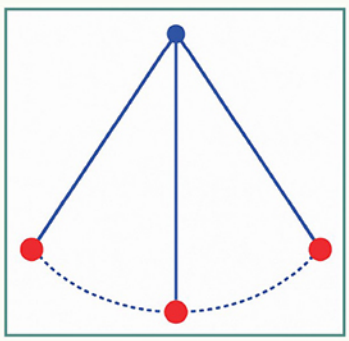
Medical Yoga Therapy

(Modern Medicine Approach for Yogic Techniques)



Yoga and
Modern Medicine

Yoga for
Female Health

Medical Yoga Therapy
for Lifestyle Disorders

Rope and
Belt Therapy

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Foreword
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JAYPEE

Contents

PART I: Yoga and Modern Medicine

PART II: Yoga for Female Health

CHAPTER

30

Lumbar Spondylosis and Disc Disease

1. Anatomy
2. Kinesiology
3. Pathophysiology
4. Symptoms, signs, investigations
5. Medical line of treatment
6. Medical yoga therapy

ANATOMY

- Bony skeleton
- Joints involved
- Muscles support

Bony Skeleton

12th Rib

- Last rib (floating)
- Important muscles attached
- One muscle connects it with iliac crest namely Quadratus Lumborum
- Junction of upper ½ and lower ½ of body
- Curvature of vertebral column changes at T12.
- From end of kyphosis to beginning of lordosis.

Lumbar Spine

- L1 to L5—big and strong
- **Parts:**
  - Body, pedicle, laminae
  - Transverse process
  - Spinous process
  - Superior and inferior articulating surfaces
  - Pars interarticularis
- Vertebral canal-boundaries
- Intervertebral foramen-boundaries
- **Ligaments:** ALL, PLL, ligamentum flavum, supraspinous ligament, intertransverse and interspinous ligaments

- **Lumbar lordosis:** Why, how, its effects on intervertebral discs (IVD) and intervertebral joints, its relationship with pelvic movement and yogic postures, changes occurring in it and their causes, lumbosacral angle.

Intervertebral Disc (IVD)

- Is a cushion between two vertebrae.
- It has 3 parts. Namely vertebral end plate, annulus fibrosus and nucleus pulposus.
- VEP is tough boundary layer, AF is outer fibrous layer and NP is soft, pulpy, pasty part.
- The disk thickness varies from 3 mm in cervical region to 9 mm in lumbar region due to increasing weight bearing loads.
- Although the disk is smallest in cervical region and largest in lumbar region, it is the ratio between this thickness and vertebral body height that determines the available motion. The greater the ratio greater the mobility.
- The ratio is greatest in cervical regions and smallest in thoracic region.
- Annulus fibrosus has more collagen and elastic fibers (50–60%) and proteoglycans (20%). It has 60–70% of water depending on age and time of day. It has many cells such as fibroblasts and chondrocytes.
- Nucleus pulposus has more proteoglycans, about 60–70% and collagen fibers (15–20%). It has 70–90% water. It has proteolytic enzymes and many cells.
- Vertebral end plate are layers of cartilage 0.6–1 mm thick that cover the region of vertebral bodies on superior and inferior surfaces. They cover entire nucleus pulposus. It is made up of hyaline cartilage and fibrocartilage as the age advances.
- The intervertebral disks are innervated in the outer one third to one half of the fibers of the annulus fibrosus.
- The intervertebral disk does not receive blood supply from any major arteries. It receives nutrition via diffusion from dense capillary plexus at the base of end plate cartilage and subchondral bone.
- The function of annulus fibrosus is to resist tensile (stretching) forces. The function of nucleus pulposus is to resist compressive forces.
- Its functions are:
  - Weight bearing
  - Shock absorption
  - Movements

Sacrum and Coccyx

- Five joined vertebrae, terminal 4 vertebrae
- Posteriorly joined with ileum of pelvis—by sacroiliac joint
- The position of tip of coccyx is anterior

Pelvis

- Is formed by union of 3 bones
- They are ileum, ischium, pubis
- All three meet at acetabulum
- Pelvis has Inlet and outlet
- Male X female pelvis differ in shape
- The pelvis moves on head of femur
- During sitting, standing, walking, lying positions. Many muscles are attached to it on inside, outside.

Spinal Cord

- Tail end of brain
- Ends at L1
- Below are only bunch of spinal nerves
- This bunch is called equina
- Each nerve comes out of its respective foramen
- It has three coverings inner pia, middle arachnoid, outer dura.
- There is a space between pia and arachnoid, filled with cerebrospinal fluid in which the spinal cord and its nerves are suspended
- Outer dura covering is very sensitive, it extends up to S2, lines the posterior longitudinal ligament, which may be indented in bulged disc or prolapsed disc (Dura is called Theca here).

Spinal Nerves

- Spinal cord gives 31 pairs of spinal nerves.
- Cervical—8
- Thoracic—12
- Lumbar—5
- Sacral—5
- Coccygeal—1
- 5th lumbar nerve comes out between 5th lumbar and 1st sacral vertebra
- Thus, in lumbar region, the number of the spinal nerve is number of upper vertebra.
- Exiting nerve is the nerve which comes out through its respective foramen. This may get compressed by right or left foraminal protrusion of disc, in intervertebral foramen.
- Traversing nerves are the next nerve to come out. This may get compressed by central disc bulge in vertebral canal.
- Thus, foraminal disc bulge or prolapse at L5/S1 may compress L5 exiting nerve.
- Central disc at L5/S1 may compress S1 traversing nerve
- Each spinal nerve comes out of vertebral canal through intervertebral foramen.
- This nerve carries sensation from a particular area and supplies to particular muscles for their actions.

Sciatic Nerve

Is formed by L4, L5, S1, S2, S3 spinal nerves. They all join to form sciatic nerve. Which gives multiple branches to supply to its' respective territory. This nerve is formed inside the pelvis, on sacrum covered by pyriformis muscle. It comes out of pelvis in between two muscles, namely pyriformis and gemelli superior, to enter the gluteal region. 54 then it travels in the posterior part of thigh, by lying on number of muscles to divide into two branches. One travels in front and other at back of leg. Both supply the front and back part of leg and dorsal and plantar surface of foot. It supplies many muscles.

Joints Involved

SI—Sacroiliac Joint

- Stable joint, minimal movement.
- Torso's weight is transmitted from 5th vertebrae to right and left SI joint and then to respective hip joints.
- While walking, there is movement of one side of pelvis, weight is born by one leg momentarily and there is movement at SI joint.

- In sitting forward postures, SI joint is mobilized.
- Lifting both legs together, with both knees extended, stretch is felt on both SI joint up to 70°, after that to lumbar spine.

Intervertebral Joints

- There exists a joint between adjacent vertebrae above and below
- This joint has built-in locking mechanism.
- Torso weight is transmitted from one vertebra to next via a portion in between two articulating surfaces of one vertebra
- These joints are weight bearing joints
- There is a range of movement at cervical/thoracic
- Dorsal/lumbar intervertebral joints—these joint forms the posterior boundary of intervertebral foramen.
- Intervertebral joint-movements-flexion, extension, lateral flexion. The most mobile joint in the spine in terms of bending and straightening is between L4 and L5. L4 derives its security for its dynamic activity by L5 which is firm, anchored by the strongest lumbosacral ligaments, providing a sturdy base.

Hip Joint

Lumbar spine curvature, position of pelvis and hip joint movements are interlinked

Muscles Attached to Lumbar Spine

- **Anterior:**
  - Psoas major, minor—flexors of lumbar spine
  - Quadrates lumborum—lateral flexor of lumbar spine (anterior to lumbar spine, forms posterior abdominal wall)
- **Posterior:**
  - From superficial to deep.
  - Latissimus dorsi
  - Erector spinae—keep spine erect
  - Has three parts:
    1. Central—spinalis leads to extension of lumbar spine which leads to increase in lordosis
    2. Middle—longissimus contraction leads to loss of lordosis
    3. Outer—iliocostalis contraction helps in lateral flexion of trunk

Muscles of Anterior Abdominal Wall

- Middle—rectus abdominis
- At sides:
  - External oblique—outer
  - Internal oblique—middle
  - Transverse abdominis—inner most

Muscles Attached to Pelvis

All muscles acting on pelvis:

- Gluteus maximus—extensor
- Gluteus medius—extensor

- Gluteus minimums—extensor
- Ileacus—flexor.

All muscles acting on hip joint

1. Flexors—psoas major, rectus abdominis, all adductors of hip joint
2. Extensors—gluteus maximus, hamstrings
3. Adductors—adductor magnus, adductor longus, adductor brevis
4. Abductors—gluteus medius, gluteus minimums, tensor fascia lata
5. Medial rotators—tensor fascia lata, anterior fibers of gluteus medias.
6. Lateral rotators—gluteus maximus, 6 deep lateral rotators (obturator interns and externus, gemelli superior and inferior, pyriformis, quadratus femoris).

Muscles Acting on Torso

- Flexion—anterior abdominal wall muscles
- Extension—erector spinae + gluteus maximus
- **Lateral flexion:**
  - One sided erector spina latissimus dorsi quadratus lumborum
  - One sided abdominal oblique muscle
- **Rotation:**
  - Lower thoracic—abdominal oblique muscles
  - Mid thoracic—scapular movement
  - Upper thoracic—shoulder joint movement

KINESIOLOGY

- Is study of muscles, during movements
- Lumbar spine suffers most, due to our upright posture
- It is the weak link which joins 12th vertebra to sacrum (pelvis) below
- Since it bears weight of torso and does not have any bony support in front, the muscles play a significant role
- Erector Spinae behind, rectus abdominis in front and oblique muscles at sides, form a natural lumbar belt
- Erector spinae are postural muscles, controlled at subconscious level. They are acting constantly in upright posture (as gravity is pulling our torso).
- Line of gravity passes through' center, or in front of lumbar spine
- Bending body on one side, needs balance by action of opposite side erector spinae
- Bending forward is by Psoas Major and anterior abdominal wall muscles, but its rate is controlled by erector spinae.
- Extension of torso (trunk) from flexed position requires action of erector spinae.
- Lifting weight leads to increased activity of erector spinae, so also standing. This leads to compressive load on lumbar spine

ADDITIONAL INFORMATION ANOMALIES

There are congenital anomalies of 5 lumbar vertebra and sacrum, which can influence the working of spine.

- **Lumbarization of S1** where the uppermost segment of the sacrum, instead of being fused, is loose and participates along with neighboring 5th Lumbar vertebra. Hence the first sacral segment is said to be lumbered i.e., lumbarization of S1

- **Sacralization of L5** where the body of 5th lumbar vertebra is fused with body of sacrum; hence there is one less mobile vertebra. This is called sacralization of L5.
- **Sacralization of L5** where the long transverse process of fifth lumbar vertebra, (one sided or both sided) reaching, touching, impinging the iliac bones, in this way the 5th lumbar vertebra is said to be sacralized—partial or complete. The body of 5th lumbar vertebra is fully or partially mobile. But the transverse touching process to ilia seriously hinders this natural movement. These conditions are rarely complete or pure but exist in halfway conditions. Hence these conditions are vulnerable to producing pain (semi fused, semi free condition).
- **Scoliosis** is lateral deviation of spine with rotation. It may be congenital, i.e., since birth or may develop afterwards, becoming evident at the time of puberty due to spurt in growth or may be postural (acquired). Commonly seen cases are the second ones, called idiopathic since the exact cause is not known. In scoliosis one curve is primary which is compensated by body by opposite side curvature in neighboring area. For example, mid-thoracic scoliosis with convexity on left is compensated by lumbar scoliosis, with convexity on right. Practicing yogic postures to work on both sided muscles for stretching and strengthening is vitally important.

Pathophysiology

- **Definition of spondylosis:** It is a degenerative condition of vertebral column involving intervertebral (facetal) joints, intervertebral disc and bodies of vertebrae.
- The vertebral column is a weight bearing structure. 75% of weight is borne by bodies of vertebrae and remaining is shared by intervertebral disc and intervertebral joints. The weight needs to be transferred along the line of gravity (LOG). This happens if the vertebral column has its curvatures in normal range and with proper alignment of all vertebrae.
- This weight bearing function leads to compressive load on these three structures. The compressive load in course time in years is responsible for changes in them.
- These changes may occur early for age, if the vertebral column is subjected to long hours of sitting, standing, travelling or weightlifting.
- **Changes in bodies of vertebrae:** Excessive or imbalanced weight bearing leads to excessive bone formation at margins of body of vertebrae. This is called osteophytes.
- These osteophytes may protrude in intervertebral foramen, putting pressure on spinal nerve.
- Changes in the Intervertebral Disc-Prolonged compressive load leads to escaping of water molecules from Annulus Fibrosus and Annulus Pulposus making them dry and thin
- This reduces the height of IVD, which may narrow the intervertebral foramen through which the spinal nerve comes out. However, this is a long duration (chronic) process which may lead to nerve compression.
- Unequal pressure on disc, mainly in its posterior region, may lead to bulging of annulus fibrosus posteriorly or laterally.
- Persistent pressure may lead to tear of annulus fibrosus posteriorly (central, paracentral or lateral - foraminal).
- The herniation of nucleus pulposus through this tear is called prolapsed intervertebral disc (PID) also called as herniation of disc or slip disc.
- This PID may press the nerve in the intervertebral foramen (foraminal-exiting nerve) or posteriorly (central or paracentral - traversing nerve).
- There may be precipitating causes like lifting eight, straining at stool coughing, sudden bending, kick of vehicle or obesity etc. The pressure on the nerve gives rise to its' irritation. This gives rise to sharp pain in the region of its distribution. This commonly occurs at intervertebral foramen between L5 and S1 affecting L5 nerve. Other common site being IVF between L4 and L5 affecting L4 (Both exiting nerves). However, let us remember the

posterocentral disc bulge or prolapse may compress L5/S1 traversing nerves depending on the level. This is called radiculopathy of L4/L5/S1(in layman's term it is called Sciatica).

- Changes in the intervertebral joint-excessive load/compression leads to thinning of articular cartilage, ligamental laxity and osteophyte formation. Osteophytes may protrude in the intervertebral foramen (posterior boundary) compressing the nerve. Ligamental laxity may lead to anterior or posterior listhesis of one vertebra over other.
- Thus, lumbar spondylosis is the wear and tear of vertebral column in lumbar region. It can be prevented by sufficient sleep, postural awareness, optimum, strength in muscles supporting the lumbar spine, stretching the shortened erector spinae and mental peace (disturbed mind may increase the tone of erector spinae muscle).

Complications of Spondylosis

- **Spondylolysis**—is a break at pars interarticularis, i.e., the part between superior and interior articulating processes. This part is a weight bearing part of vertebra as weight of HAT (Head + Arms + Trunk) is shared with intervertebral joints passing through this portion of vertebra. This break is called stress or fatigue fracture. If it occurs bilaterally, the front (anterior) portion of vertebra slips forward leading to anterior listhesis of one vertebra over other.
- **Spondylolisthesis—**is slipping of one vertebra over other. It can be anterior (front) or posterior (back). It can occur due to ligamentous laxity or spondylolysis. As longterm degenerative changes in intervertebral discs lead to its desiccation, thinning, the intervertebral space reduces. The ligaments holding the vertebrae snuggly with each other become loose. The degenerative changes at intervertebral joints add to this situation leading to anterior or posterior slipping of vertebra over other. The effect of spondylolisthesis can be narrowing intervertebral foramen leading to nerve compression at that level

Symptoms

- Patient complains of dull pain at L4–L5 and L5–S1, in the center or at sides.
- Pain in gluteal region, back thigh, calf, heel region.
- Sharp pain – L4–L5 and L5–S1. Sharp shooting, intermittent, radiating. Called Sciatica (Gluteal region to heel) OR (at patchy areas).
- Pain worsens on walking or is relieved on walking.
- Pain increases on climbing, weightlifting, sneezing, coughing, straining at defection.
- Restriction of movements-bending forward, Torso rotation is observed.
- Sense of heaviness, numbness, impaired motor (muscle) power is suggestive of advanced nerve damage.
- Occasionally one may complain of abnormal sensations.

Signs

- Observe the patient—How is he/she standing/walking.
- Observe height of pelvis on right and left side.

Testing for Neurological Deficit

L4—side lying leg raising:

- Standing on one leg and observing the position of pelvis on other side
- Muscles tested are—gluteus medius and minimus

L5—heel walk:

- Observe the action of dorsiflexion at ankle joint

- Muscles tested are Anterior TDH group of leg (tibialis anterior, extensors digitorum longus, extensor hallusis longus)

S1—toe walk:

- Observe for the action of plantar flexion at ankle joint
- Muscles tested are calf muscles (3 Superficial + 3 deep muscles)
- Ask for urinary control—testing of S2 and S3

Grades of Muscle Power

- G-0—no muscle contraction
- G-1—slight movement
- G-2—full range of movement along gravity
- G-3—full range of movement against gravity
- G-4—full range of movement with partial power
- G-5—full range of movement with full power

Investigations

Lumbosacral Spine—Anteroposterior and Lateral

- Prior night – Advice – Tablet – Gasex – (1) + Tablet – Dulcolax – (1) Empty stomach on X-ray day (preferably)
- **AP:**
  - Look for scoliosis (Rotational lateral deviation of vertebral column)
  - Sacralization of L5 vertebra—no space seen between L5–S1
  - Tip of the transverse process of L5 touching the iliac
- **Crest (unilateral/bilateral):**
  - *Lateral:*
    - Observe intervertebral space
    - Observe lordosis—normal/lost/exaggerated
    - Note Lumbosacral angle
    - Look for osteophytes
    - Look for lumbar listhesis

MRI

- Is for intervertebral disc status/any other soft tissue swelling
- Note the difference of normal/degenerated desiccated IVD.
- Note posterior protrusion/disc bulge of IVD in between L4 – L5/L5 – S1

Nerve Conduction Study (NCV)

Electromyography (EMG): This is advised to differentiate between radiculopathy and peripheral neuropathy, also to find out the extent of severity in radiculopathy.

Arterial Doppler Study

Is advised for cases with numbness to differentiate between PVD—peripheral vascular disease (causing ischemic pain) and radiculopathy.

Conventional Medical Treatment

1. Analgesics—to relieve pain.
2. Muscle relaxants—to relieve muscle spasm.

3. Rest in bed.
4. Physiotherapy
5. Nerve block
6. Decompression surgery
   - Endoscopic
   - Open surgery with or without fusion

ROPE AND BELT THERAPY (FIG. 30.1)

Prevention

- Basic Yoga postures—classical
- Advance Yoga postures—classical
- Postural awareness in sitting, standing, weightlifting.
- Shalabhasan, Prone Naukasan
- Hands/Head/Legs together up (Noukasan)
- Setubandh (optional)
- Side bend Chakrasan
- Supine + Sitting + Standing twisting postures

Palliation and Restoration

Lumbar @ Home Care

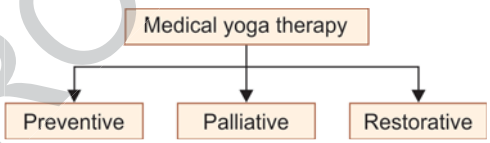


Fig. 30.1: Medical Yoga therapy.

- **Phase I:**
  - Lumbar rest
  - Pawanmuktasan
  - Gomukhasan (legs)
  - Padangushthasan with rope
  - Sitting forward and lateral stretch at 45° (in Swastikasan or sitting on chair)
  - Active pelvic movement in lying, standing and sitting position
- **Phase II:**
  - Tadasan
  - Shalabhasan
  - Naukasan (prone)
  - Setubandh
  - Both Legs 1' up and down (supine)
  - Both Legs 1' rotations (supine)
  - Both hands and torso up (supine)
  - Pawanmuktasan twisting
  - Side bend chakrasan (standing)
  - Konasan 1
  - Side lying leg raising

Ambulatory Belt

Pelvic lift—as the name denotes this is a belt which lifts the pelvis from front. This belt offers a passive correction to extend the pelvis from behind. This causes stretching of Erector spinae muscles at Lumbosacral region and reduction in the region of lumbar spine. It helps to relieve pain and stiffness at L5 – S1 level.

Set I—Rope and Belt Therapy

1. Lumbar traction–horizontal and slanting
2. Standing forward position
3. Sitting forward position
4. Padangushthasan with lumbar traction.
   All with bilateral medial rotation of hip joints-By Rope GT or Belt GT

Effects

1. **Lumbar traction-slanting or horizontal:**
   - Stretching of erector spinae
     - Paraspinal/paravertebral muscles in lumbosacral area
   - Decrease in lumbosacral angle
   - Decrease in lumbar lordosis due to mobilization of pelvis
2. **Standing forward position:**
   - Stretching of erector spinae in thoracolumbar area
   - Stretching of erector spinae + over lapping region of trapezius and latissimus dorsi (T7 – T12) to reduce increased kyphosis (thoracic –dorsal)
   - Mobilization of pelvis.
   - Increase in L5 – S1 – space called distraction.
   - Awareness of anterior abdominal wall muscles action.
   - Stretching of hamstrings.
3. **Sitting forward position:**
   - Resting or passive pose—with support, with pelvis fixed for stretching of erector spinae 67 at lumbosacral, thoracolumbar areas
     Active Pose - for use of Rectus Abdominis + Pectoralis Major in front and latissimus dorsi at back (lifting of Torso up)
   - Distraction at L5 – S1 level
   - Distraction at T12 – L1 and L1 – L2 level
   - Lateral stretch—stretches the erector spinae on one side.
4. **Padangushthasan with—lumbar traction:**
   - Calf stretch
   - Hamstring stretch
   - Extension of pelvis
   - Straightening of lumbar spine
   - Distraction of L4 – L5 and L5 – S1 IVS
   - Decrease in lumbosacral angle

Set II

1. Double rope pelvic lift
2. Sciatic entrapment release
3. Padangusthasan with lumbar traction

Effects

1. **Double rope pelvic lift:**
   - Anterior lift of pelvis
   - Posterior pull of pelvis (extension)
   - Ideal lumbar rest position
   - Distraction at L5 – S1

2. **Sciatic entrapment release:**
   - Extension of pelvis
   - Medial rotation of one hip joint
   - Stretching of lateral rotators of hip joint
   - Release of sciatic nerve from entrapment.
3. **Padangusthasan with lumbar traction:**
   - Calf stretch
   - Hamstring stretch
   - Extension of pelvis
   - Straightening of lumbar spine
   - Distraction at L4 - L5 and L5 - S1
   - Decrease in lumbosacral angle

Note:
- **S**traightening of lumbar spine leads to 60% distraction
- Lumbar traction given in Rope and Belt Therapy further adds to distraction effect. Distraction is a force of pulling apart **(Fig. 30.2)**.
- Loss of lordosis causes straightening of lumbar spine which on the other hand increases the compressive load **(Fig. 30.2)**.

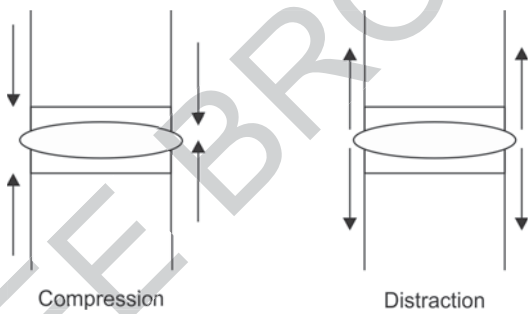


Fig. 30.2: Compression and distraction.

O. Psoas major: lumbar vertebrae
Iliacus: inner surface of ilium
I. Lesser trochanter of femur
A. Flexion, abduction and lateral rotation of hip
N. Iliacus: femoral nerve (L2, 3, 4)
Psoas major: L2, 3 directly
P. Cannot palpate

Psoas major and iliacus are usually referred to as the iliopsoas muscle because of their common insertion and action. Iliopsoas is the strongest hip flexor. Psoas minor is not shown in drawing and is not present in most people. When present, it is a small muscle with a long tendon lying in front of psoas major, originating on the 12th thoracic vertebra, inserting on the pelvic brim and innervated by L1.

Fig. 30.3A: Psoas major and Iliacus.

O. Posterior iliac crest
I. 12th rib of transverse processes of lumbar vertebrae
A. Lateral flexion of trunk or raises hip
N. Branches of T12, L1 nerves
P. Cannot palpate

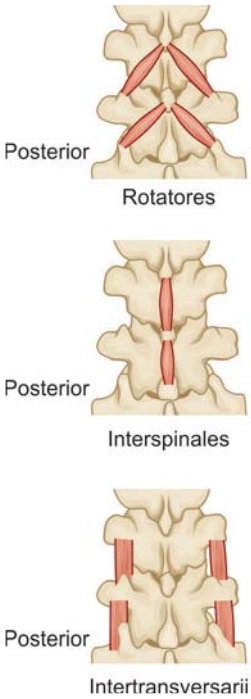
This muscle can be remembered for its action as a "hip hiker".

Fig. 30.3B: Quadratus lumborum.

O. Thoracolumbar aponeurosis from T7 to iliac crest, lower 3 or 4 ribs, Inferior angle of scapula
I. Bicipital groove of humerus
A. Extension
Medial rotation and adduction of humerus
N. Thoracodorsal nerve (C6, 7, 8)
P. Along posterior-lateral side of ribcage toward its insertion It forms posterior border of axilla.

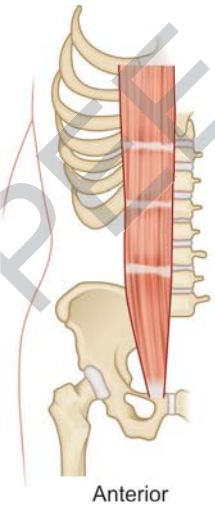
Latissimus means widest and dorsi means back (Latin). It is the widest muscle of the back. It is a powerful extensor of flexed arm in such activities as swimming or chopping with an axe. This muscle pulls the shoulder girdle down and is active when doing a depression transfer or when using crutches.

Fig. 30.3C: Latissimus dorsi.



O. Rotatores: transverse processes of all vertebrae
Interspinalis: spinous processes of cervical, lumbar and T1-2, T11-12 vertebrae
Intertransversarii: transverse processes of cervical, lumbar and T10-12 vertebrae
I. Rotatores: spinous processes of all vertebrae, inserting on vertebra directly above origin
Interspinalis: spinous processes of cervical, lumbar and T1-2, T11-12 vertebrae, each inserting on vertebra directly above origin
Intertransversarii: transverse processes cervical, lumbar and T10-12, inserting on vertebra directly above origin
A. Rotatores: extension of spine and rotation to opposite side
Interspinalis: extension of spine
Intertransversarii: lateral flexion of spine
N. Posterior branches of spinal nerves
P. Cannot palpate

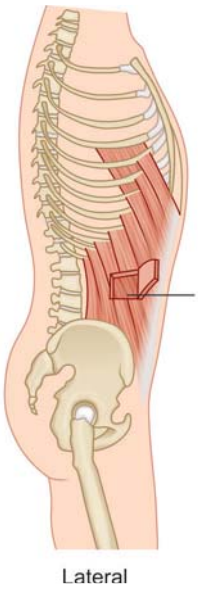
Fig. 30.3D: Transversospinalis-rotatores, interspinales and intertransversarii.



O. Costal cartilages 5, 6, 7
I. Pubis
A. Flexion of trunk compression of abdominal contents
N. 7-12 intercostal nerves
P. Anterior-medial surface of abdomen, on either side of umbilicus from sternum to pubis

Rectus abdominis contracts strongly when doing sit-ups or lifting both legs several inches from the floor in a supine position. Some sources consider O and I in terms of kinesiological muscle action and thus, for the rectus abdominus, the O is the pubis and this the ribs. However, in this manual, the anatical proximal-distal determination of O and I has been used throughout.

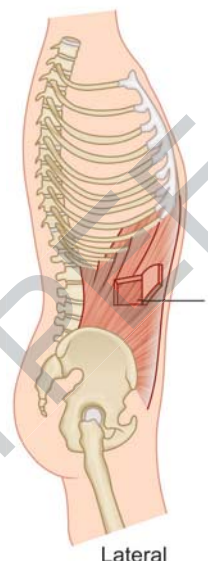
Fig. 30.3E: Rectus abdominis.



O. Lower 8 ribs
I. Abdominal aponeurosis and iliac crest
A. Bilaterally—flexion of trunk, compression of abdominal contents unilaterally–lateral flexion, rotation of trunk to opposite side
N. 8-12 intercostal nerves
L1 (L1 = iliohypogastric nerve and ilioinguinal nerve)
P. Lateral sides of abdomen

If you position your hands as if you we reaching into your pants pocket, your fingers will assume the direction of the fibers (obliquely downward and media ward). Its origin interdigitates with serratus anterior, and it is the most superficial side muscle.

Fig. 30.3F: External oblique.



O. Inquinal ligament and anterior iliac crest
I. Costal cartilages of last 4 ribs
Abdominal aponeurosis
A. Bilaterally—flexion of spine, compression of abdominal contents
Unilaterally—lateral flexion, rotation of trunk to same side
N. 8-12 intercostal nerves
L1 (L1 = iliohypogastric nerve and ilioinguinal nerve)
P. Cannot palpate

If you cross your arms over your abdomer with fingertips on the anterior-superior ilia spines your fingertips will assume the direction of these fibers (obliquely upward and medialward).

Fig. 30.3G: Internal oblique.

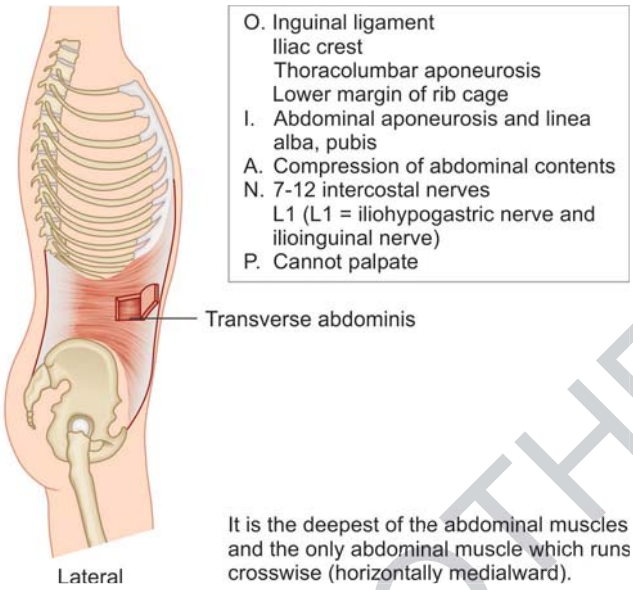


Fig. 30.3H: Transverse abdominis.

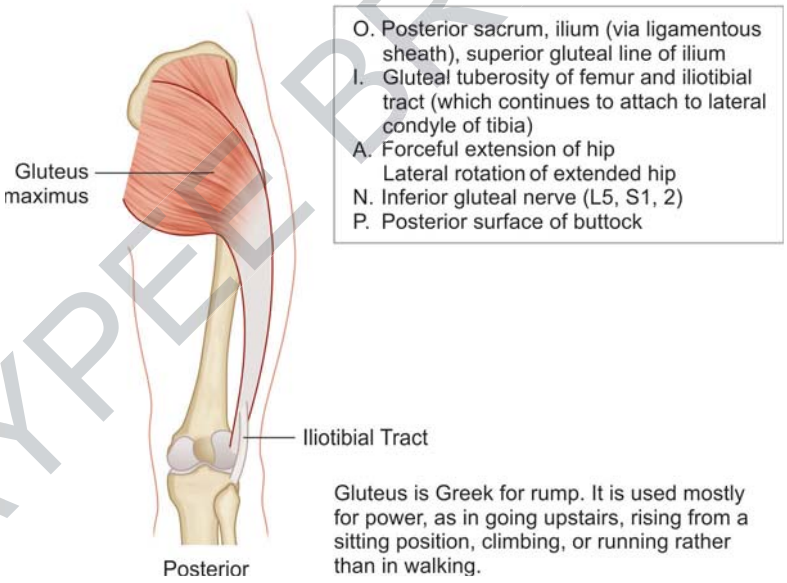
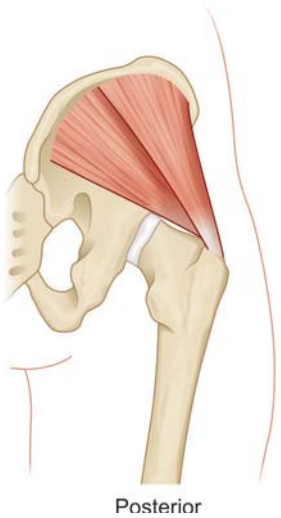


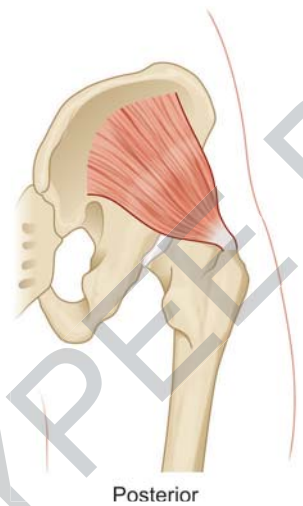
Fig. 30.3I: Gluteus maximus.



O. Iliac crest; ilium between superior and middle gluteal lines
I. Greater trochanter of femur
A. Abduction
Medial rotation of hip (anterior fibers)
N. Superior gluteal nerve (L4, 5, S1)
P. Lateral aspect of hip, above the greater trochanter

When standing on one foot, this muscle contracts on that side to keep the pelvis from tilting to the unsupported side. Alternate contraction of these muscles occurs in walking. Paralysis of this muscle on one side results in the "gluteus medius limp": the pelvis tilts towards the uninvolved side in walking.

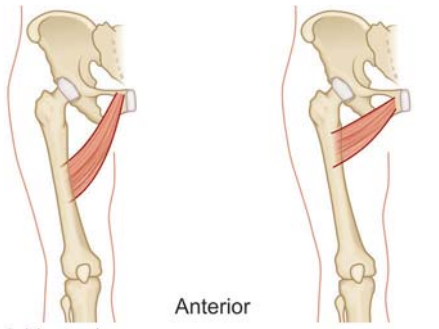
Fig. 30.3J: Gluteus medius.



O. Posterior ilium between middle and inferior gluteal lines
I. Anterior surface of greater trochanter of femur
A. Abduction
Medial rotation of hip
N. Superior gluteal nerve (L4, 5, S1)
P. With gluteus medius

Gluteus minimus works with gluteus medius.

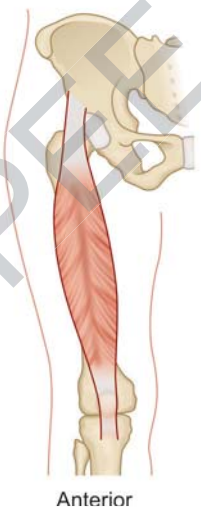
Fig. 30.3K: Gluteus minimus.



O. Anterior publis
I. Linea aspera on posterior femur
A. Adduction of hip
Assists flexion and medial rotation of the hip
N. Obturator (L3, 4)
P. Adductor longus: just below its proximal cord-like origin at medial aspect of groin
Adductor brevis: cannot palpate
Adductor longus forms the medial border of the femoral triangle.
Adductor brevis is found deep to the adductor lonaus

Fig. 30.3L: Adductor longus and adductor brevis.

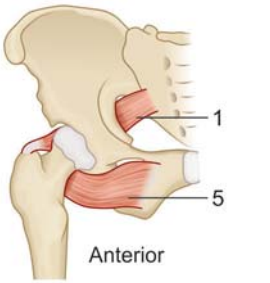
Rectus femoris



O. Anterior inferior iliac spine
Upper margin of acetabulum
I. Patella and via patellar ligament to tibial tuberosity
A. Extension of knee
Assists flexion of hip
N. Femoral nerve (L2, 3, 4)
P. Anterior surface of thigh

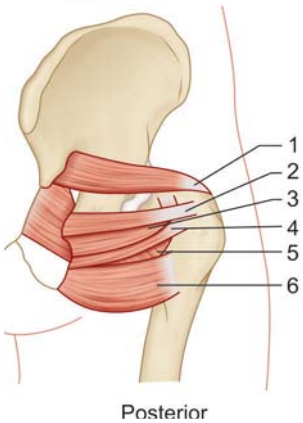
Rectus femoris is the only muscle in the quadriceps group that crosses both the hip and knee joints. Its combined actions are seen as the leg is brought forward in walking.

Fig. 30.3M: Quadriceps group.



1. Piriformis
2. Gemellus superior
3. Obturator internus
4. Gemellus inferior
5. Obturator externus
6. Quadratus femoris

O. Anterior sacrum
Ischium
Obturator foramen
I. Greater trochanter of femur
A. Lateral rotation of hip
N. Branches from sacral plexus (L4, 5, S1), [Obturator externus supplied by obturator nerve (L3, 4)]
P. Cannot palpate



The first letter in the words of the phrase "Piece Goods Often Go On Quilts" denote the anatomical order of these muscles from superior to inferior.

Fig. 30.3N: Six deep lateral rotators of the hip.

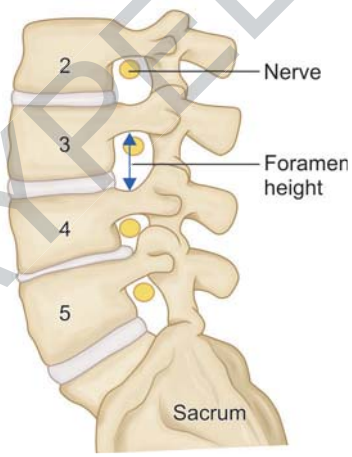


Fig. 30.3O: Intervertebral foramen.

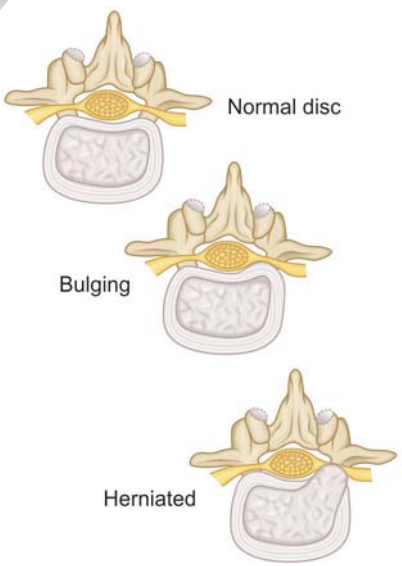


Fig. 30.3P: Disc.

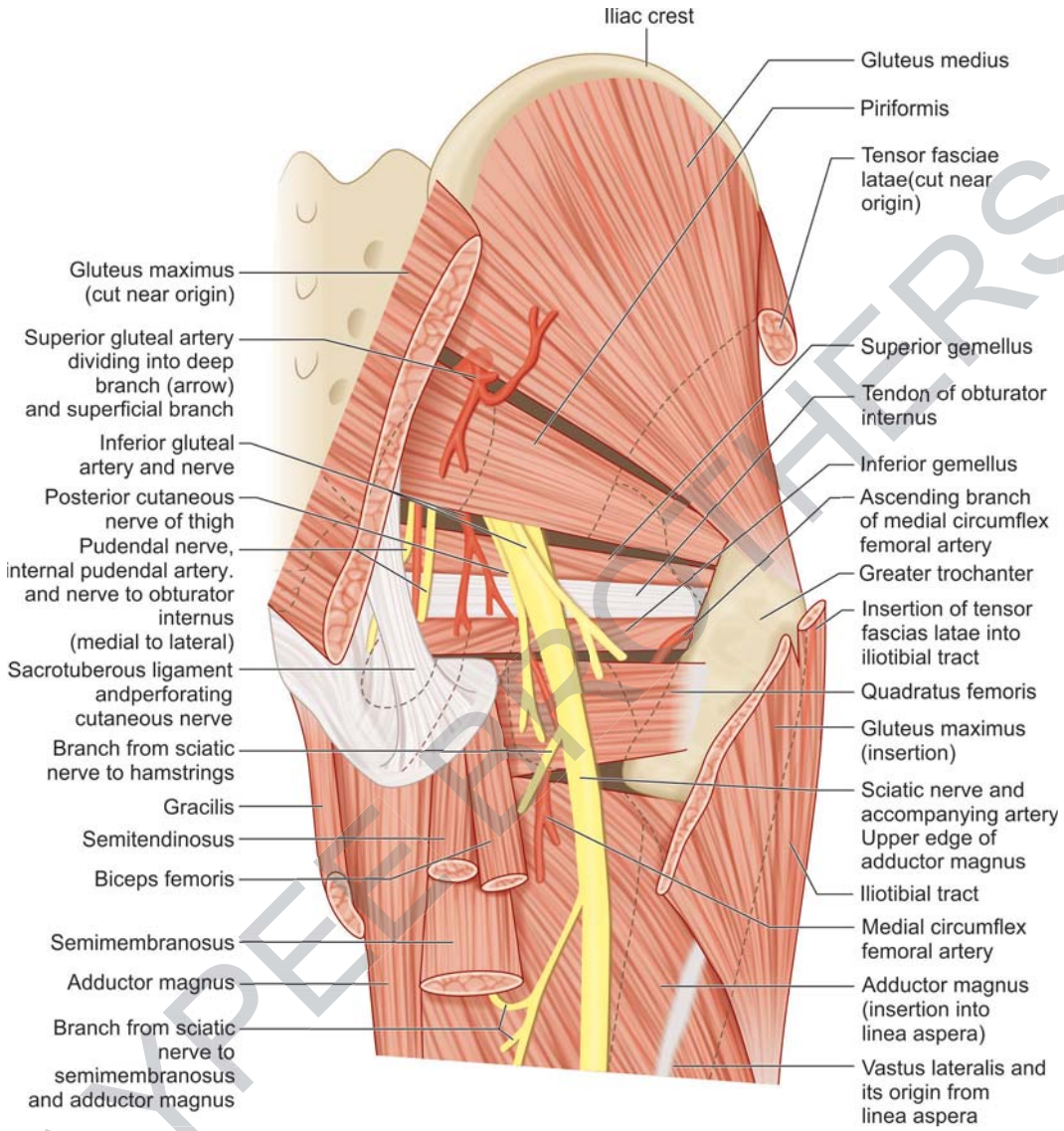


Fig. 30.3Q: Sciatic nerve at gluteal region.

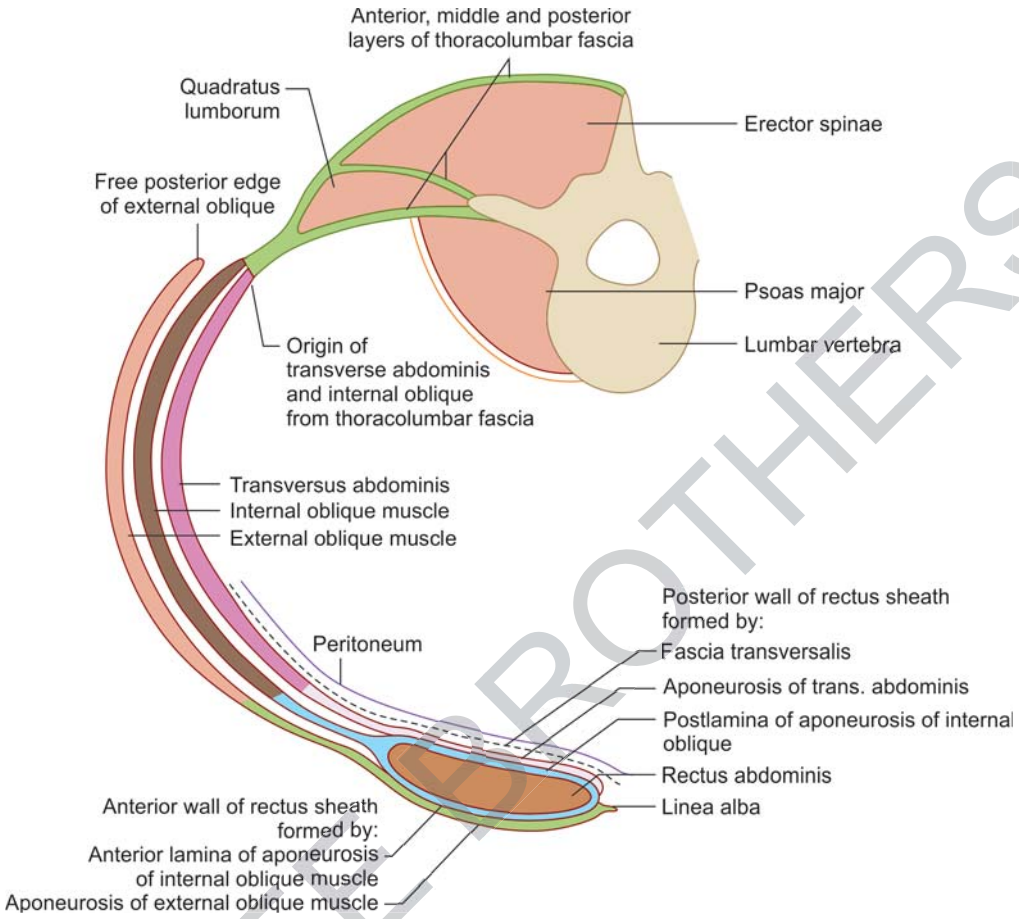


Fig. 30.3R: Schematic transverse section through abdominal wall to show its layers.

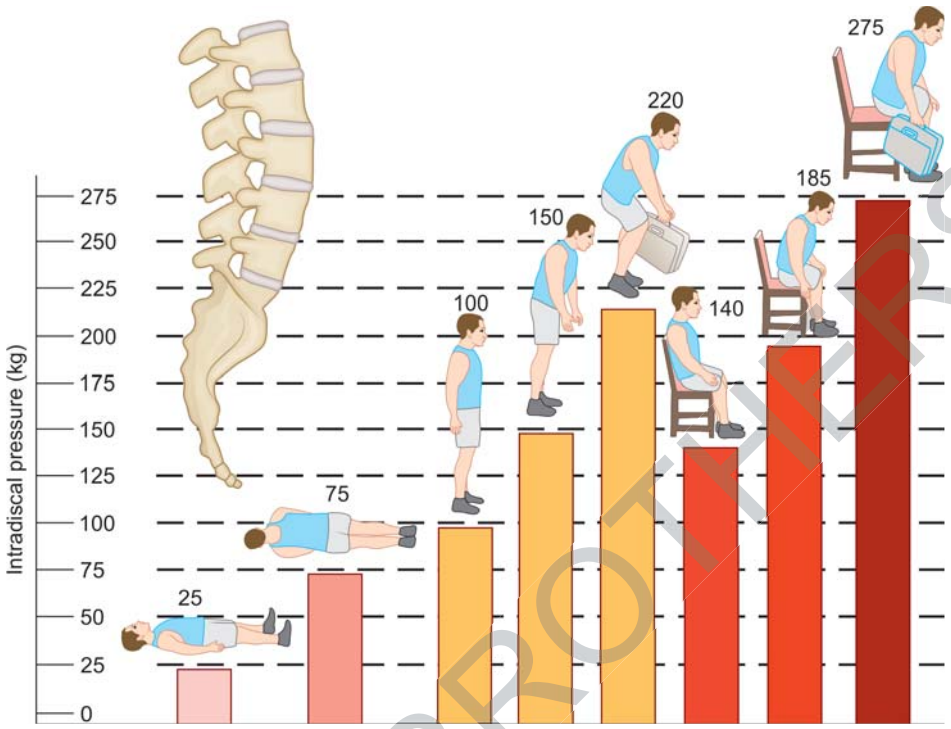


Fig. 30.3S: Body positions and disc pressure.

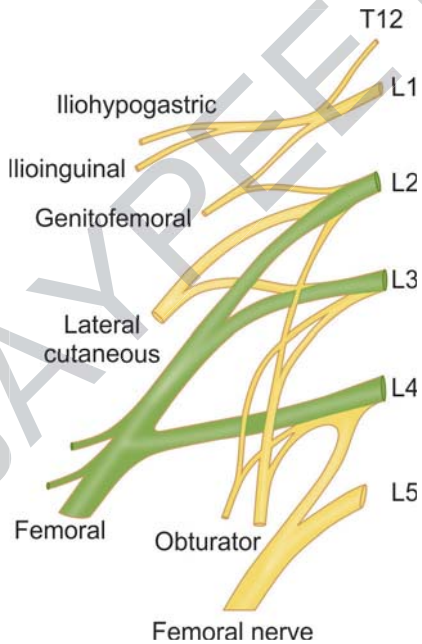


Fig. 30.3T: Femoral nerve.

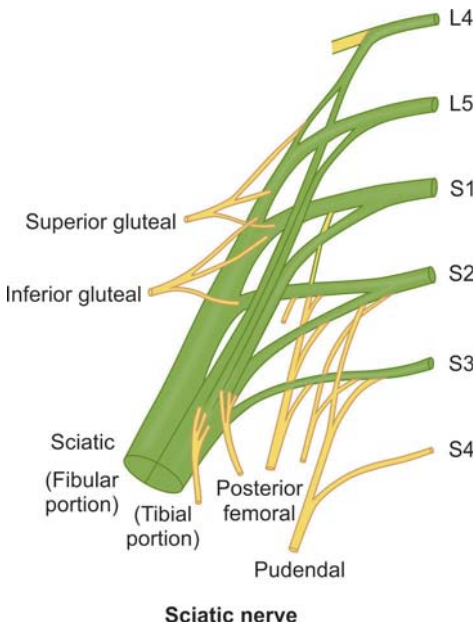


Fig. 30.3U: Sciatic nerve.

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Vineeta Ketkar MBBS is a dedicated family physician, practicing modern medicine since 1981 in Pune, Maharashtra, India. Her clinical practice is based on counseling and educating the patients with a judicial use of medicines. She firmly believes in the healing capacity of body and considers the doctor's role as "Help to Heal". She is always keen to find the "cause and effect" angle for each and every illness. Her quest is further enriched due to her study of Yogic Science. She belongs to a rare community of committed modern medicine practitioners with Yogic attitude. Her aim is to apply principles of Ashtanga and Hatha Yoga in her clinical practice to take care of the patient's health.

She studied Rope and Belt Therapy under Dr Shrikant V Karandikar for 14 years. She also learnt clinical assessment, therapeutic protocol, periodic follow-up, and educative activities with him.

She opted for an opportunity to work independently at a leading orthopedic hospital in Pune—Hardikar Orthopaedic Hospital. The founder of the hospital Padmashree Dr SM Hardikar appreciates the clinical benefits of Rope and Belt Therapy and advises it in selective cases.

At present, in addition to her family physician practice, she offers clinical and educational services at Gnosis Medical Yoga Foundation, Pune, Maharashtra, India.

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