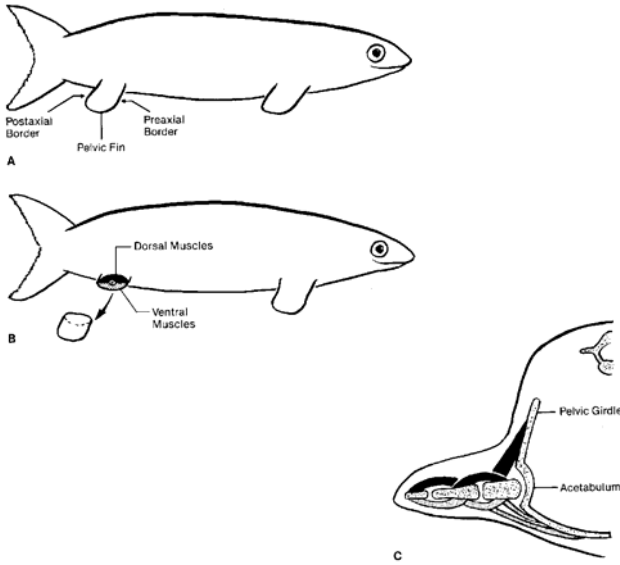


EVOLUTION OF THE LOWER LIMB

THE PRIMORDIAL HINDLIMB IS A FLAT PADDLE OR FIN.

In fish, and in the embryo

Dorsal and ventral surfaces - preaxial and postaxial borders



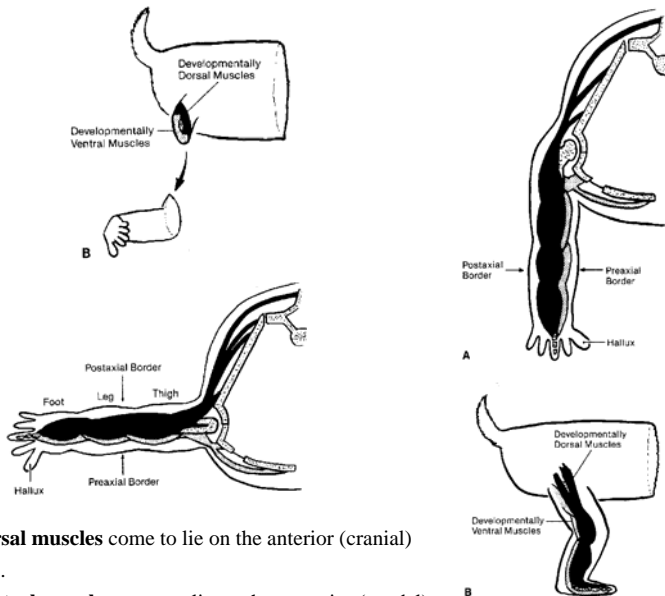
Dorsal muscles connect long bones of the limb with the vertebral column or ilium. In fish they elevate the fin.

Ventral muscles connect long bones of the limb with the ischium or pubis. In fish they depress the fin.

EVOLUTION OF THE LOWER LIMB MAMMALIAN ADAPTATIONS

LIMB CHANGES ORIENTATION

1. **Medially rotated** so that the preaxial digit (hallux) is medial
2. **Adducted** to bring the limb under the body
3. **Also extended in humans** to bring the limb in line with the torso



Dorsal muscles come to lie on the anterior (cranial) side.

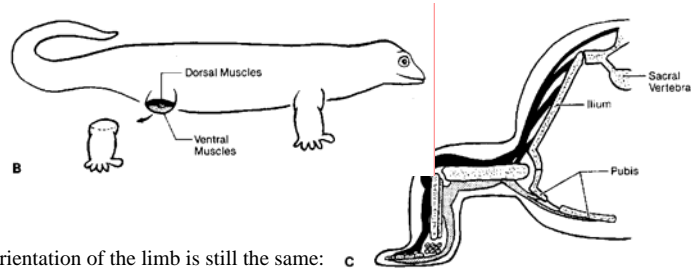
Ventral muscles come to lie on the posterior (caudal) side.

Pre-axial digit becomes the medial.

EVOLUTION OF THE LOWER LIMB TERRESTRIAL ADAPTATIONS

The characteristic segments of the limb (pelvis, thigh, leg and foot) were present in the fins of fossil fish

But became fully developed in terrestrial forms (amphibia & reptiles)



The orientation of the limb is still the same:

Dorsal is dorsal and Ventral is ventral

Pre-axial (big toe side) is front edge of limb

The limbs and mode of locomotion are very similar in fish & reptiles



DORSAL AND VENTRAL MUSCLES IN THE LOWER LIMB

The limb rotations modify the action of the muscles

Primitive **dorsal elevators** of the fin

become **anterior extensors**, and **lateral abductors**

Ventral depressors of the fin

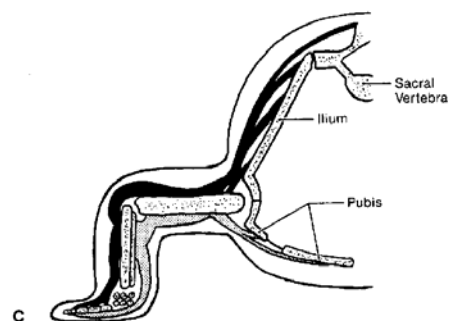
Become **posterior flexors**, and **medial adductors** of the limb

Dorsal muscles either:

- Attach to the vertebral column or the ilium
- or Lie in anterior or lateral compartments of the limb

Ventral muscles either:

- Attach to the pubis or ischium
- or Lie in posterior or medial compartments



NERVES OF THE LUMBO SACRAL PLEXUS

We have seen dorsal and ventral

1. Aspects of the limb
2. Muscle groups
3. Bones

Now we have dorsal and ventral nerves

Femoral nerve - L2,3,4

Obturator nerve L2,3,4

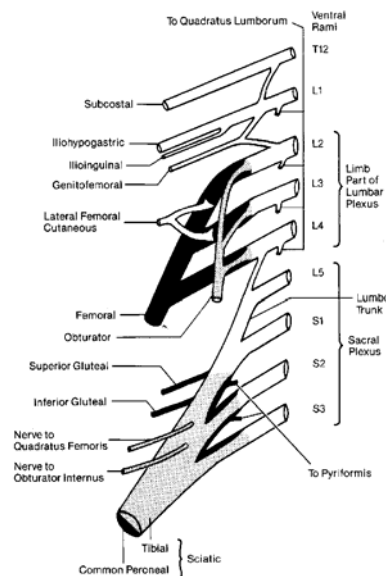
Lumbosacral trunk L4,5

Superior gluteal nerve - L4,5,S1

Inferior gluteal nerve - L5,S1,2

Sciatic nerve

- a) Tibial nerve - L4,5,S1,2,3
- b) Common peroneal nerve - L4,5,S1,2,3



ANTERIOR AND MEDIAL COMPARTMENTS OF THE THIGH

Anterior aspect of the hip

ANTERIOR COMPARTMENT MUSCLES

Flexors (and medial rotators) of the thigh and extensors of the knee

Hip muscles take origin from:

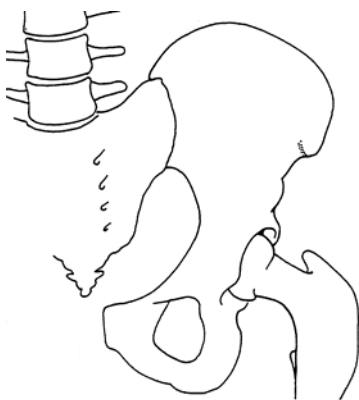
Vertebrae Psoas

Ilium Iliacus, sartorius, rectus femoris (and pectineus)

Origin from vertebrae and Ilium – therefore **dorsal muscles**

The other three muscles – the vasti – cross the knee only

All supplied by the Femoral nerve
Femoral nerve L234 (dorsal)



MEDIAL COMPARTMENT MUSCLES

Adductors (and medial rotators) of the hip

Take origin from:

The Pubis Gracilis, adductor longus, brevis & magnus, and pectineus

Origin from Pubis – therefore **Ventral muscles**

All supplied by the Obturator nerve (L234)

Dorsal and Ventral MUSCLE COMPARTMENTS OF THE LOWER LIMB And their Dorsal and Ventral nerves

Dorsal:

Femoral nerve (L234)

Anterior compartment of the thigh

Dorsal:

Gluteal nerves (L45S123)

“Lateral” compartment of the thigh

Ventral:

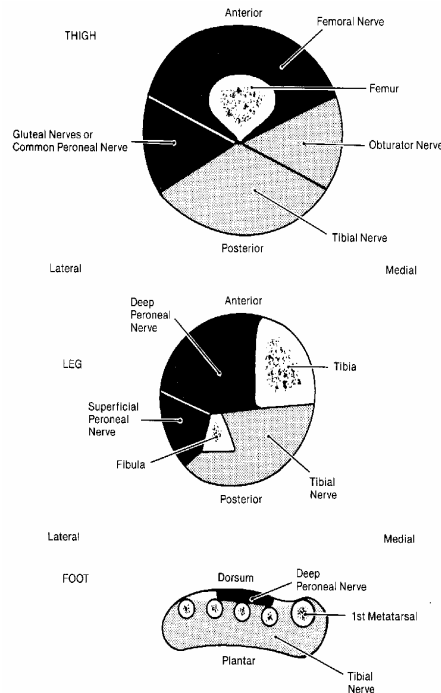
Obturator nerve (L234)

Medial compartment of the thigh

Ventral:

Tibial nerve (L45S123)

Posterior compartment of the thigh



Ventral:

Tibial nerve (L45S123)

Posterior compartment of the Leg

Dorsal:

Deep peroneal nerve (L45S123)

Anterior compartment of the leg

Dorsal:

Superficial peroneal nerve (L45S123)

Lateral compartment of the leg

Ventral:

Tibial nerve (L45S123)

Sole of foot

POSTERIOR AND LATERAL COMPARTMENTS OF THE THIGH

Posterior aspect of the hip

POSTERIOR COMPARTMENT MUSCLES

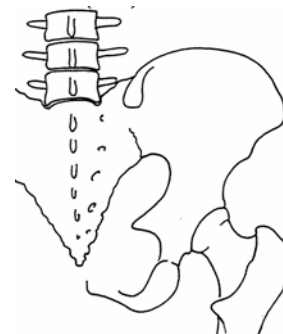
Extensors of the thigh and flexors of the knee

Take origin from:

The Ischium Semitendinosus, semimembranosus, long head of biceps (adductor magnus)

Origin from the Ischium – therefore **Ventral muscles**

All supplied by the Tibial division of the sciatic nerve (L45S123)



LATERAL COMPARTMENT MUSCLES

Abductors of the hip (plus other things)

Take origin from:

The Ilium Gluteus medius and minimus, tensor fascia lata

Vertebral column Gluteus maximus

Origin from the Ilium – therefore **Dorsal muscles**

Supplied by **Superior and inferior gluteal nerves (L45S12)**

Also the short head of biceps (knee flexor only – not a hamstring) common peroneal nerve (dorsal)

UPPER AND LOWER LIMB COMPARED

Upper limb is concerned with Manipulation and prehension

Lower limb is an organ of locomotion

Upper limb is more mobile

Lower limb is stronger and more stable

Upper limb has a whole set of muscles which can move and position the pectoral girdle with respect to the trunk.

Trapezius, rhomboids, levator scapulae, serratus anterior

The lower limb has its pelvic girdle securely fixed to the vertebral column

The upper limb is an organ of the prehension and manipulation.

Therefore an upper limb muscle's action is usually the same as their function.

Most muscles work concentrically

The lower limb is an organ of locomotion

Therefore a lower limb muscle's action is not always the same as its function.

Most of the time, muscles work eccentrically

(resisting and controlling the effects of gravity and momentum)

HUMAN FUNCTIONAL ANATOMY THE LOWER LIMB

THIS WEEKS LAB:

Proximal parts plexuses and patterns

READINGS

Stern. Essentials of Human Anatomy:- Lower limb

Stern. Core concepts in anatomy:- 96 Organization of Lower limb musculature and the lumbosacral plexus

Faiz and Moffat. Anatomy at a Glance:- Nerves of the lower limb 1 & 2

Grant's Method:- Lower limb (especially nerve summaries at the end of section)

OR any other regional textbook - similar sections

IN THIS LECTURE I WILL COVER:

Ontogeny and Phylogeny

The Pelvic fin

Dorsal and ventral muscle/nerve/girdle bone

Rotations of the limb in phylogeny

Segmental nerve supply

Upper and lower limb compared