LECTURE (SACRAL PLEXUS, SCIATIC NERVE AND FEMORAL NERVE)

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If there is any mistake please feel free to contact us:

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Both - Black
Male Notes - BLUE
Female Notes - GREEN
Explanation and additional notes - ORANGE
Very Important note - Red
Objectives:

By the end of the lecture, students should be able to:

- Describe the formation of sacral plexus (site & root value).
- List the main branches of sacral plexus.
- Describe the course of the femoral & the sciatic nerves
- List the motor and sensory distribution of femoral & sciatic nerves.
- Describe the effects of lesion of the femoral & the sciatic nerves (motor & sensory).
The Mind Maps

Lumber Plexus

Branches

Iliohypogastric - ilioinguinal

obturator

Femoral

Muscular branches to abdomen and lower limb

Cutaneous branches

Sacral Plexus

Branches

Pelvic Splanchnic nerves

Sciatic nerve (largest nerve), divides into:

Tibial and divides into:

Medial and lateral planter nerves

Fibular and divides into:

Deep peroneal

Superficial peroneal

Pudendal nerve.
**Remember !!**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>gastrocnemius</td>
<td>Planter flexion – knee flexion.</td>
</tr>
<tr>
<td>soleus</td>
<td>Planter flexion</td>
</tr>
<tr>
<td>Iliacus – sartorius- pectineus – psoas major</td>
<td>Hip flexion</td>
</tr>
<tr>
<td>Quadriceps femoris</td>
<td>Knee extension</td>
</tr>
<tr>
<td>Hamstring muscles</td>
<td>Knee flexion and hip extension</td>
</tr>
<tr>
<td>gracilis</td>
<td>Hip flexion and aids in knee flexion</td>
</tr>
</tbody>
</table>

*popliteal fossa structures (superficial to deep):*  
1-tibial nerve  2-popliteal vein  3-popliteal artery.

*foot drop: planter flexed position*

Common peroneal nerve injury leads to **Equinovarus**

Tibial nerve injury leads to **Calcaneovalgus**

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![Diagram of the nervous system](image)

- **Subcostal n.**
- **Iliohypogastric n.**
- **Ilioinguinal n.**
- **Lateral cutaneous n. of thigh.**
- **Femoral n.**
- **Genitofemoral n.**
- **Accessory obturator n.**
- **Obturator n.**
- **Lumbosacral trunk.**

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**Note:** The diagram shows the distribution of nerves from L1 to L5 levels, indicating the spinal cord segments associated with different nerves.
### Lumbar Plexus

<table>
<thead>
<tr>
<th>Formation</th>
<th>Ventral (anterior) rami of the upper 4 lumbar spinal nerves (L1,2,3 and L4).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>Within the substance of the psoas major muscle.</td>
</tr>
</tbody>
</table>
| Main branches | - Iliohypogastric & ilioinguinal: to anterior abdominal wall.  
                  - Obturator: to medial (adductor) group of the thigh.  
                  - Femoral: to anterior group of the thigh.             |

#### Femoral nerve

<table>
<thead>
<tr>
<th>Origin</th>
<th>from lumbar plexus (L2,3,4).</th>
</tr>
</thead>
</table>
| Course | - Descends lateral to psoas major & enters the thigh behind the inguinal ligament.  
          - Passes lateral to femoral artery & divides into anterior & posterior divisions. |

### MUSCULAR BRANCHES OF FEMORAL NERVE

- **In abdomen:**  
  To iliacus (flexor of hip joint).  
  - **In lower limb:**  
    - To anterior compartment of the thigh:  
    - **Flexors of hip joint:** sartorius & pectineus  
    - **Extensors of knee joint:** quadriceps femoris.

### CUTANEOUS BRANCHES OF FEMORAL NERVE

- **To antero-medial** aspect of the thigh.  
- **To medial side** of knee, leg and foot (saphenous nerve).
**Sacral Plexus**

<table>
<thead>
<tr>
<th>Formation</th>
<th>By the ventral (anterior) rami of a part of L4 &amp; whole L5 (lumbosacral trunk) + S1,2,3 and most of S 4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>in front of the piriformis muscle.</td>
</tr>
<tr>
<td>Main branches</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pelvic splanchnic nerves are the sacral part of the parasympathetic system and arise from the second, third, and fourth sacral nerves.</td>
</tr>
<tr>
<td></td>
<td>• They are distributed to the pelvic viscera.</td>
</tr>
<tr>
<td></td>
<td>▶ Pudendal nerve: to perineum.</td>
</tr>
<tr>
<td></td>
<td>▶ Sciatic nerve: to lower limb.</td>
</tr>
</tbody>
</table>

**Sciatic nerve (largest nerve in our body)**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Sacral plexus (L4,5, S1, 2,3).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td>Leaves the pelvis through greater sciatic foramen, below piriformis &amp; passes in the gluteal region (between ischial tuberosity &amp; greater trochanter) then to posterior compartment of thigh.</td>
</tr>
</tbody>
</table>

**Termination**

The sciatic nerve divides into:

- **Tibial nerve**
  - **Course:**
    - Descends through popliteal fossa to the posterior compartment of leg, accompanied with posterior tibial vessels.
    - **Passes deep to flexor retinaculum** (behind the medial malleolus) to reach the sole of foot where it divides into 2 terminal branches, (Medial & Lateral planter nerves).
  
- **common peroneal (fibular)**
  - **Course:**
    - Leaves popliteal fossa & close to the lateral aspect of neck of the fibula.
    - Then divides into:
      1. **Superficial peroneal:** descends into lateral compartment of leg.
      2. **Deep peroneal:** descends into anterior compartment of leg.

**MUSCULAR BRANCHES OF THE SCIATIC NERVE**

- To Hamstrings (flexors of knee & extensors of hip).
- To all muscles in the leg & foot through:
  1. Common peroneal:
     - TO Muscles of anterior & lateral compartments of leg (Dorsiflexors of...
2. Tibial: TO Muscles of posterior compartment of leg & intrinsic muscles of sole (Planterflexors of ankle, Flexors of toes, Invertors of foot).

| Cutaneous BRANCHES OF SCIATIC NERVE | • To all leg & foot
• EXCEPT:
• areas supplied by saphenous nerve (blue), branch of femoral nerve. |

Useful video for sciatic nerve (please ignore the accent = (http://www.youtube.com/watch?v=gBX_X2jETo)
Femoral and sciatic nerves injuries

**MOTOR EFFECT:** paralysis of iliacus, Sartorius, pectineus and quadriceps femoris.

**MOTOR MANIFESTATION:** 1-Wasting of quadriceps femoris. 2-Loss of extension of knee. 3-Weak flexion of hip (psoas major is intact).

**SENSORY EFFECT:** Loss of sensation of the areas supplied by femoral nerve.

**SENSORY MANIFESTATION:** loss of sensation over areas supplied (antero-medial) aspect of thigh & medial side of leg & foot.

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**Sciatic nerve injuries**

**Causes:**
- The sciatic nerve is *most frequently injured* by...?
  1- Badly placed intramuscular injections in the gluteal region.
  2- To avoid this, injections into the gluteus maximus or medius should be made... into the *upper outer quadrant* of the buttock.
  3- Posterior dislocation of the hip joint

**Clinical features**

**Motor:**
- The hamstring muscles are paralyzed, but weak flexion of the knee is possible. Why?
  - because of the action of the sartorius (femoral nerve) and gracilis (obturator nerve).
- All the muscles below the knee are paralyzed, and the weight of the foot causes it to assume the *plantar-flexed position, or Foot Drop*
SCIATICA (Sciatica describes the condition in which patients have pain along the sensory distribution of the sciatic nerve.)

- the pain is experienced in the 1- posterior aspect of the thigh
- 2- the posterior and lateral sides of the leg
- 3- the lateral part of the foot.

Causes:
1- Prolapse of an intervertebral disc
2- Pressure on the sacral plexus or sciatic nerve by an intrapelvic tumor.
3- Inflammation of the sciatic nerve or its terminal branches.

Foot drop

It is a peripheral nerve injury that affects a patient’s ability to lift the foot at the ankle. While foot drop injury is a neuromuscular disorder, it can also be a symptom of a more serious injury, such as a nerve compression or herniated disc.

Symptoms:
1- Inability to point toes toward the body (dorsi flexion)
2- Pain
3- Weakness
4- Numbness (on the shin or top of the foot)
5- Loss of function of foot
6- High-stepping walk (called Steppage gait or Footdrop Gait)

Sensory manifestation:
Sensation is lost below the knee, except for a narrow area down the medial side of the lower part of the leg and along the medial border of the foot as far as the ball of the big toe, which is supplied by the saphenous nerve (femoral nerve).
Common Peroneal Nerve Injury
The common peroneal nerve is in an exposed position as it leaves the popliteal fossa it winds around neck of the fibula to enter peroneus longus muscle. (Dangerous Position).

The common peroneal nerve is commonly injured
In Fractures of the neck of the fibula and By pressure from casts or splints.

Clinical features

Motor:
- The muscles of the anterior and lateral compartments of the leg are paralyzed,
- As a result, the opposing muscles, the plantar flexors of the ankle joint and the invertors of the subtalar joints, cause the foot to be Plantar Flexed (Foot Drop) and Inverted, an attitude referred to as Equinovarus.

Tibial Nerve Injury

- The tibial nerve leaves the popliteal fossa by passing deep to the gastrocnemius & soleus.
- Because of its deep and protected position, it is rarely injured.

Motor:
All the muscles in the back of the leg and the sole of the foot are paralyzed. The opposing muscles Dorsiflex the foot at the ankle joint and Evert the foot at the subtalar joint, an attitude referred to as Calcaneovalgus.
1. Which of the following is supplied by the femoral nerve?
   A. Extensors of hip.
   B. Skin of dorsum of foot.
   C. Hamstrings.
   D. Extensors of knee.

2. Injury of common peroneal nerve leads to:
   A. Loss of dorsiflexion of ankle.
   B. Loss of inversion of foot.
   C. Loss of extension of knee.
   D. Loss of flexion of toes.

3. What are the nerve roots of the Femoral Nerve?
   A. L2 to L4
   B. L2 to L5
   C. L1 to L4
   D. L2 & L3

4. Stripping of varicose veins can cause damage to which one of the following nerves?
   A. Sural.
   B. Femora.
   C. Saphenous.

5. Within which muscle does the Femoral Nerve arise?
   A. Pectineus
   B. Sartorius
   C. Psoas Major
   D. Rectus Abdominis
6. What is the position of the femoral nerve in relation to the femoral artery?
   A. Lateral
   B. Medial
   C. Above
   D. Below

7. Where do the cutaneous branches of the femoral nerve supply?
   A. Lateral Thigh
   B. Anteromedial Thigh
   C. Dorsum of the foot
   D. Lateral surface of the leg
   E. Gluteal region

8. Which area of the lower limb is innervated by motor branches of the femoral nerve?
   A. Posterior Thigh
   B. Anterior Thigh
   C. Anterolateral compartment of the leg
   D. Gluteal region

9. Which of the following movement is lost when the tibial nerve is injured?
   A. Extension of knee.
   B. Planter flexion of ankle.
   C. Dorsiflexion of ankle
   D. Extension of toes.
10. What happen If the sciatic nerve get injured?
   A. wasting of the muscles below the knee
   B. Loss of extension of knee
   C. Sensation is lost below the knee, Except the medial side
   D. 1-3

11. Which one of the following nerves is rarely injured?
   A. Femoral nerve
   B. Common peroneal nerve
   C. Tibial nerve
   D. Sciatic nerve

12. One of them is branch of the lumbar plexus?
   A. Obturator
   B. Sciatic
   C. Femoral
   D. 1-3

13. One of them is branch of femoral nerve?
   A. Iliohypogastric
   B. Ilioinguinal
   C. Genitofemoral
   D. Nerve to iliacus
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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</table>

**GOOD LUCK**

Anatomy Team Leaders:

Fahad AlShayhan & Eman AL-Bedica.