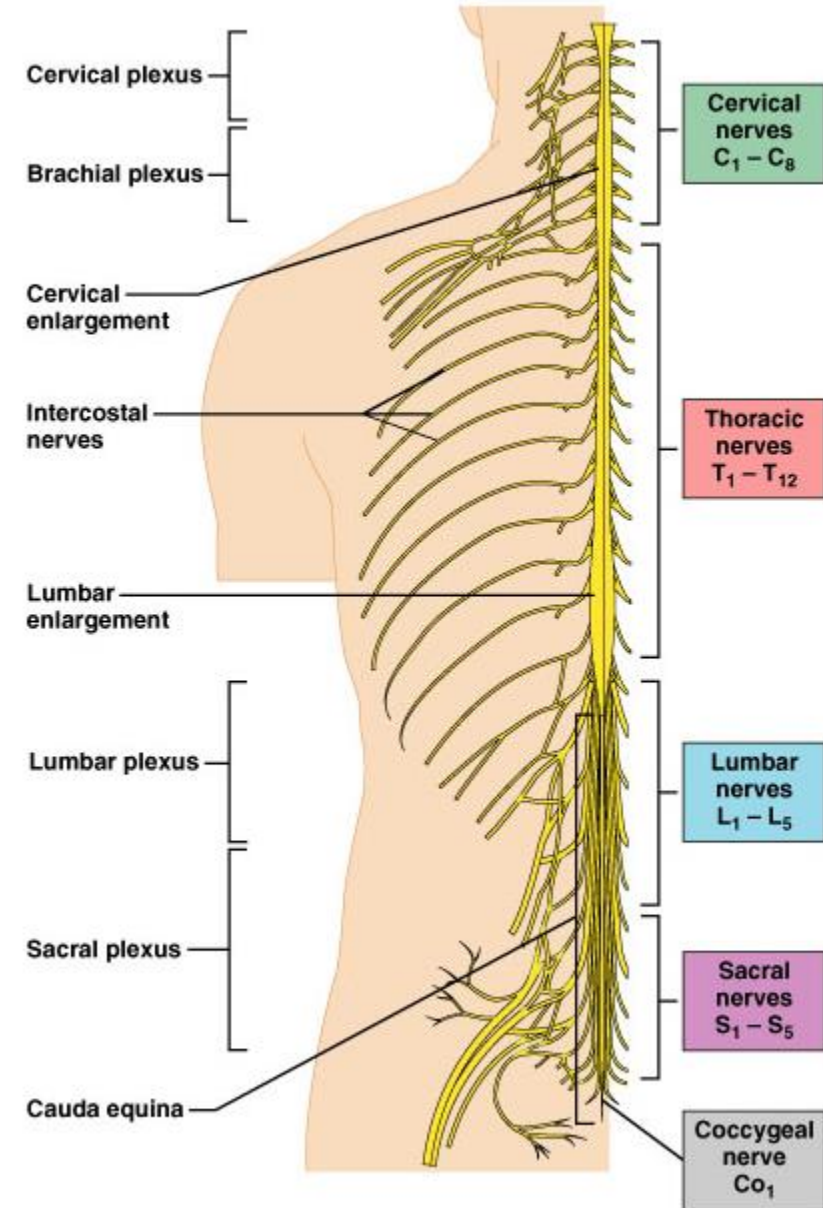


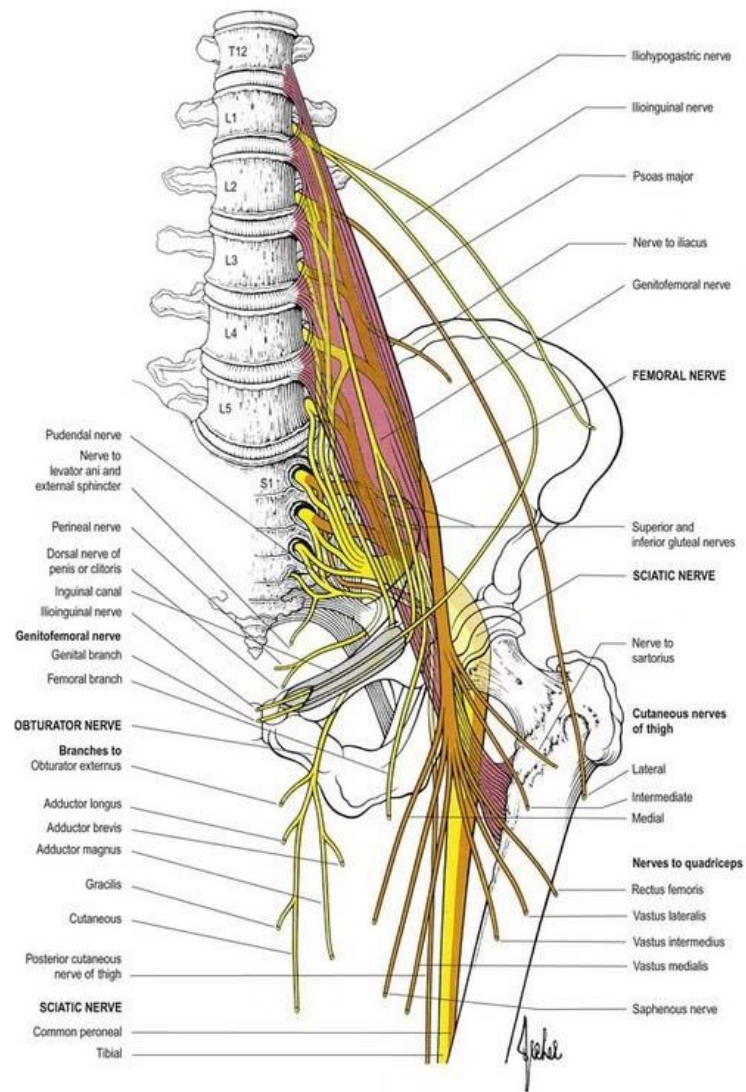
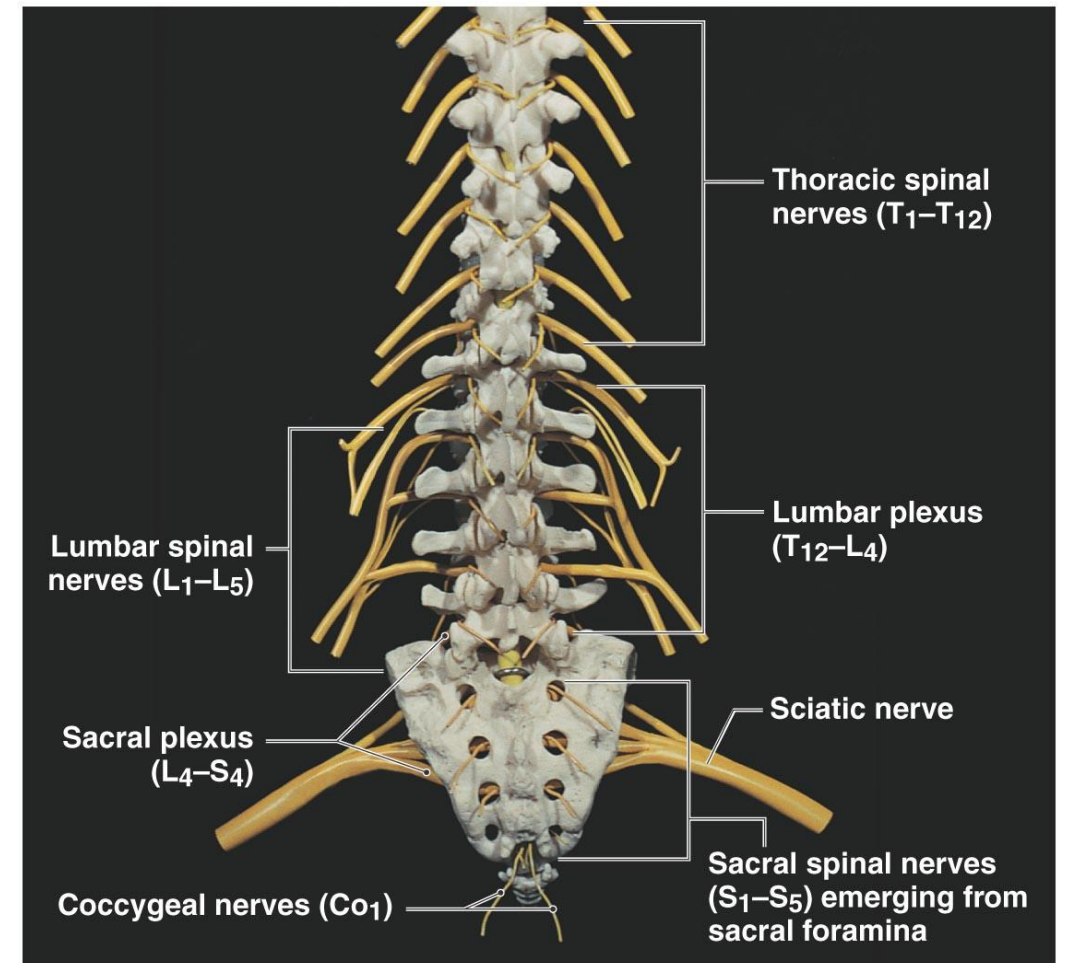
Lower Extremities

Lumbar Plexus

Nerve plexuses

- Networks of successive *ventral* rami that exchange fibers (crisscross & redistribute)
 - Why would this be protective?
- Mainly innervate the limbs
- Thoracic ventral rami do not form nerve plexuses

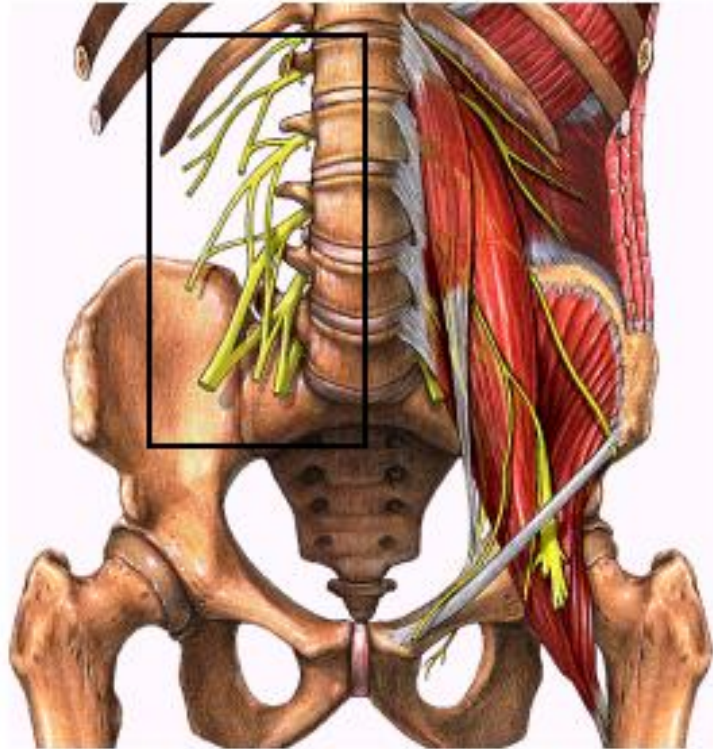




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Lumbar plexus

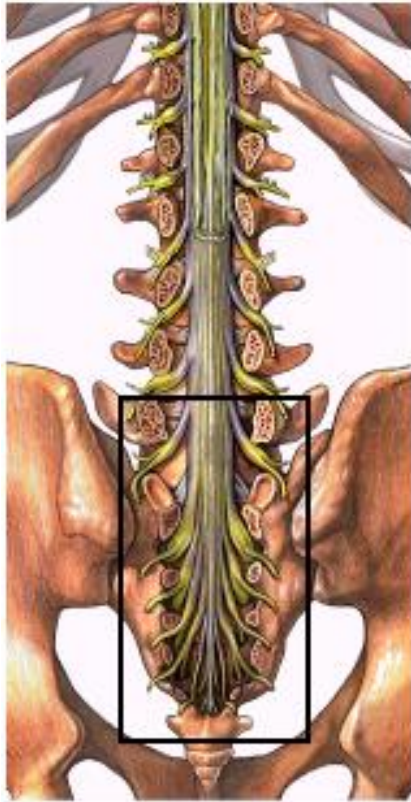
- L1-L4
- Lies within the psoas major muscle
- Innervates anterior and medial muscles of thigh through femoral and obturator nerves respectively
- Femoral nerve also innervates skin on anterior thigh (including quads) and medial leg



LUMBAR PLEXUS

- Spinal nerves branching from the lumbar region of the cord form the lumbar plexus. Branches of this plexus stimulate muscles of the back, hip and thigh. The plexus also is responsible for sensation in the skin of the thighs, the pubic area and the external genitalia in males and females.

LUMBOSACRAL SPINAL CORD POSTERIOR VIEW



- The area within the rectangle shows the lower portion of the spinal cord. The branches leaving the sacral region pass through the sacral foramina forming the sacral plexus.

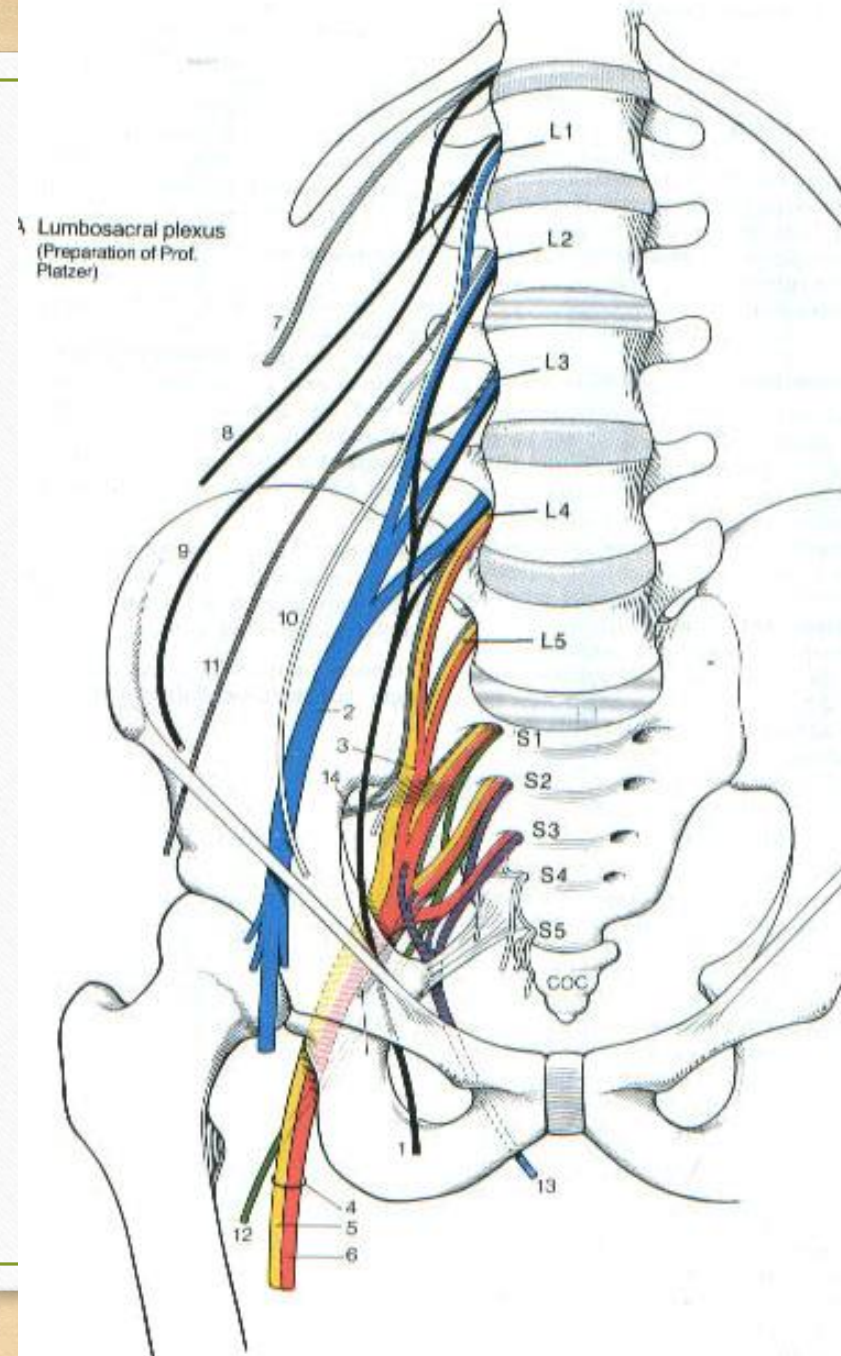
SEGMENTAL INNERVATION OF MUSCLES OF THE LOWER LIMB

L1	Psoas major, psoas minor
L2	Psoas major, iliacus, sartorius, gracilis, pectineus, adductor longus, adductor brevis
L3	Quadriceps, adductors (magnus, longus, brevis)
L4	Quadriceps, tensor fasciae latae, adductor magnus, obturator externus, tibialis anterior, tibialis posterior
L5	Gluteus medius, gluteus minimus, obturator internus, semimembranosus, semitendinosus, extensor hallucis longus, extensor digitorum longus, peroneus tertius, popliteus
S1	Gluteus maximus, obturator internus, piriformis, biceps femoris, semitendinosus, popliteus, gastrocnemius, soleus, peronei (longus and brevis), extensor digitorum brevis
S2	Piriformis, biceps femoris, gastrocnemius, soleus, flexor digitorum longus, flexor hallucis longus, some intrinsic foot muscles
S3	Some intrinsic foot muscles (except abductor hallucis, flexor hallucis brevis, flexor digitorum brevis, extensor digitorum brevis)

Lumbosacral plexus

Lumbar plexus (T12- L4):

- 1- Obturator nerve (L2-L3-L4)
- 2- Femoral nerve (L2-L3-L4)
- 3- Lumbosacral trunk (L4-L5)
- 7- subcostal nerve (T12)
- 8- iliohypogastric N. (T12-L1)
- 9- ilioinguinal N. (L1)
- 10- genitofemoral N. (L1-L2)
- 11- lateral cutaneous N. of the thigh (L2-L3)

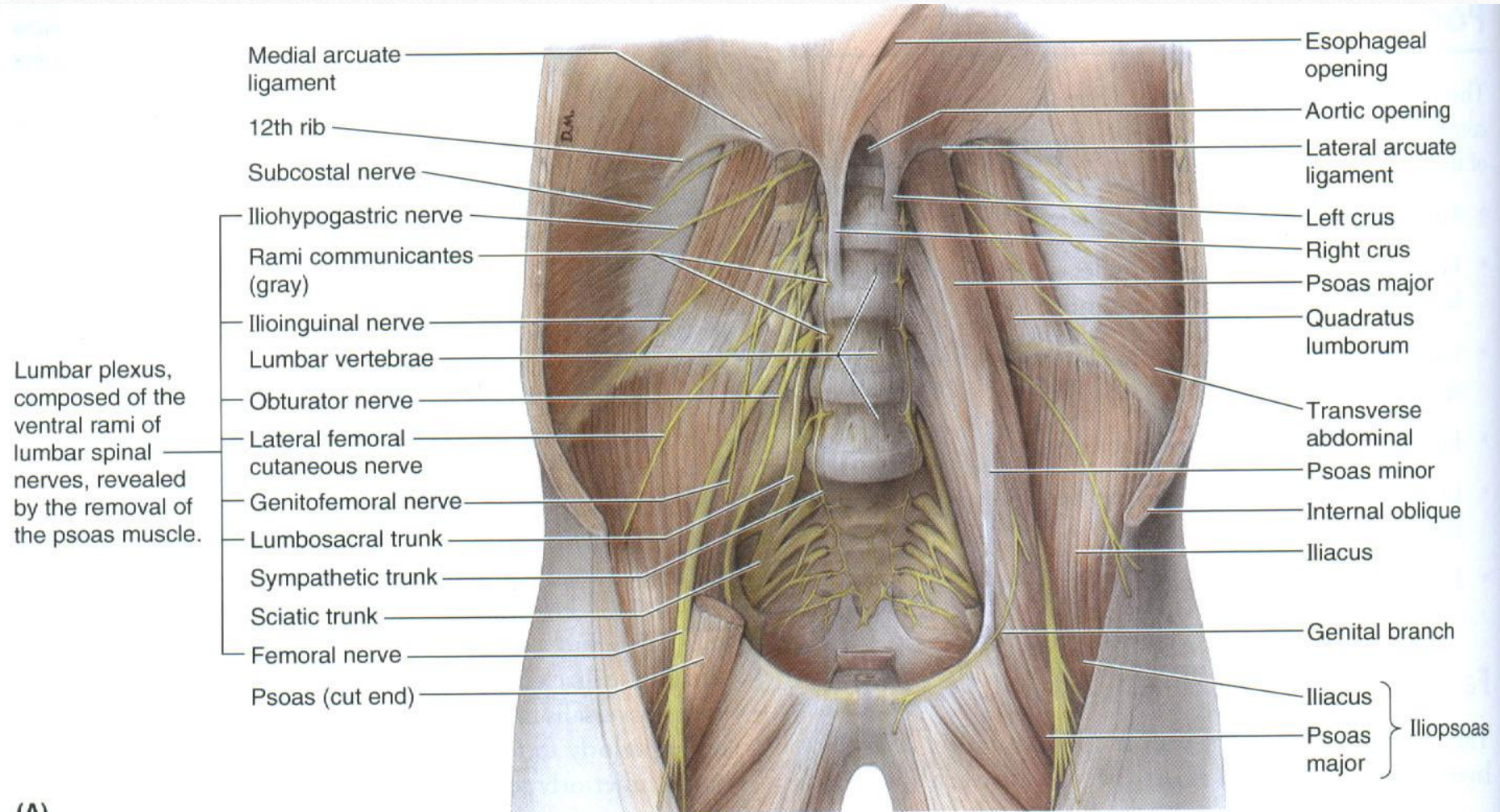


SEGMENTAL INNERVATION OF JOINT MOVEMENTS OF THE LOWER LIMB

Hip	Flexors, adductors, medial rotators	L1–3
	Extensors, abductors, lateral rotators	L5, S1
Knee	Extensors	L3, L4
	Flexors	L5, S1
Ankle	Dorsiflexors	L4, L5
	Plantar flexors	S1, S2
Foot	Inverters	L4, L5
	Everters	L5, S1
	Intrinsic muscles	S2, S3

Diaphragm and posterior abdominal wall:

The psoas major and minor muscles, the quadratus lumborum muscle. The lumbar plexus and its related nerves.



Reflexes

Knee Jerk (L2–4)

With the patient supine and the knee supported and partially flexed, the patellar tendon is struck at its midpoint; this should elicit quadriceps contraction, which extends the knee.

Ankle Jerk 'Achilles Reflex' (S1, S2)

With the patient supine and the lower limb externally rotated and partially flexed at the hip and knee, the foot is passively dorsiflexed to stretch the calcaneal tendon, which is then struck with a percussion hammer. Contraction of the calf muscles plantar-flexes the ankle. The reflex can also be examined with the patient kneeling on a chair.

Plantar Reflex

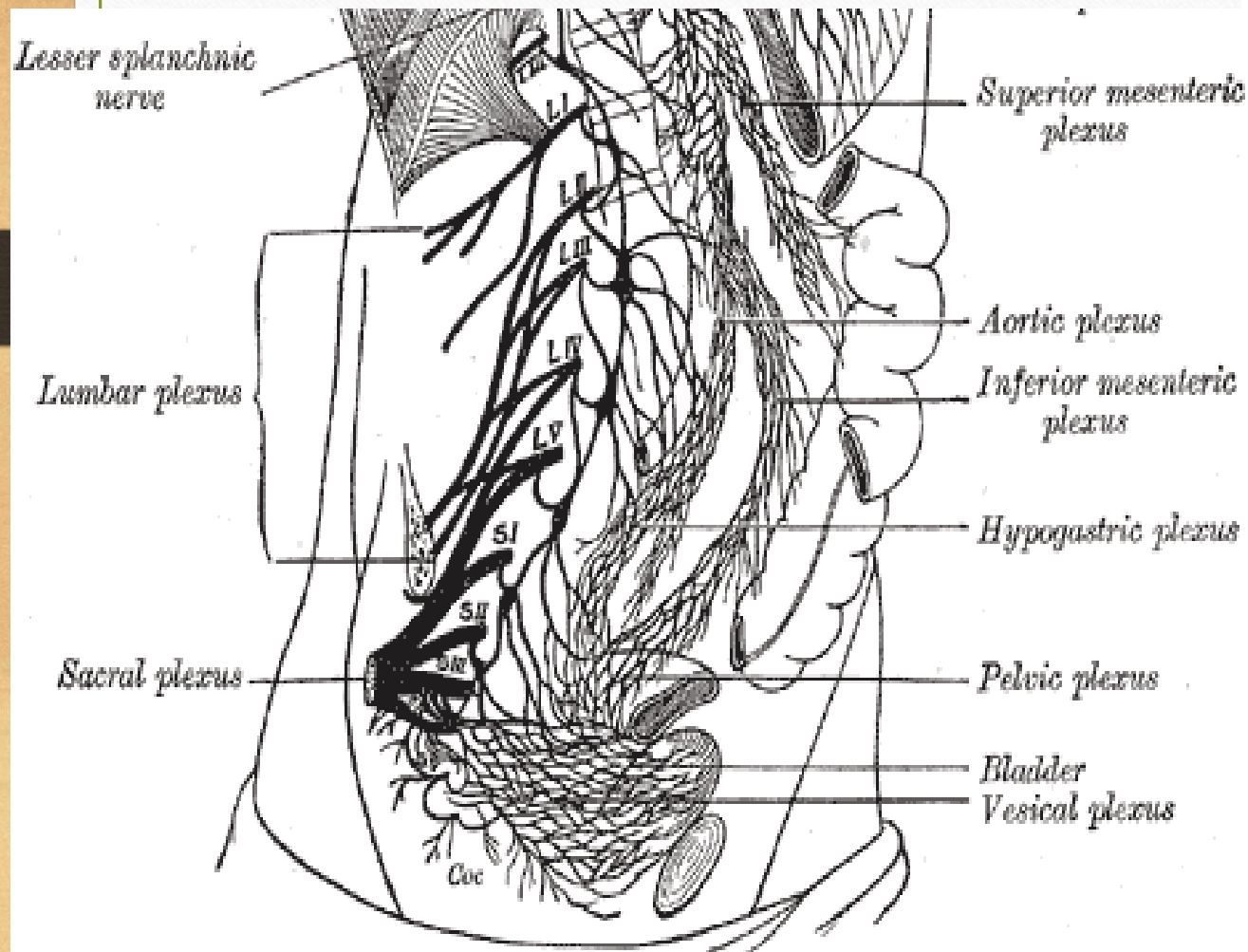
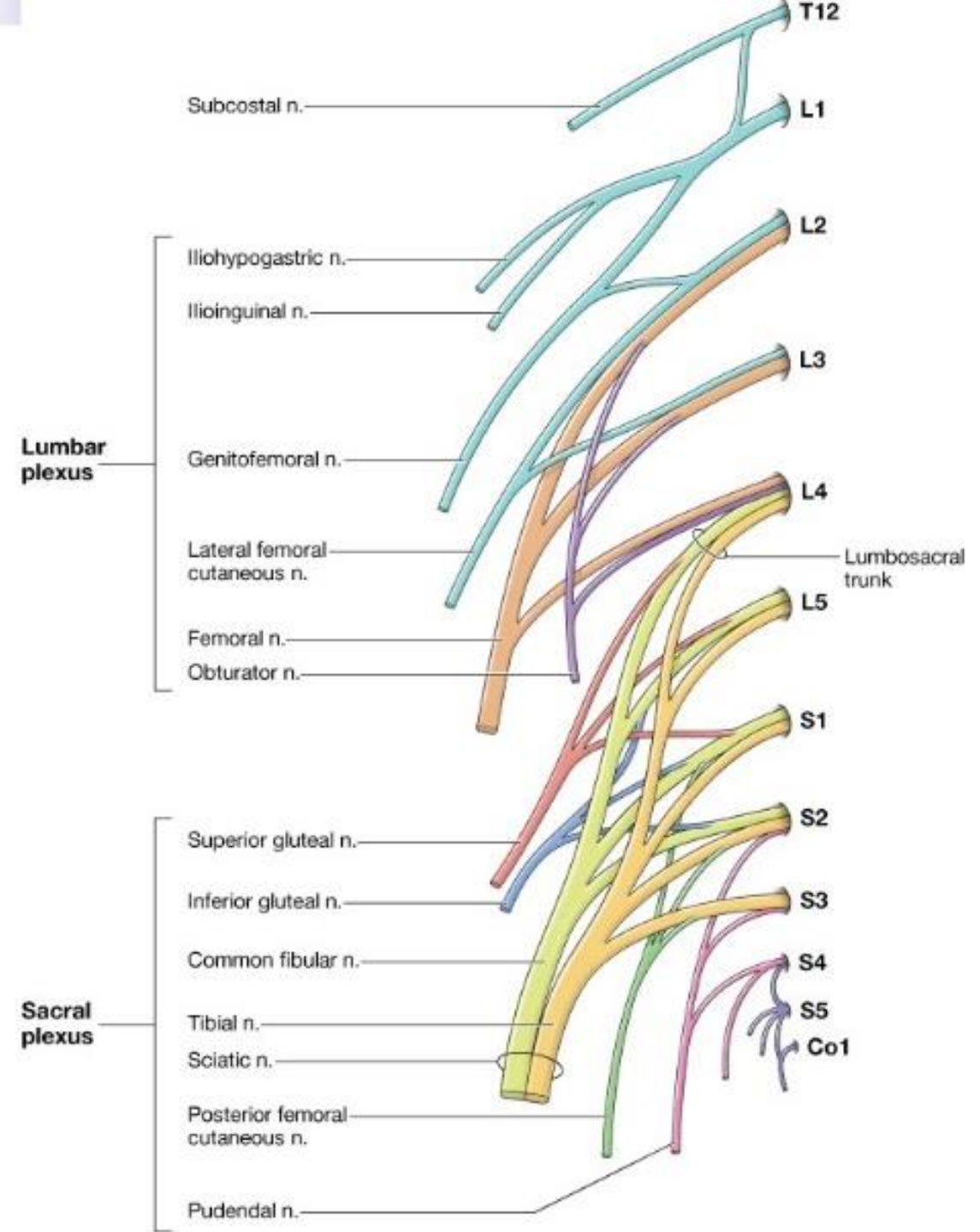
The plantar reflex is a superficial reflex, and its elicitation is an important part of the clinical examination of the central nervous system. With the foot relaxed and warm, the outer edge of the sole is stroked longitudinally with a hard object (traditionally, the examiner's fingernail or a key). This should elicit flexion of the toes, although the normal adult response varies with the strength of the stimulus. In adults with upper motor neurone lesions, the response includes extension of the great toe (Babinski's sign).

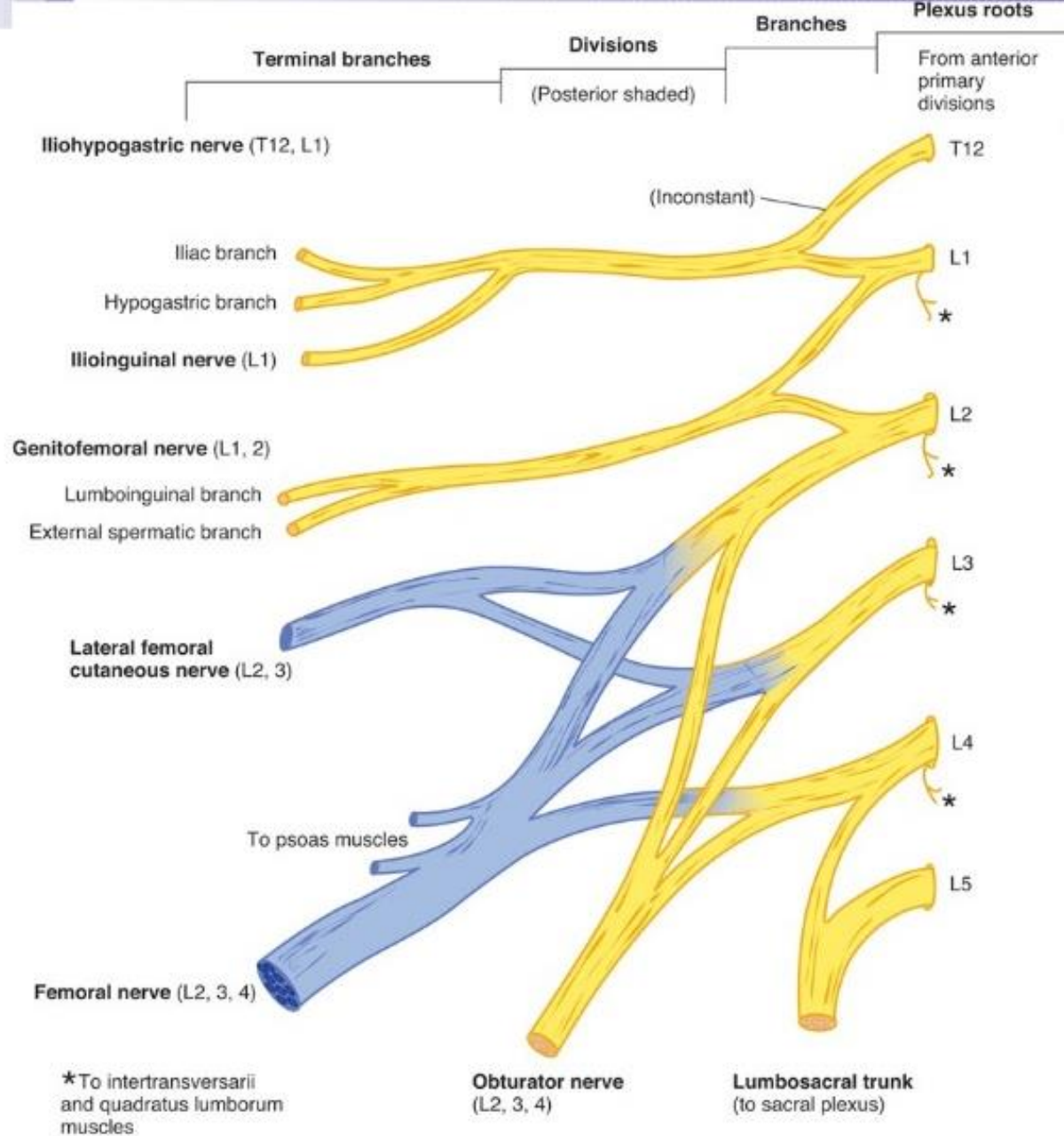
Movement	Muscle	Upper Motor Neurone*	Root	Reflex	Nerve
Hip flexion	Iliopsoas	++	L1, L2		Femoral
Hip adduction	Adductors		L2, L3	(+)	Obturator
Hip extension	Gluteus maximus		L5, S1		Sciatic
Knee flexion	Hamstrings	+	S1		Sciatic
Knee extension	Quadriceps		L3, L4	++	Femoral
Ankle dorsiflexion	Tibialis anterior	++	L4		Deep peroneal
Ankle eversion	Peronei		L5, S1		Superficial peroneal
Ankle inversion	Tibialis posterior		L4, L5		Tibial
Ankle plantar flexion	Gastrocnemius/soleus		S1, S2	++	Tibial
Big toe extension	Extensor hallucis longus		L5	(Babinski's reflex)	Deep peroneal

The muscles indicated in this column are those that are preferentially affected in upper motor neurone lesions. The root level is the principal supply to a muscle.

LUMBAR and SACRAL PLEXII *the

Sacral Plexus is also called the Lumbosacral Plexus
(includes L4 & L5)





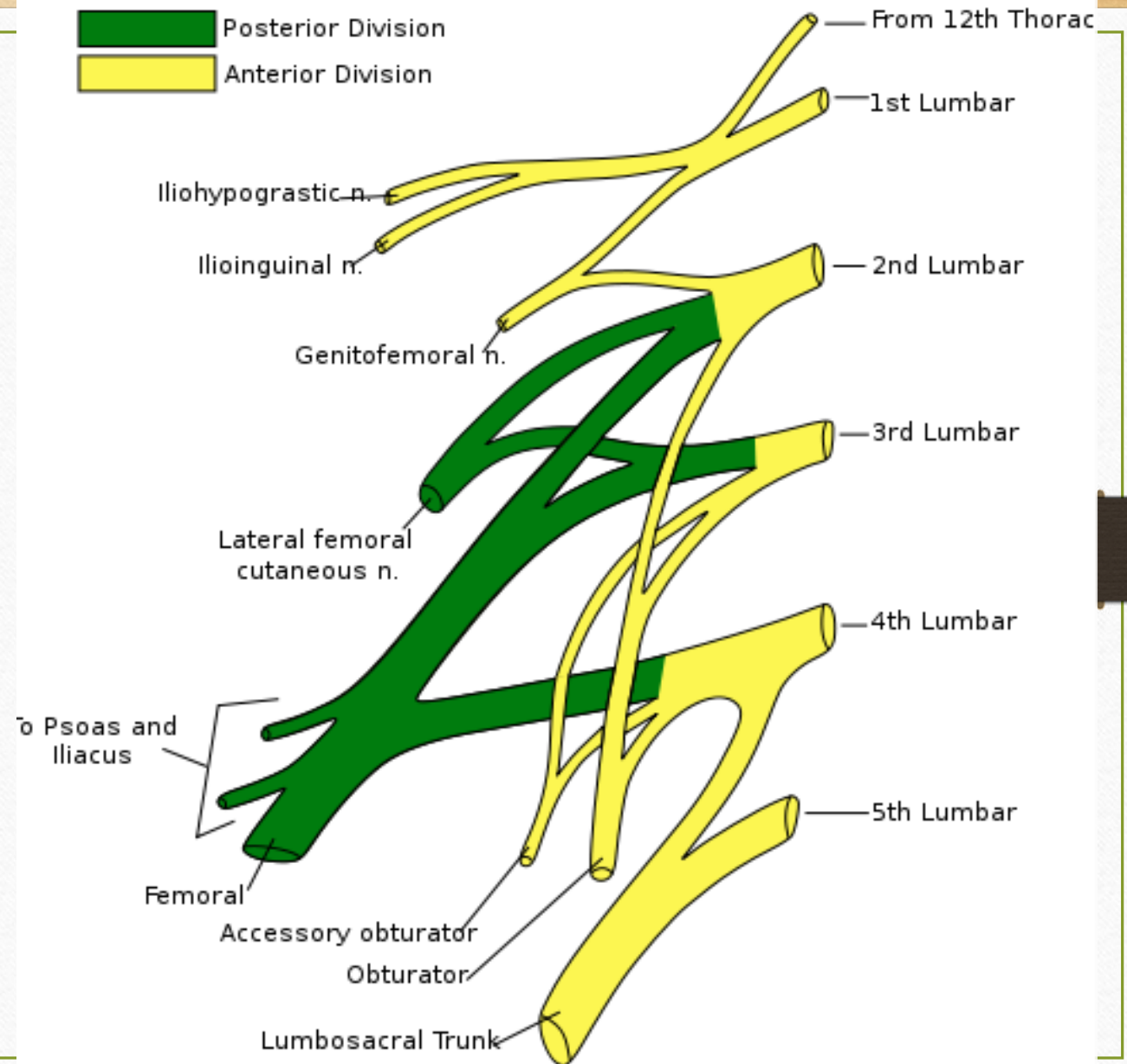
Lumbar Plexus

The lumbar plexus originates from ventral rami of L1–L4.

It provides motor and sensory contributions to the anterior and medial compartment of the leg as well as to the abdominal wall and pelvic areas.

DRAWING OF LUMBAR PLEXUS

**mnemonic = I (twice) Get Laid on Fridays*
Iliohypogastric
Ilioinguinal
Genitofemoral
Lateral Femoral Cutaneous
Obturator
Femoral



Nerves of the lumbar plexus^[3]

Nerve	Segment	Innervated muscles	Cutaneous branches
Iliohypogastric	T12-L1	<ul style="list-style-type: none"> Transversus abdominis Abdominal internal oblique 	<ul style="list-style-type: none"> Anterior cutaneous ramus Lateral cutaneous ramus
Ilioinguinal	L1		<ul style="list-style-type: none"> Anterior scrotal nerves in males Anterior labial nerves in females
Genitofemoral	L1, L2	<ul style="list-style-type: none"> Cremaster in males 	<ul style="list-style-type: none"> Femoral ramus Genital ramus
Lateral femoral cutaneous	L2, L3		<ul style="list-style-type: none"> Lateral femoral cutaneous
Obturator	L2-L4	<ul style="list-style-type: none"> Obturator externus Adductor longus Adductor brevis Gracilis Pectineus Adductor magnus 	<ul style="list-style-type: none"> Cutaneous ramus
Femoral	L2-L4	<ul style="list-style-type: none"> Iliopsoas Pectineus Sartorius Quadriceps femoris 	<ul style="list-style-type: none"> Anterior cutaneous branches Saphenous
Short, direct muscular branches	T12-L4	<ul style="list-style-type: none"> Psoas major Quadratus lumborum Iliacus Lumbar intertransverse 	

DRAWING OF LUMBAR PLEXUS

**mnemonic* = I (twice) Get Laid on Fridays

Iliohypogastric

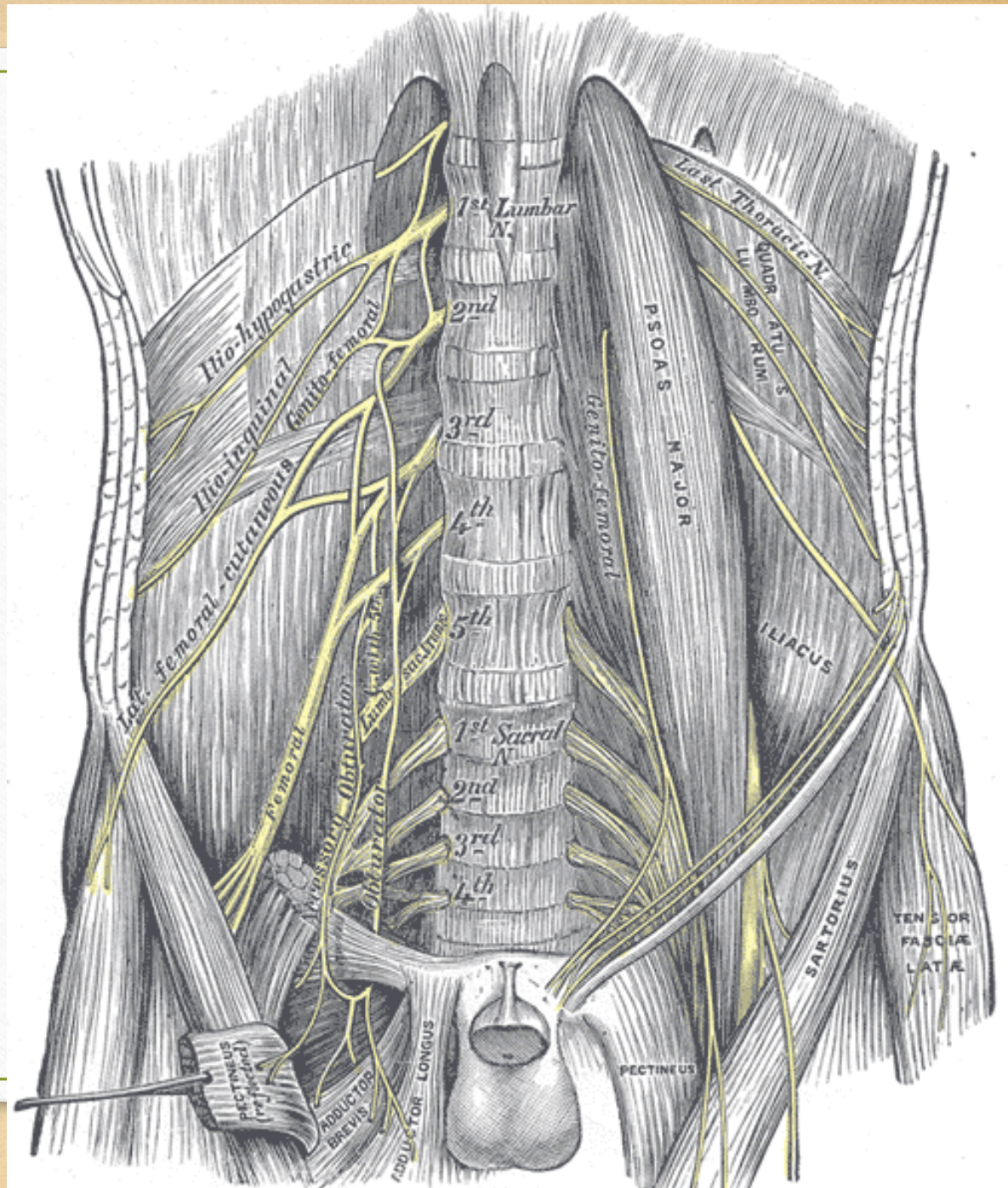
Ilioinguinal

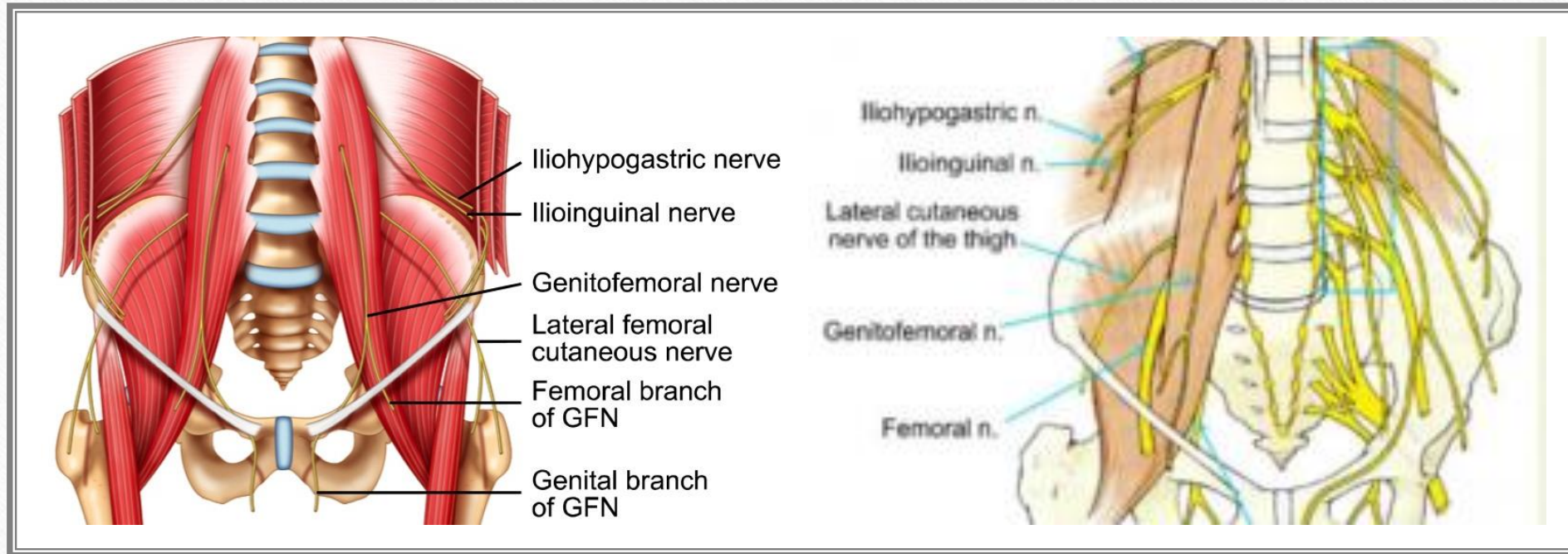
Genitofemoral

Lateral Femoral Cutaneous

Obturator

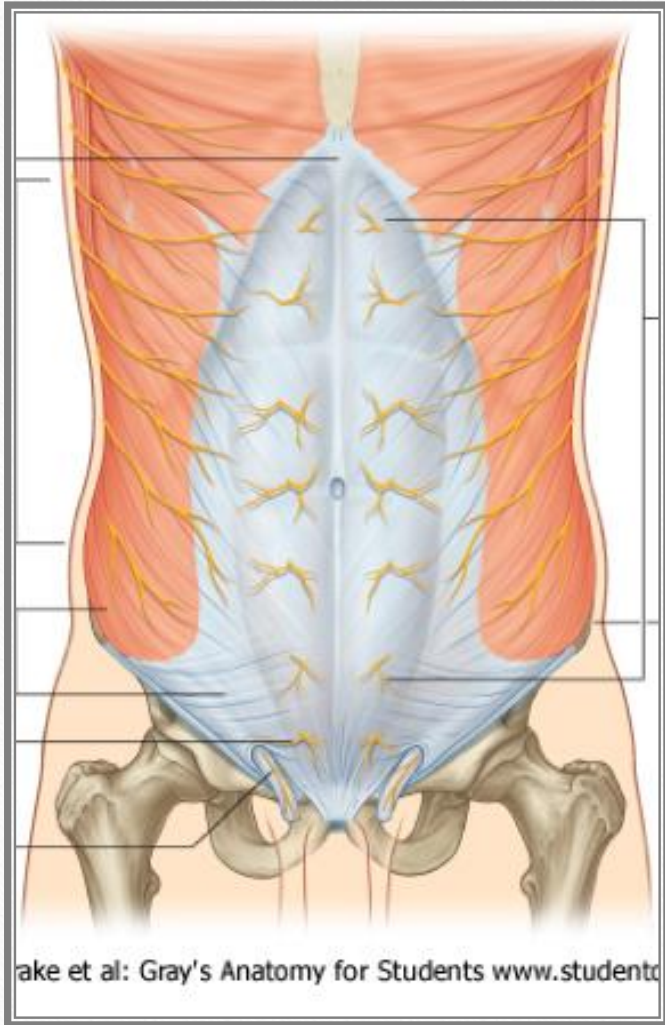
Femoral

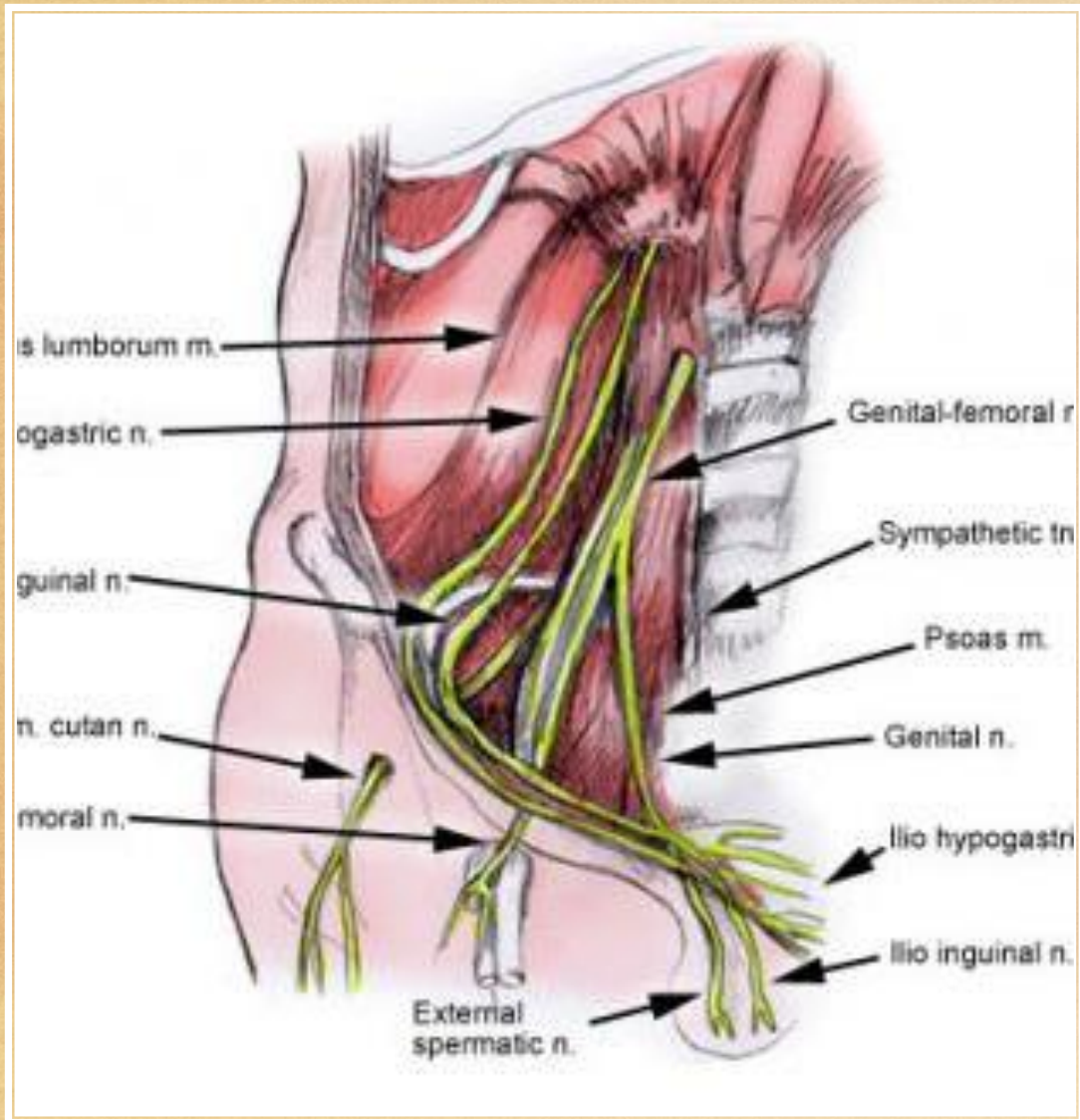
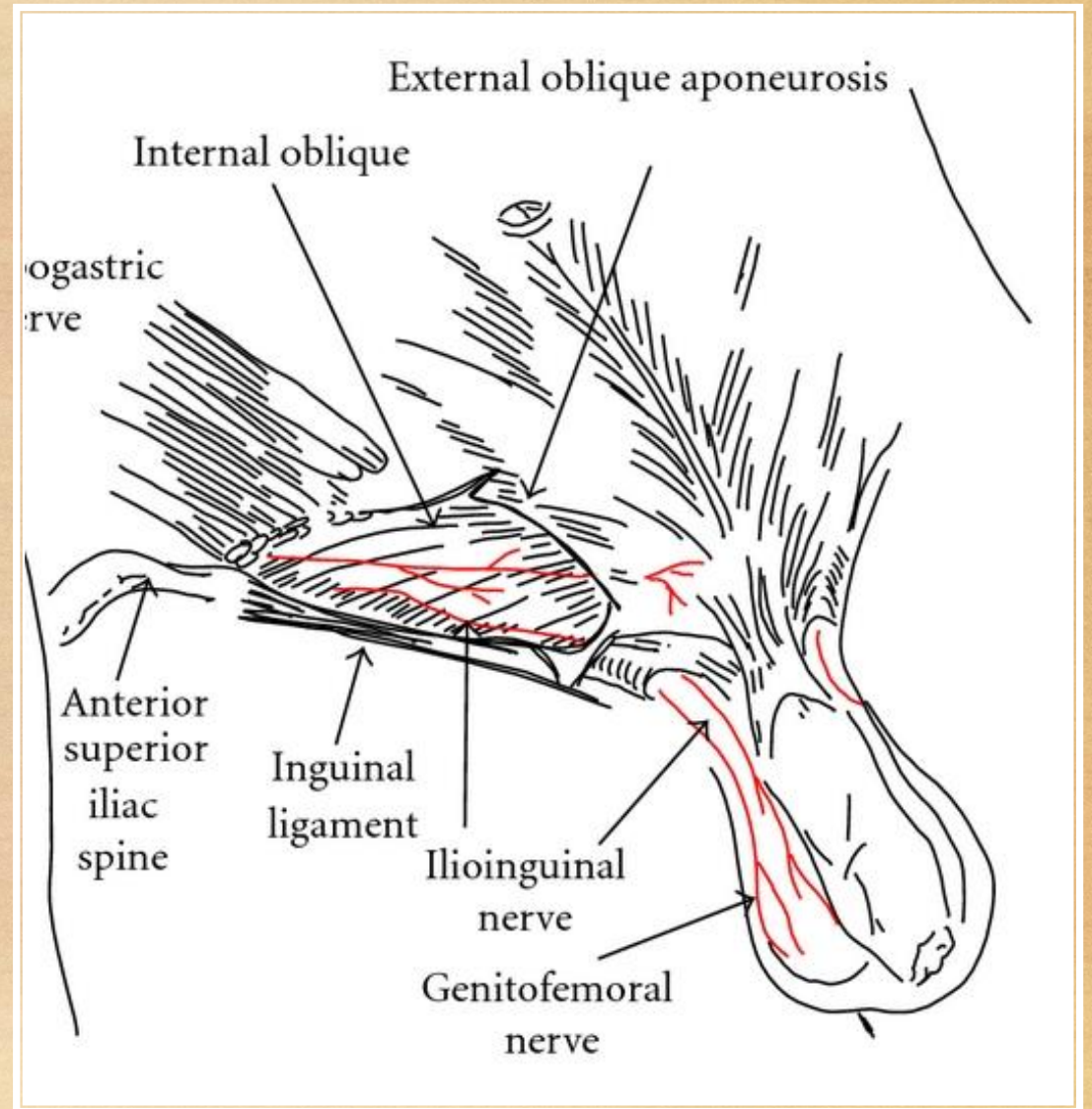


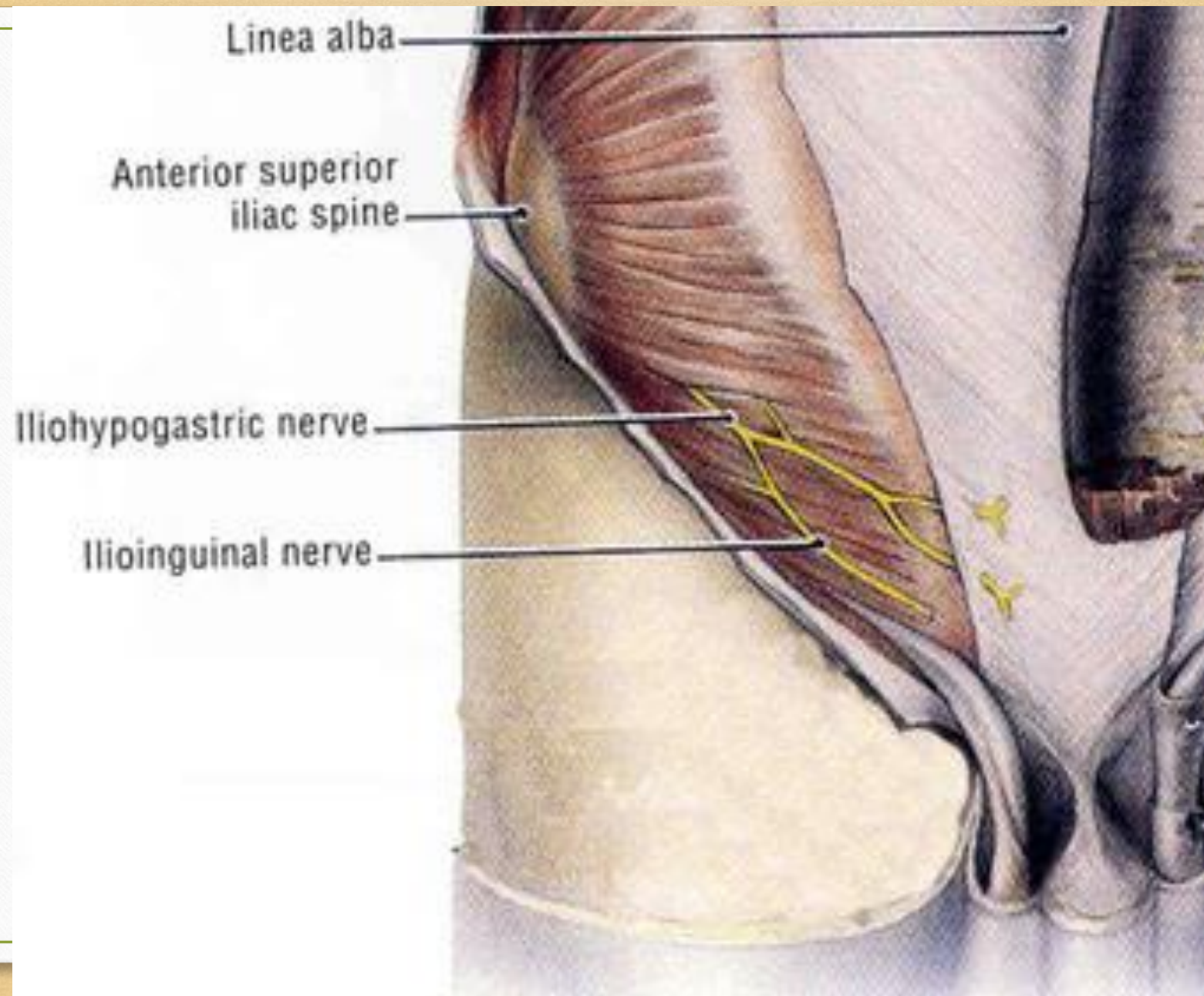


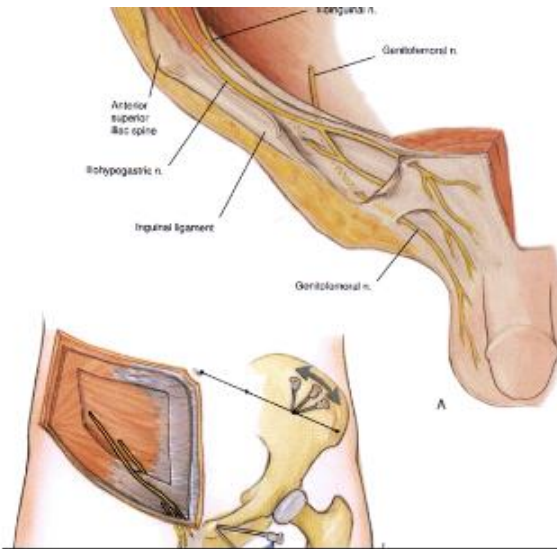
DRAWINGS OF LUMBAR PLEXUS

SENSORY (CUTANEOUS) BRANCHES OF THE ILIOHYPOGASTRIC & ILIOINGUINAL NERVES

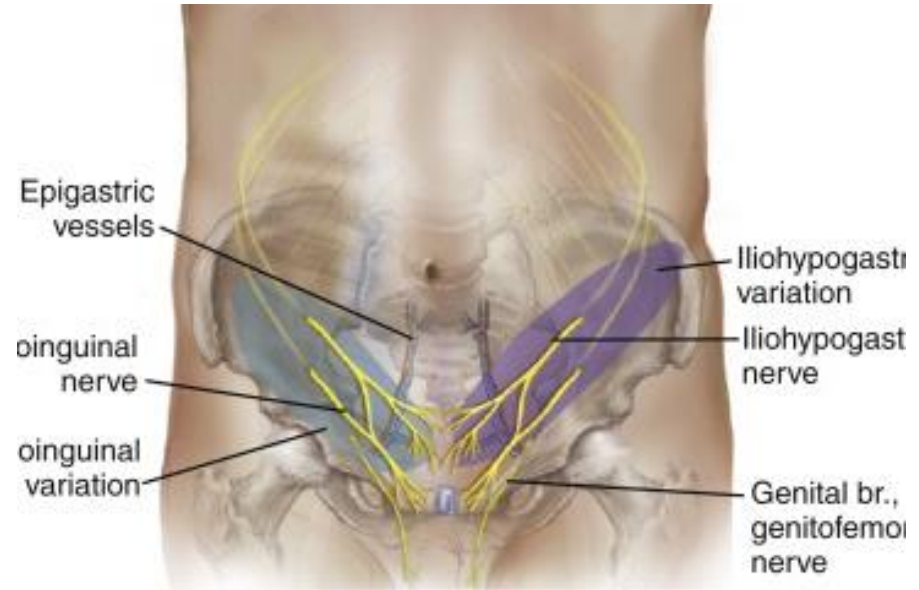






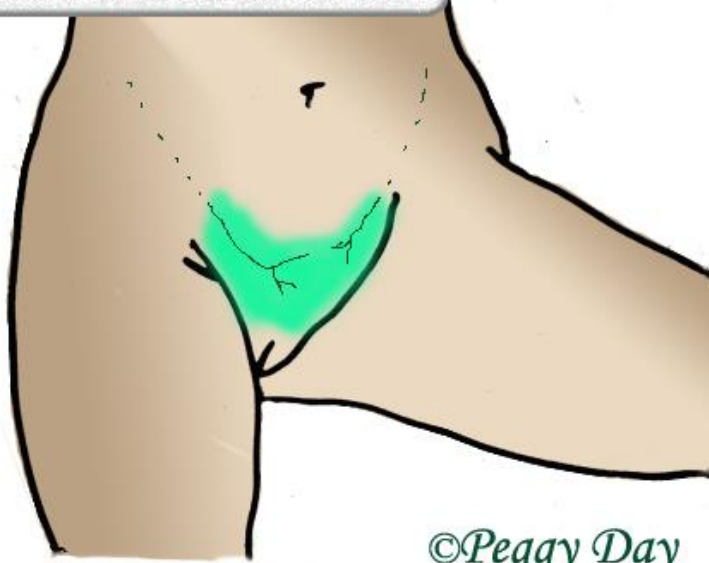


SS II sails down the canal



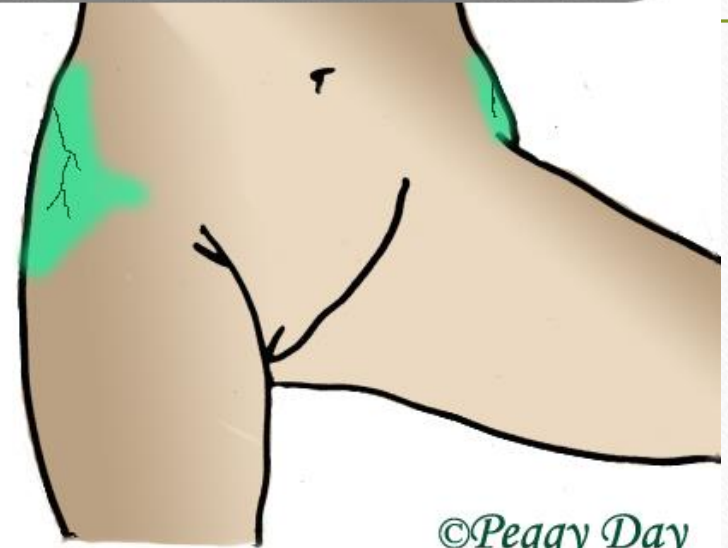
SENSORY (CUTANEOUS) BRANCHES OF THE ILIOHYPOGASTRIC & ILIOINGUINAL NERVES

Iliohypogastric Nerve Pain



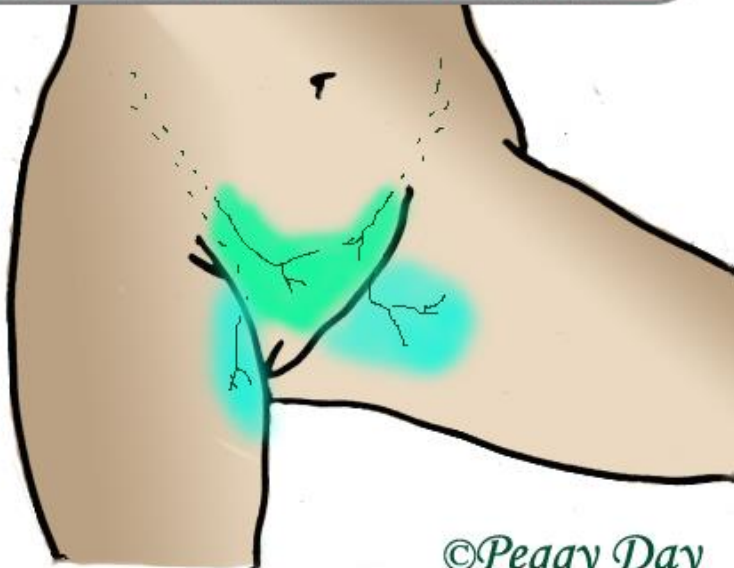
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Lateral Branch Iliohypogastric Nerve Pain



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Ilioinguinal+Iliohypogastric Nerve Pain



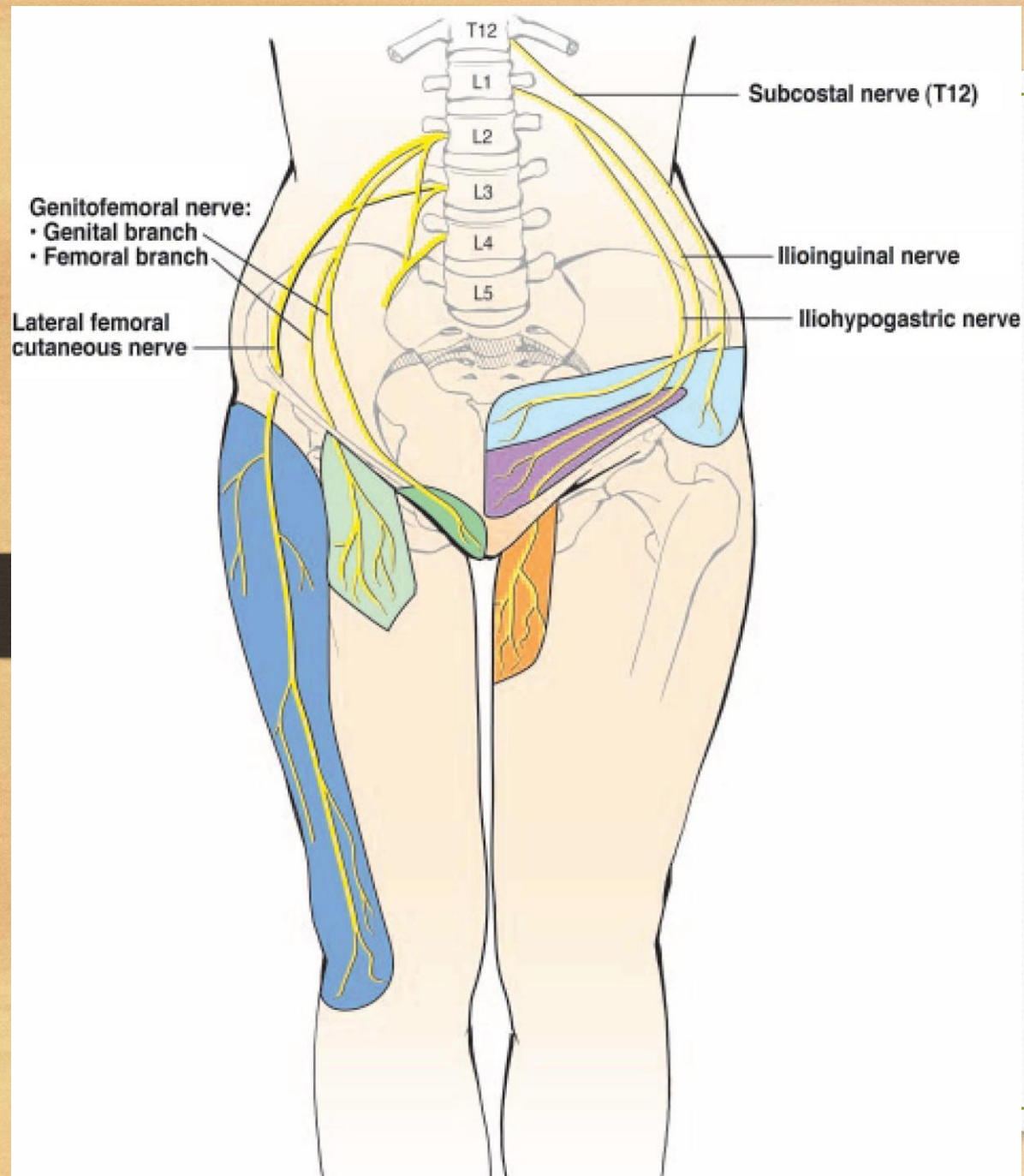
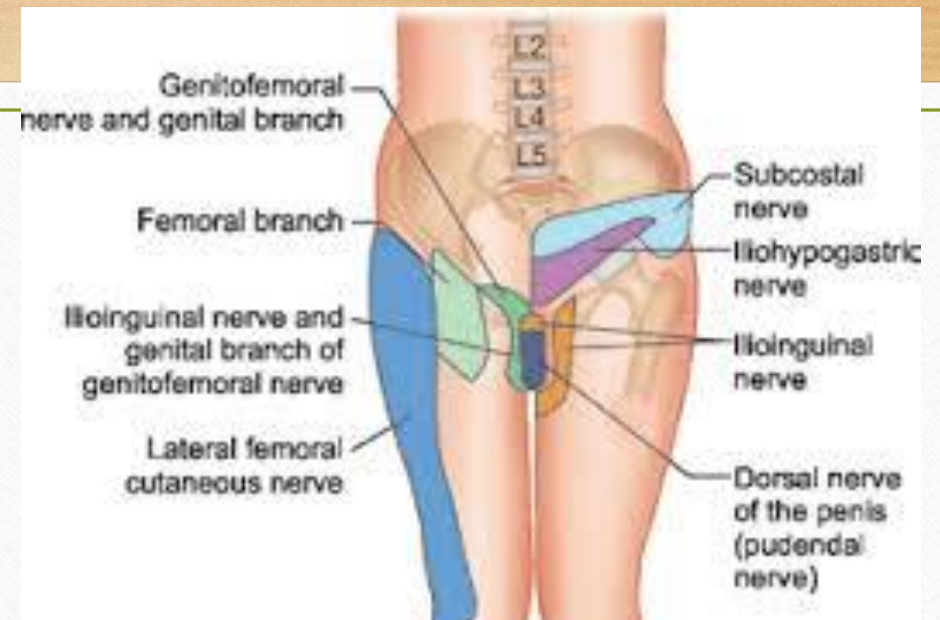
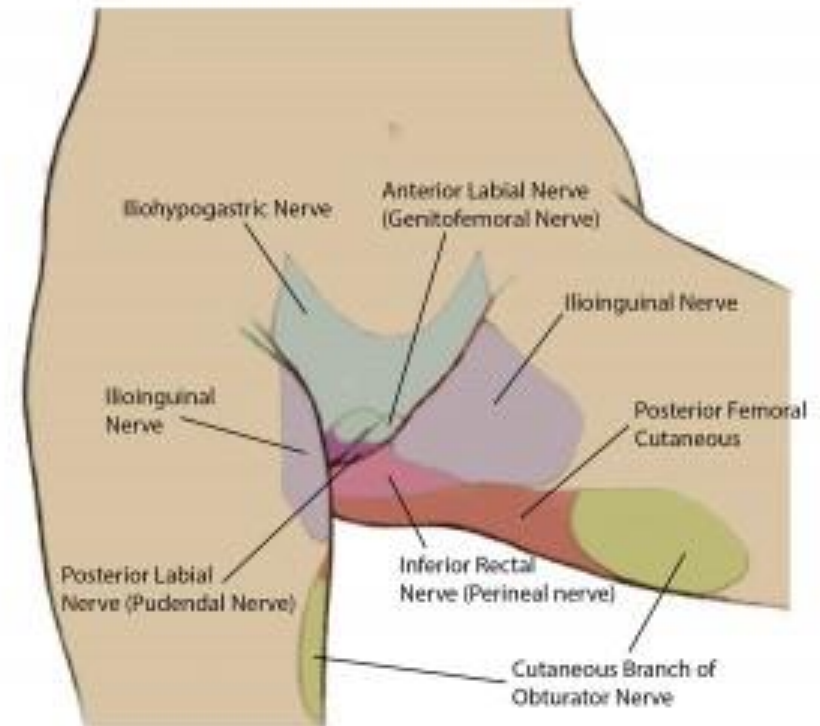
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**SENSORY
(CUTANEOUS)
DISTRIBUTION
OF THE
ILIOHYPOGASTRIC,
ILIOINGUINAL
&
GENITOFEMORAL NERVES**

Genitofemoral Nerve Pain



©Peggy Day

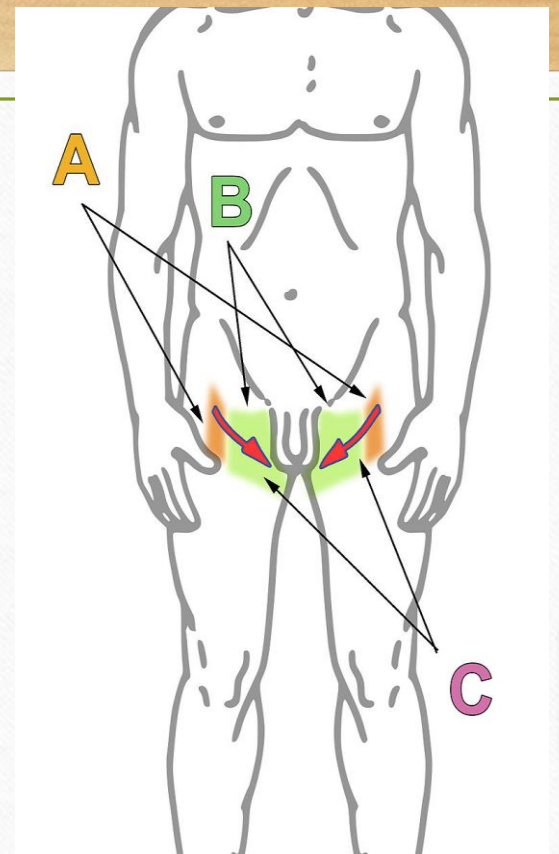


CREMASTERIC REFLEX

A superficial (i.e., close to the skin's surface) reflex observed in human males.

This reflex is elicited by lightly stroking or poking the superior and medial (inner) part of the thigh - regardless of the direction of stroke. The normal response is an immediate contraction of the cremaster muscle that pulls up the testis ipsilaterally (on the same side of the body).

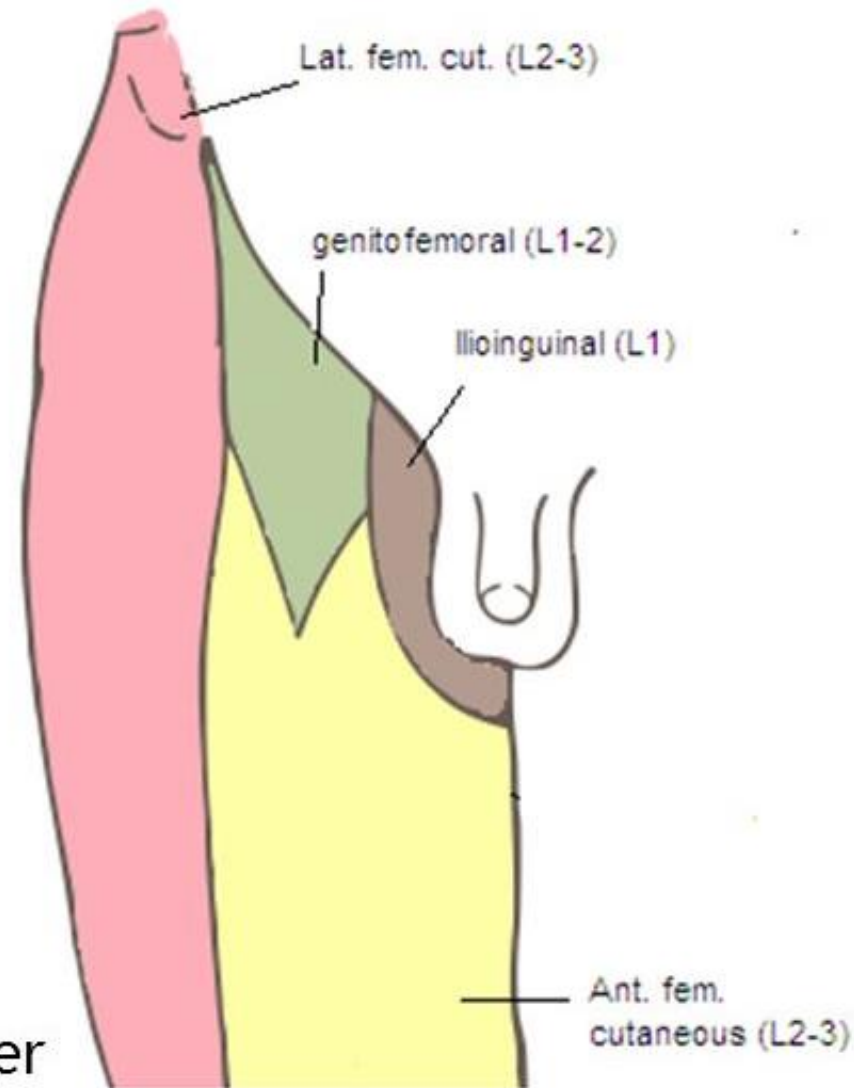
More specifically, the reflex utilizes sensory and motor fibers of the genitofemoral nerve, formed by fibers from both the L1 and L2 spinal nerves. When the inner thigh is stroked, sensory fibers of the femoral branch of the genitofemoral nerve and the ilio-inguinal nerve are stimulated. These synapse in the spinal cord and activate the motor fibers of the genital branch of the genitofemoral nerve which causes the cremaster muscle to contract and elevate the testis.

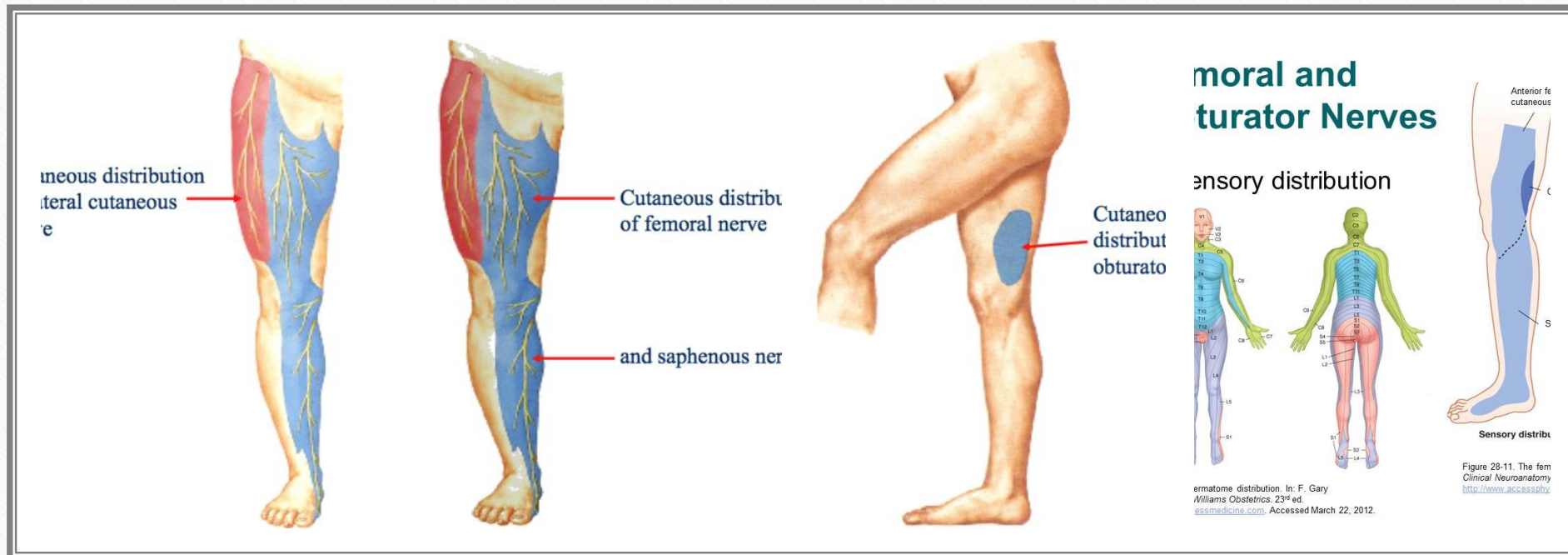


Area A (in orange) represents the area of sensory fibers controlled by the genitofemoral nerve; area B (in green) represents that controlled by the ilioinguinal nerve; arrow C (in red with blue outline) shows the direction and location where the skin must be stroked to elicit this reflex.

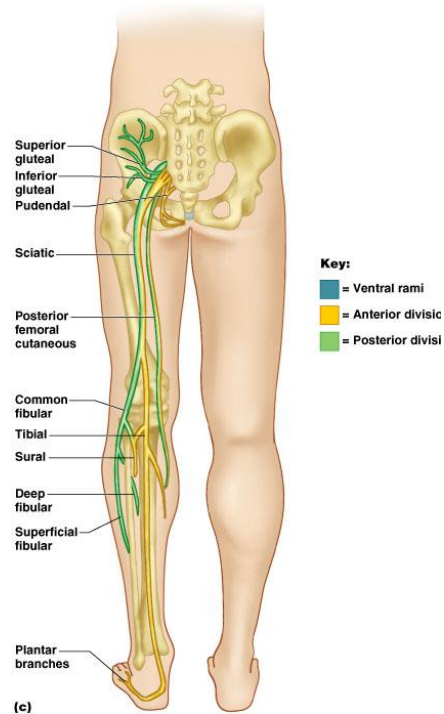
Cremasteric Reflex

- Afferent Limb: femoral branch of genitofemoral nerve and ilioinguinal nerve
- Efferent Limb: genital branch of genitofemoral nerve
- **Iliohypogastric Nerve (L1):** skin above inguinal ligament
- **Ilioinguinal Nerve (L1):** skin of anterior scrotum and adjacent thigh
- **Genitofemoral (L1, L2):** skin below inguinal ligament, motor to cremaster
- Note: both the ilioinguinal nerve and the genital branch of the genitofemoral nerve pass through the inguinal canal





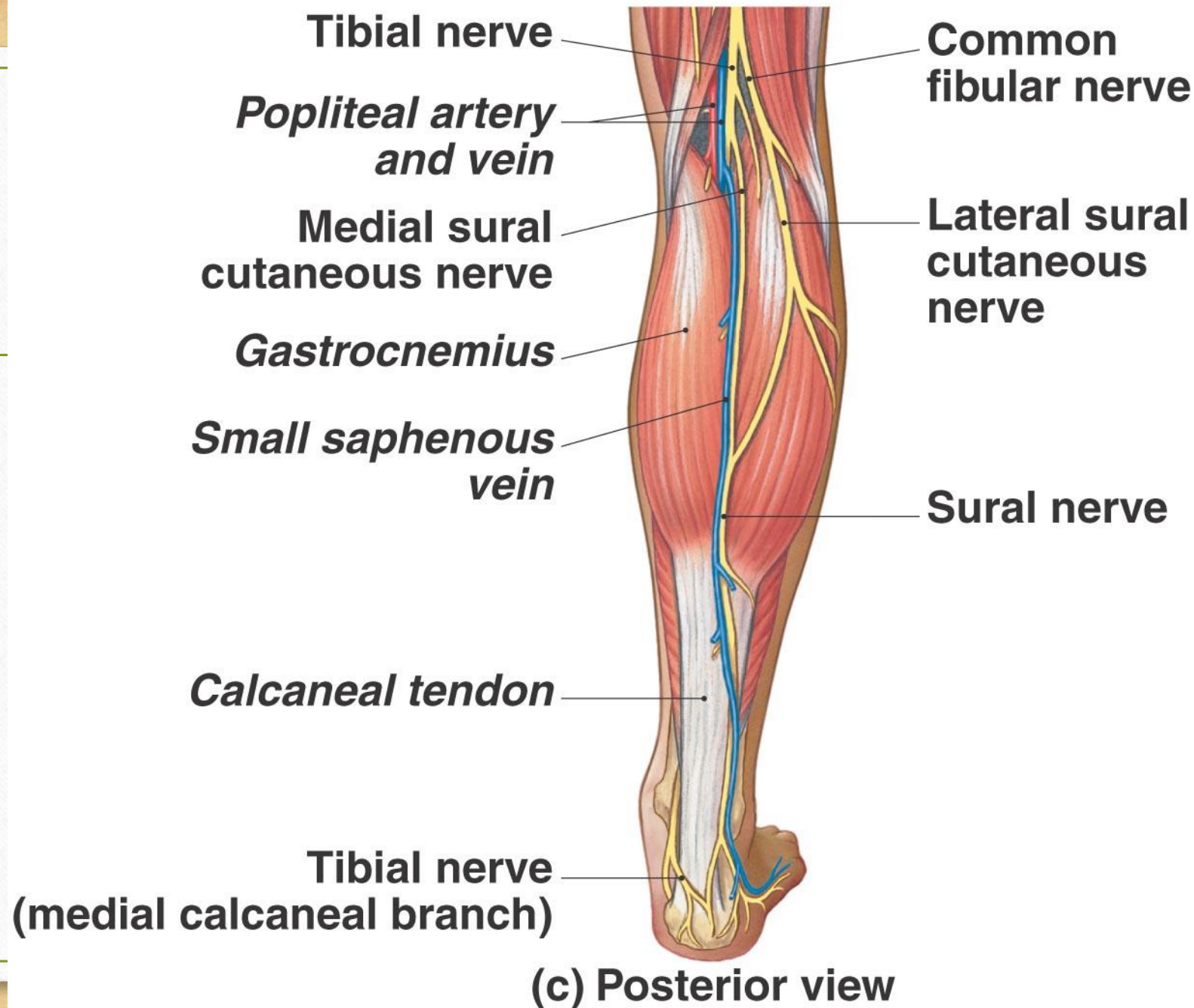
CUTANEOUS DISTRIBUTION OF THE LATERAL FEMORAL CUTANEOUS, FEMORAL (and it's terminal branch SAPHENOUS), & OBTURATOR NERVES

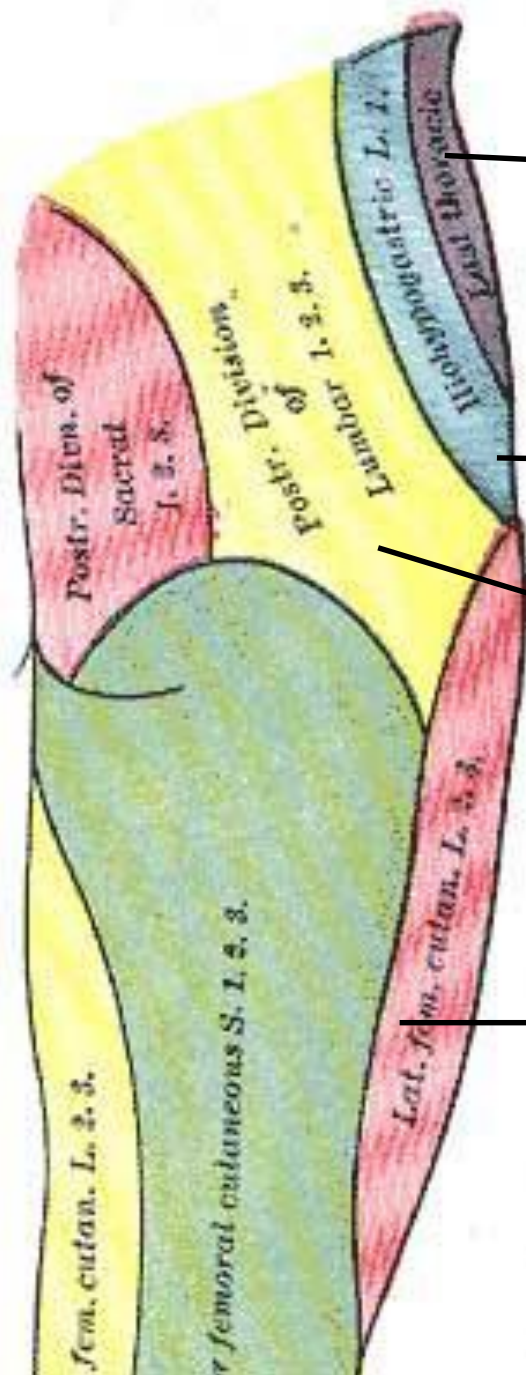


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- Sacral plexus nerves:

(Be able to label sciatic, tibial and common fibular nerves)





Twelfth Thoracic Nerve (T12)

Iliohypogastric Nerve (L1,2)

Posterior Divisions (L1,2,3)

Lateral Femoral Cutaneous Nerve (L1,2,3)

POSTERIOR PELVIS AND THIGH

Iliohypogastric Nerve

Distribution

The iliohypogastric nerve originates from the L1 ventral ramus. It emerges from the upper lateral border of psoas major and crosses obliquely behind the lower renal pole and in front of quadratus lumborum. Above the iliac crest it enters the posterior part of transversus abdominis. Between transversus abdominis and internal oblique, it divides into lateral and anterior cutaneous branches and also supplies both muscles. The lateral cutaneous branch runs through the internal and external oblique above the iliac crest, a little behind the iliac branch of the twelfth thoracic nerve, and is distributed to the posterolateral gluteal skin. The anterior cutaneous branch runs between and supplies the internal oblique and transversus abdominis. It runs through the internal oblique approximately 2 cm medial to the anterior superior iliac spine and through the external oblique aponeurosis approximately 3 cm above the superficial inguinal ring; it is then distributed to the suprapubic skin. The iliohypogastric nerve connects with the subcostal and ilioinguinal nerves. It is occasionally injured during an oblique surgical approach to the appendix. However, because the suprapubic skin is innervated from several sources, there is rarely any detectable sensory loss. Division of the iliohypogastric nerve above the anterior superior iliac spine may weaken the posterior wall of the inguinal canal and predispose to the formation of a direct hernia.

Motor

The iliohypogastric nerve supplies a small motor contribution to transversus abdominis and internal oblique, including the conjoint tendon.

Sensory

The iliohypogastric nerve supplies sensory fibres to transversus abdominis, internal oblique and external oblique and innervates the posterolateral gluteal and suprapubic skin.

Ilioinguinal Nerve

- **Distribution**

- The ilioinguinal nerve originates from the L1 ventral ramus. It is smaller than the iliohypogastric nerve and arises with it from the first lumbar ventral ramus, emerging from the lateral border of psoas major with or just inferior to the iliohypogastric nerve. It passes obliquely across quadratus lumborum and the upper part of iliacus and enters transversus abdominis near the anterior end of the iliac crest. It sometimes connects with the iliohypogastric nerve at this point. It pierces the internal oblique and supplies it and then traverses the inguinal canal below the spermatic cord. It emerges with the cord from the superficial inguinal ring to supply the proximal medial skin of the thigh and the skin over the root of the penis and upper part of the scrotum in males or the skin covering the mons pubis and adjoining labium majus in females. The ilioinguinal and iliohypogastric nerves are reciprocal in size. The ilioinguinal is occasionally very small and ends by joining the iliohypogastric, a branch of which then takes its place. Occasionally, the ilioinguinal nerve is completely absent when the iliohypogastric nerve supplies its territory. The nerve may be injured during inguinal surgery, particularly for hernia, which produces paraesthesia over the skin of the genitalia. Entrapment of the nerve during surgery may cause troublesome recurrent pain in this distribution.

- **Motor**

- The ilioinguinal nerve supplies motor nerves to transversus abdominis and internal oblique.

- **Sensory**

- The ilioinguinal nerve supplies sensory fibres to transversus abdominis and internal oblique. It innervates the medial skin of the thigh and the skin over the root of the penis and upper part of the scrotum in males or the skin covering the mons pubis and adjoining labium majus in females.

Genitofemoral Nerve

Distribution

The genitofemoral nerve originates from the L1 and L2 ventral rami. It is formed within the substance of psoas major and descends obliquely forward through the muscle to emerge on its abdominal surface near the medial border, opposite the third or fourth lumbar vertebra. It descends beneath the peritoneum on psoas major, crosses obliquely behind the ureter and divides above the inguinal ligament into genital and femoral branches. It often divides close to its origin; its branches then emerge separately from psoas major. The genital branch crosses the lower part of the external iliac artery, enters the inguinal canal by the deep ring and supplies cremaster and the skin of the scrotum in males. In females, it accompanies the round ligament and ends in the skin of the mons pubis and labium majus. The femoral branch descends lateral to the external iliac artery and sends a few filaments around it. It then crosses the deep circumflex iliac artery, passes behind the inguinal ligament and enters the femoral sheath lateral to the femoral artery. It pierces the anterior layer of the femoral sheath and fascia lata and supplies the skin anterior to the upper part of the femoral triangle. It connects with the femoral intermediate cutaneous nerve and supplies the femoral artery. The genital branch may be injured during inguinal surgery, as may the ilioinguinal nerve.

Motor

The genitofemoral nerve innervates cremaster via the genital branch.

Cutaneous

The genitofemoral nerve innervates the skin of the scrotum in males or mons pubis and labium majus in females via the genital branch, and the anteromedial skin of the thigh via the femoral branch.

Lateral Femoral Cutaneous Nerve of the Thigh

- The lateral (femoral) cutaneous nerve of the thigh arises from the dorsal branches of the second and third lumbar ventral rami and emerges from the lateral border of psoas major, crossing the iliacus obliquely toward the anterior superior iliac spine. It supplies the parietal peritoneum in the iliac fossa. The right nerve passes posterolateral to the caecum, separated from it by the fascia iliaca and peritoneum; the left passes behind the lower part of the descending colon. Both pass behind or through the inguinal ligament, variably medial to the anterior superior iliac spine (commonly about 1 cm) and anterior to or through sartorius into the thigh, where they divide into anterior and posterior branches. The anterior branch becomes superficial approximately 10 cm distal to the anterior superior iliac spine and supplies the skin of the anterior and lateral thigh as far as the knee. It connects terminally with the cutaneous branches of the anterior division of the femoral nerve and the infrapatellar branch of the saphenous nerve, forming the peripatellar plexus. The posterior branch pierces the fascia lata higher than the anterior, and it divides to supply the skin on the lateral surface from the greater trochanter to about mid thigh. It may also supply the gluteal skin.