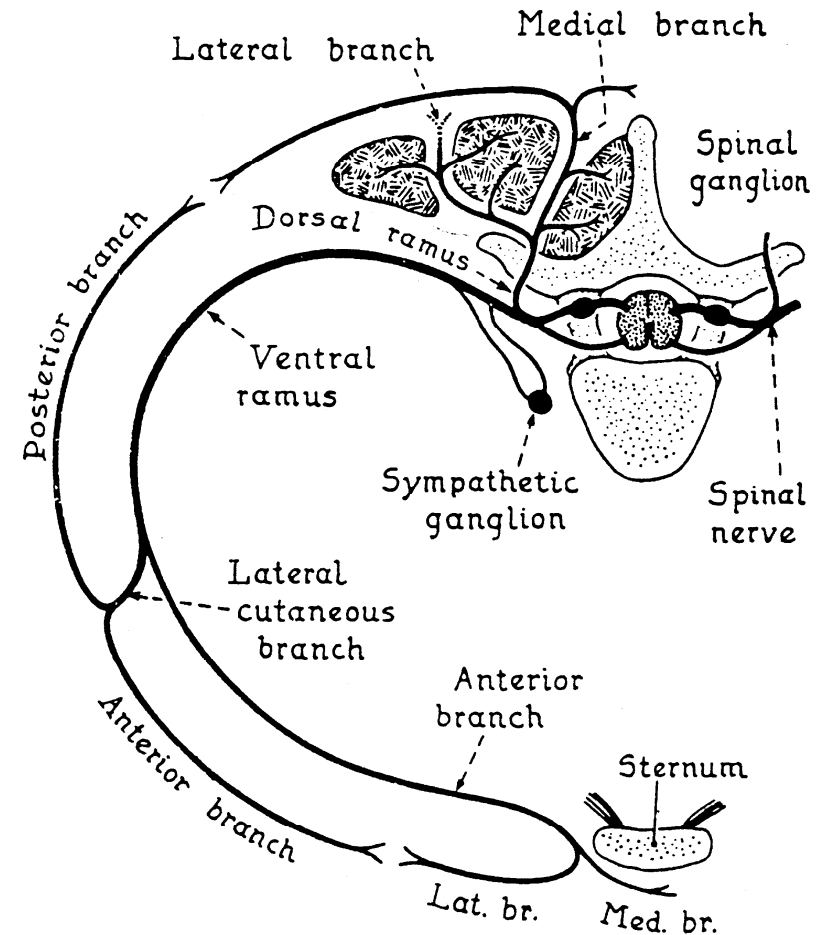


Figure 27.21. A typical segmental nerve.

SYMPATHETIC NERVES

The input to the sympathetic trunk:

White rami communicans contain preganglionic sympathetic output from the CNS, and are found from T1 to L1(2)

In the sympathetic trunk

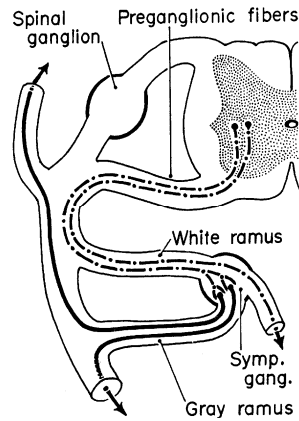
Some fibres ascend or descend in the sympathetic trunk

Some synapse in the sympathetic ganglia

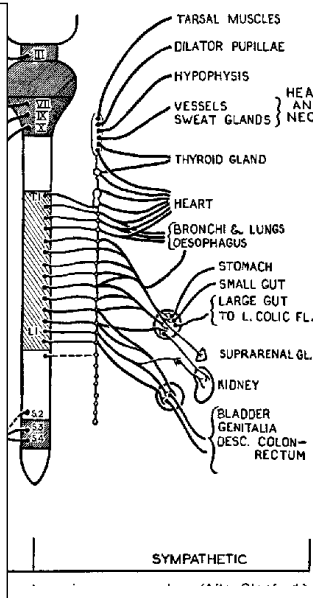
The output from the sympathetic trunk:

1. Grey rami

They carry postganglionic fibres from the trunk to ALL spinal nerves (C1 to Co1). What for? _____



2. Visceral nerves
Branch off the trunk and go to organs...



THORACIC SPINAL NERVES

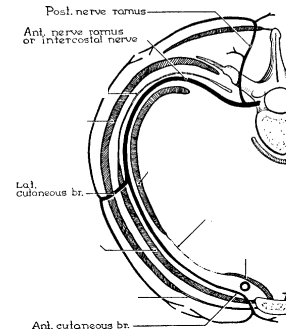
Dorsal rami (posterior ramus)

Motor: intrinsic postvertebral muscles

Sensory: skin of the back

Medial and lateral branches

1. Both branches supply muscle
2. T2-6 medial becomes cutaneous
3. T7-12 lateral branch becomes cutaneous



Ventral rami (anterior ramus) = Intercostal nerves

Motor: Body wall muscles

Sensory: skin of the body wall

1. Lateral cutaneous branch
2. Anterior cutaneous branch

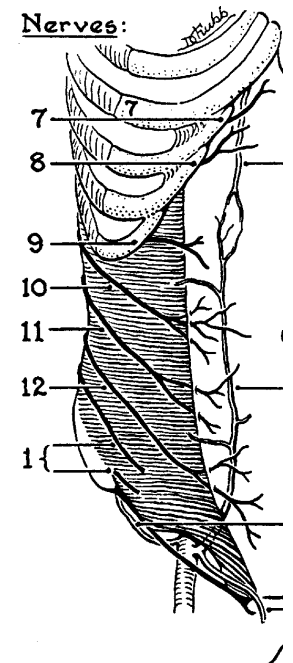
Sympathetic: white rami to sympathetic trunk

T1 – Intercostal part is small. It mostly joins the brachial plexus and contributes to ulna (median) and radial nerves to supply intrinsic muscles of the hand and skin on the medial side of arm.

T1 and T2 the lateral cutaneous branches are called the intercosticobrachial and also supply the medial side of the arm

T1 to T6 stay in their intercostal spaces

T7 to T12 continue into the anterior abdominal wall and supply those muscles and skin



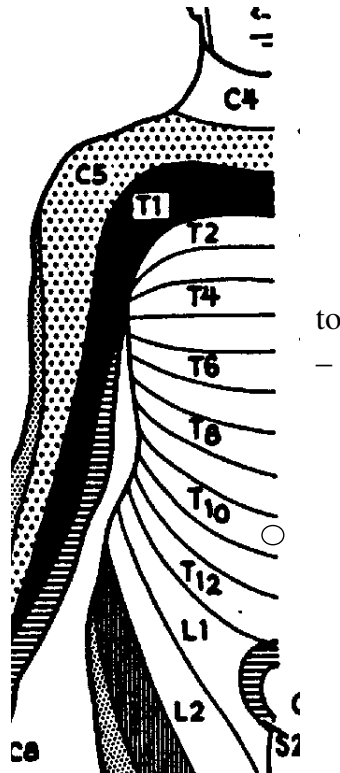
THORACIC SYMPATHETICS AND DERMATOMES

All thoracic nerves give preganglionic sympathetic fibers to the sympathetic trunk (white rami communicans) the sympathetic trunk gives off:

1. Grey rami communicans to each spinal nerve
 - a. Supply smooth muscle and glands in the skin
2. Branches to viscera (ultimately came from)
 - a. T1-5 Head and neck
 - b. T1-5 Thoracic organs
 - c. T5-9 Foregut
 - d. T9-11 Midgut and gonads
 - e. T11&12 and L1(2) Hindgut and pelvic organs

Sensory nerves from those organs return to the spinal cord with sympathetic nerves **so referred pain** is felt in relation to those segments/dermatomes

1. Heart pain is felt in the chest and sometimes down the medial arm
2. Foregut pain is felt above the umbilicus
3. Midgut pain over the umbilicus
4. Hindgut and pelvic pain is felt below the umbilicus



to
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NERVE SUPPLY OF THE LIMBS AND TORSO

Upper limb

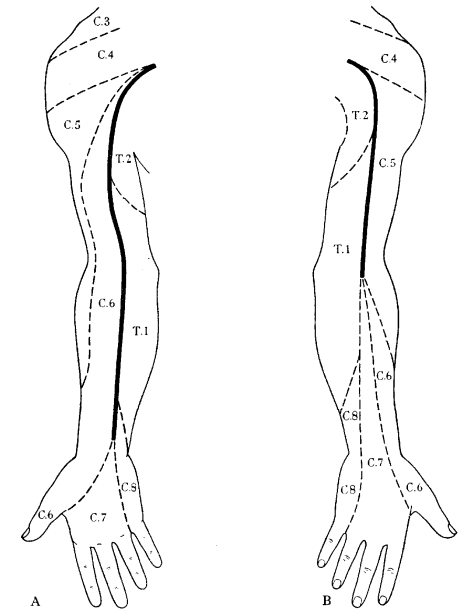
It looks as though the nerves from the limb plexuses have been drawn out into the limbs and so they don't contribute to the torso's nerve supply.

On the front and back of the shoulder C4 and T2 dermatomes are in contact. Because the C5 to T1 have been sucked into the upper limb –ventral axial line

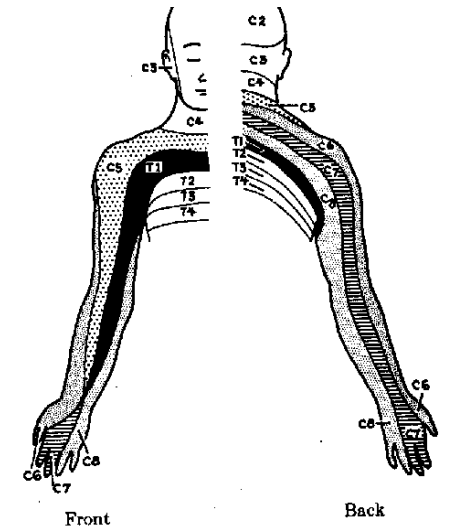
The C3/4 comes from Supraclavicular nerves from the cervical plexus.

T2 is an intercostal nerve (T1 intercostal nerve is very small and doesn't usually have a cutaneous part on the chest)

Similarly on the back the dorsal rami of C7, 8 and T1 do not have cutaneous branches – so, closer to the midline, there is contact between C6 and T2



But be aware that many dermatome maps are wrong!
See Grants and also the dermatome boy.



NERVE SUPPLY OF THE LIMBS AND TORSO

Lower limb

Similarly, the L2 to S2 nerves are almost completely in the lower limb.

In the groin, the L1 and S3 dermatomes are in contact – dorsal and ventral axial lines

Anteriorly

L1 is ilioinguinal and genitofemoral nerves

S3 is the pudendal nerve (S234)

Posteriorly

L123 dorsal rami are quite large and extend out and down to the level of the greater trochanter

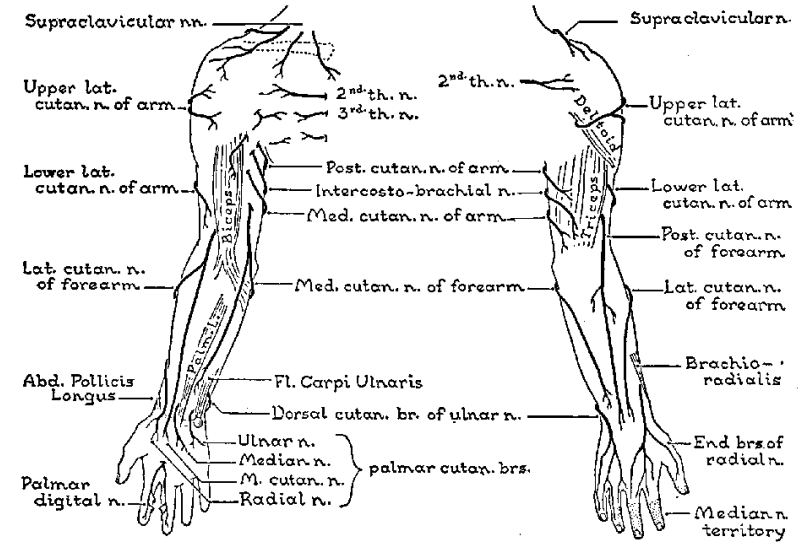
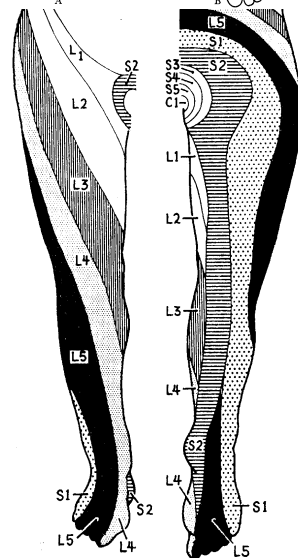
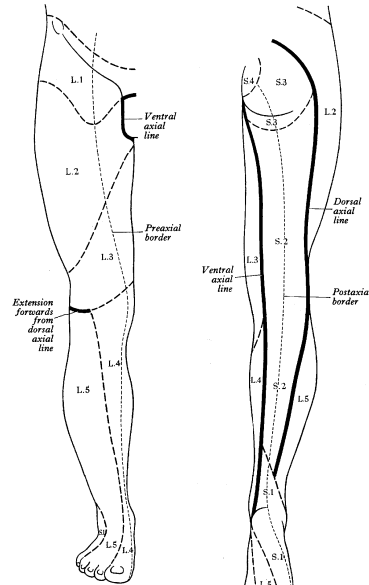
L45 dorsal rami don't have cutaneous branches

Sacral and coccygeal dorsal rami supply the skin of the medial gluteal region

S123 is the posterior cutaneous nerve of the thigh, and they supplies some of the gluteal region

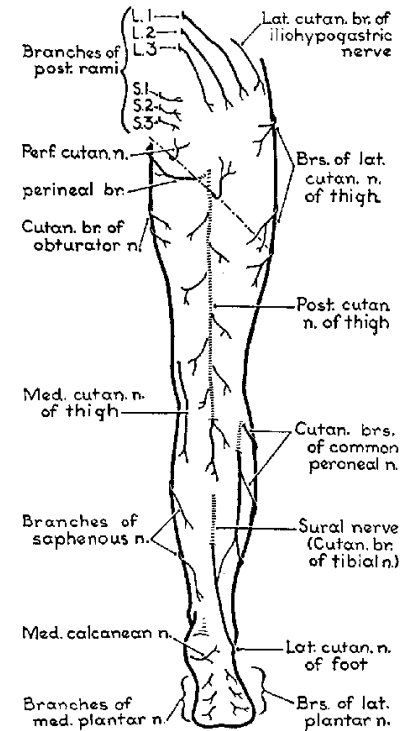
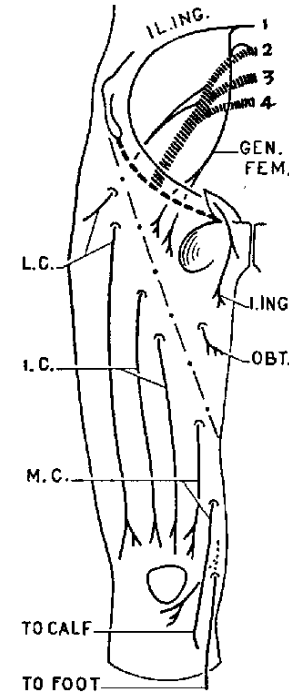
But be aware that many dermatome maps are wrong!

See Grants and also the dermatome boy.



FRONT

BACK



MOTOR NERVES

The lower limb

The lower limb doesn't have many muscles associated with the pelvic girdle so the lower limb muscles are all supplied by the lumbosacral plexus

The Upper limb

The upper limb has a set of muscles that move and position the pectoral girdle.

These muscles are supplied by:

1. Cranial nerve
 - a. Which nerve?
 - b. Which muscles?

2. Cervical plexus
 - a. Which segments?
 - b. What muscles?

3. Roots of the Brachial plexus
 - a. What nerves?
 - b.
 - c. What muscles

Other scapular muscles and their nerves?

The Hip Joint in Posture and Locomotion

Remember that in the lower limb most of the time muscles are acting:

1. **Isometrically** (As stabilisers) – resisting the affects of gravity
2. or **Eccentrically** (letting gravity or momentum do the work but regulating the movement.

Concentric action, where the muscle actually shortens and produces a movement, is rare in the lower limb.

Posture

1. **Normal posture – normal pelvic posture**
 - a. Relationship of the line of gravity to the hip joint centre _____
 - b. Muscle action required _____
 - c. Knee posture and muscles required _____

2. **Military posture – anterior pelvic tilt**
 - a. Relationship of the line of gravity to the hip joint centre _____
 - b. Muscle action required _____
 - c. Affect on the lumbar spine _____
 - d. Knee posture and muscles required _____

3. **Relaxed posture – posterior pelvic tilt**
 - a. Relationship of the line of gravity to the hip joint centre _____
 - b. Muscle action required _____
 - i. Why? _____
 - c. Affect on lumbar spine _____
 - d. Knee posture and muscles required _____

Locomotion – muscles and movements at the hip joint

1. **At heel strike**
 - a. Muscles active _____
 - b. Why _____

2. **Mid-stance**
 - a. Muscles active _____
 - b. Why _____

3. **Early swing phase**
 - a. Muscles active _____
 - b. Why _____

 - c. _____

4. **End of swing phase**
 - a. Muscles active _____
 - b. Why _____

What causes the medial rotation of the stance hip? _____

What causes the lateral rotation of the swing hip? _____