Anatomy I, Notes: Chapter 12 – Spinal cord

2 The Spinal Cord - pg 466
   - Enclosed by the vertebral column
   - 17 inches long, 3/4” wide
   - Goes from foramen magnum (distal end of brain stem) and terminates
     Figure: 14.1; page 526 at level of L2 as conus medularis
   - Spinal nerve fibers continue as cauda equina
   - Continuation of the pia matter holds cauda equina in a loose sac called filum terminal – it’s anchored at bottom of neural canal

3 Function - Two way, nerve impulse pathway to and from the brain by ascending and descending nerve tracts - major reflex center -

4 Figure 12.29; pg. 467

5 Fig. 12.29b; pg. 467

6 Fig. 12.29c; pg. 467

7 Fig. 12.29d; pg. 467

8 Fig. 12.29b; pg. 467

9 Meninges – same as skull – pia matter, arachnoid matter & dura matter
   - Dura matter is not attached to bony wall of spinal column like the skull
   - Arachnoid and pia matter extend down to S2 – between the two layers is a sub arachnoid space with cerebrospinal fluid (Central canal)
   - Between bony neural canal and the dura matter is an epidural space, filled with fat tissue and blood vessels
10 Figure: 12.31b; pg. 469

11 Figure: 12.31a; pg. 469

12 Spinal tap/lumbar puncture – Removal of cerebrospinal fluid for diagnosis purposes. Below L2, no longer any spinal cord just spinal nerve fibers and these drift away from the puncturing needle.

13 Figure: 12.30; pg. 468

14 Cross section Anatomy of Spinal Cord flattened/oval with a ventral/anterior median fissure and a posterior/dorsal median sulcus

15 Spinal cord consists of Gray & white matter. Gray matter looks kind of like a butterfly or an “H”. Both sides are mirror images and have a thin connection called a gray commissure which has a central canal in the center (cerebrospinal fluid). Each side has a dorsal, ventral horns – though the thoracic and upper lumbar region also has a lateral horn.

16 Figure: 12.31 b; page 469

17 Amount of gray matter is dependant on number of muscles controlled. Since the arms/shoulders and legs/hips have a lot of muscles there will be larger amount of gray matter in the sections of the spinal cord that controls these muscles. Therefore, the spinal cord is thicker in the neck region that controls the upper limbs as well as the lumbar region that controls the lower limb. This produces the cervical and lumbar enlargements.
White matter - myelinated – provides communication between different parts of spinal cord & w/ the brain
3 columns or funiculus/funiculi
Dorsal, ventral & lateral
Will be ascending or descending tracts (bundles of nerve fibers/axons)
-Ascending tracts are sensory
-Descending tracts are motor

Gray matter – Dorsal and Ventral horns
Dorsal Horns – Sensory- they receive sensory impulses from sensory nerves (afferent) bringing nerve impulses to the spinal cord from nerve receptors in the body From there the impulses will be sent to the brain by the afferent, ascending tracts
Ventral horns – Motor- they send motor impulses received from the efferent descending tracts to the effectors in the body by the way of efferent nerves
26 The afferent sensory nerve impulses enter the dorsal horn by rootlets
The efferent motor nerve impulses leave the ventral horn by rootlets

27 Figure: 12.31b; page: 469

28 The rootlets merge to form a root and the roots join to form a nerve (bundle of axons/fibers)
The nerve is carrying both afferent, sensory fibers and efferent, motor fibers so, it is called a mixed nerve.

29 Figure: 12.31b; page: 470
2 Peripheral Nervous System – Connects the brain with our internal and external environment
Includes: sensory receptors, peripheral nerves, their associated ganglia and efferent motor endings
Nerve: Cord-like organ, a bundle of peripheral axons
There’s motor and sensory nerves but, most are mixed (carry both efferent/motor and afferent/sensory axons)

3 Nerve structure-
- **Endoneurium**: Delicate, loose CT layer that surrounds the axon and it’s myelin sheath
- **Fascicle**: a group of axons/fibers bundled together by a coarser connective tissue called the perineurium
- **Epineurium**: Sheath that bundles the fasicles together to form the nerve

4 Figure: 13.3; page: 492

5 Cranial Nerves- Nerves that carry impulses directly to or from the brain and by-pass the spinal cord
There are 12, all with names and associated Roman numerals, I-XII
Numbered from anterior to posterior
I & II come from the forebrain while III to XII come from the brain stem
They all service the head or neck except for the Vagus (X) that goes into the abdomen

6 I Olfactory, - function: smell
II Optic, function: vision
III Occulomotor, function: eyeball movement
IV Trochlear, function: eyeball movement
V Trigeminal, function: chewing, sensory to face
VI Abducens, function: movement of eyeball
VII Facial, function: muscles of expression, tears, saliva, taste
VIII Vestibulochochlear (acoustic), function: hearing, equilibrium (balance)
IX Glossopharengal, function: saliva, taste
X Vagus, function: stomach smooth muscles, secretion of digestive juices, sensation from viscera

7 XI Spinal Accessory, function: swallowing, movement of head
XII Hypoglossal, function: tongue movement, swallowing

On old Olympus terraced top a Finn and German vaulted a hedge. On occasion our thirsty truck acts funny. Very good vehicle some how

8 Figure: 12.15; page: 446

9 Spinal Nerves
Spinal nerves start out at the ventral and dorsal horns of the spinal gray matter as nerve rootlets, these merge to form ventral & dorsal nerve roots
The ventral & dorsal nerve roots merge to form spinal nerves

10 Figure: 12.33b; page: 469

11 Spinal Nerves – 31 pairs of nerves (all mixed) that supply the whole body except for the head and parts of the neck (cranial)
Named according to the superior vertebrae they come out under C1-C8, Ti-T12, L1-L5, S1-S5, C1

12 Figure: 13.6: page: 502
13 The spinal nerves are quite short as they quickly split into 3 branches called rami/ramus
   1. Meningeal ramus – doubles back into intervertebral foramen and services the meninges of the spinal cord
   2. Posterior ramus – Innervates the posterior body trunk in an orderly manner w/ narrow band of control along the posterior trunk
   3. Ventral ramus- Also very orderly in the thoracic region
      However, the cervical and lumbar ramus quickly merge and form complex plexuses

14 Figure 13.7b; page: 503

15 Except for T2-T12 all the other ventral rami join one another and form complicated interlacing nerve networks called nerve plexuses
   The ventral rami join and form trunks, the trunks bifurcate and form divisions, the divisions merge and form cords, the cords bifurcate and form the major terminal branches or “nerves”
   So, each actual nerve ends up being a complicated fusion of various spinal nerves

16 Figure: 13.9; page: 506

17 There are four major plexuses - Cervical, brachial and the lumbar and sacral plexuses often combined as the lumbosacral plexus
   Cervical plexus- Spinal nerves C1-C4 - under the sternocliedeomastoid muscle – services the head, neck & anterior trunk
   Phrenic nerve that innervates the diaphragm

18 Figure 13.8 & table 13.3; page: 504

19
20 Brachial Plexus  
C5-T1 - lies in neck and axilla  
Eventually form muscles: musculocutaneous, median, ulnar, radial and axillary nerves

Figure: 13.9a & c; page: 506

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23 Lumbar plexus  
L1-4 – innervates abdominal wall and anterior thigh - femoral nerve in thigh, muscles of the hip

Figure 13.10 & table 13.5; page: 508

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27 Sacral Plexus - From spinal nerves L4-S4  
Innervates: buttocks, lower limb, pelvis  
Sciatic nerve- longest & thickest nerve in body – innervates lower leg – sciatica – pain along coarse of nerve  
Tibial nerve- lowere leg  
Common peroneal – anteriolateral lower leg  
Superior & inferior gluteal nerve – gluteal muscles

Figure 1311 & table 13.6; page: 510
Dermatomes
Each spinal nerve has a sensory cutaneous branch that is responsible for the sense of touch for a specific patch of skin

Figure 13.12; page: 511