Orthopedic Disorders

Section 4

Arthritis

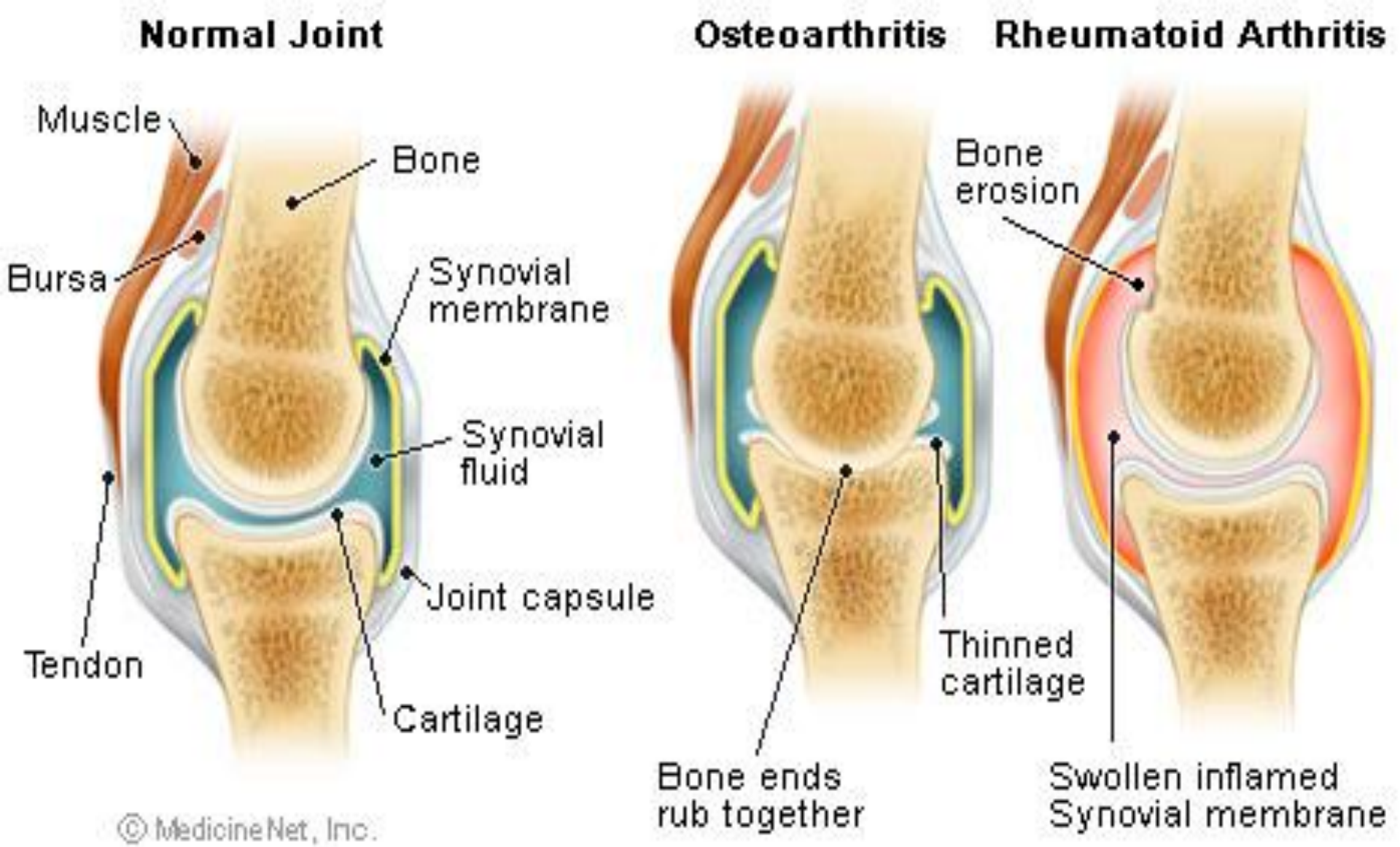
Types of Arthritis

- Non-inflammatory arthritis
  - Osteoarthritis
  - Fibromyalgia and CFS arthritis
- Inflammatory arthritis
  - Rheumatoid arthritis (autoimmune)
  - Lupus erythematosis (autoimmune)
  - Gout (autoimmune)
  - Septic arthritis (metabolic)
  - Lyme disease (autoimmune/infectious)
  - Psoriatic arthritis (autoimmune)
  - Arthritis associated with inflammatory bowel disease (autoimmune)

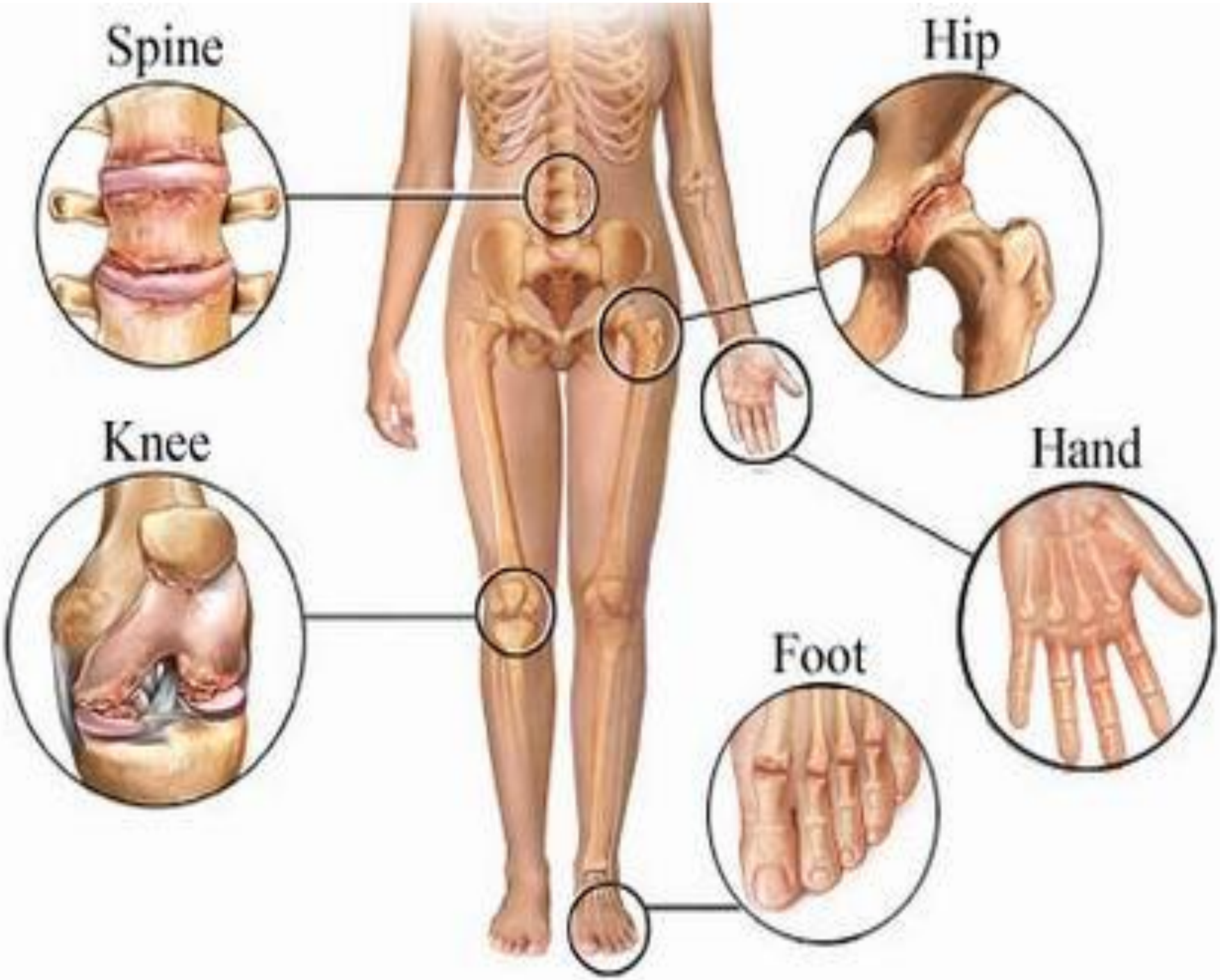
Osteoarthritis

- Degenerative arthritis – "wear and tear" arthritis
- Incidence
  - Most prevalent form of arthritis in the United States with 20-30 million cases
  - Affecting more than 70% of adults between 55 and 78
  - 90% over 45 have some OA symptoms
  - Women are affected more than men
  - Common in 20-30 year old athletes with silent symptoms

- Pathophysiology
  - With aging, the water content of the cartilage increases, and the protein makeup of cartilage degenerates.
  - Eventually, cartilage begins to degenerate by flaking or forming tiny crevasses.
  - In advanced cases, there is a total loss of cartilage cushion between the bones of the joints.
  - Repetitive use of the worn joints over the years can irritate and inflame the cartilage, causing joint pain and swelling.
  - Loss of the cartilage cushion causes friction between the bones, leading to pain and limitation of joint mobility.
  - Inflammation of the cartilage can also stimulate new bone outgrowths.



Normal and Arthritic Joints


Spine
Hip
Knee
Hand
Foot

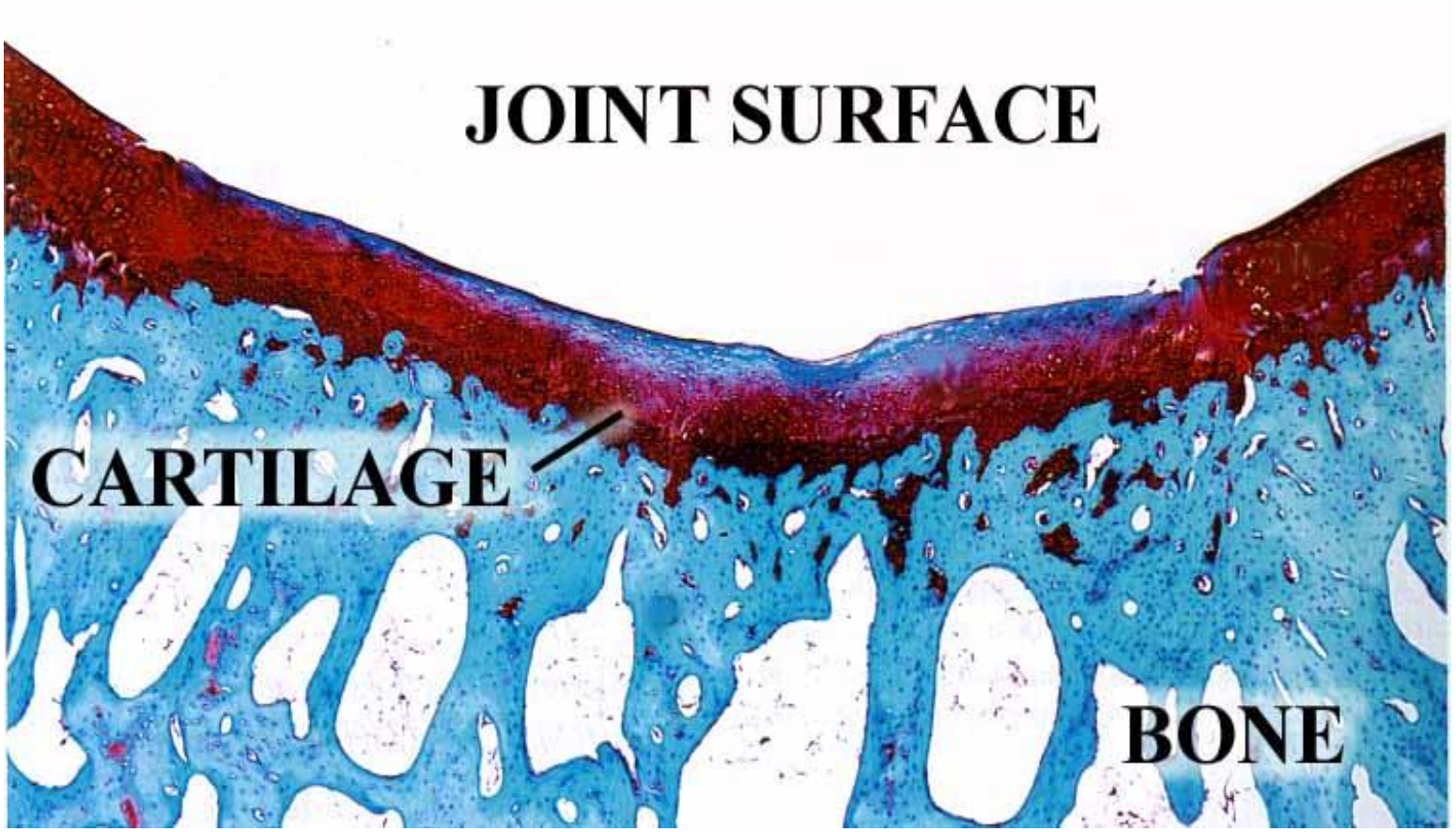
- Symptoms
  - Develop gradually (RA is fast onset)
  - Usually starts in 1-2 joints
  - Starts with weight bearing joint pain that is better with rest
  - Eventually joint ROM decreases
- Diagnosis
  - By history with tender joints, decreased ROM, osteophytes
  - No signs of inflammatory changes
  - Joint fluid usually WINL
  - X-rays show decreased joint spaces and osteophytes
    - Usually x-rays appear worse than the level of symptoms

- Treatment of OA
  - Gentle exercise, pool therapy
  - PT and OT
  - Appliances (heating pads, orthotics, walkers, braces, supports, etc.)
  - Weight control
  - TENS units
  - MEDS
    - Tylenol and NSAIDs, COX2 inhibitors
    - Glucosamine and chondroitin sulfate
    - Steroids used short term but not very helpful
    - Joint injections helpful at times
    - OTC rubefacients helpful
  - Surgery reserved for very severe and incapicating form only

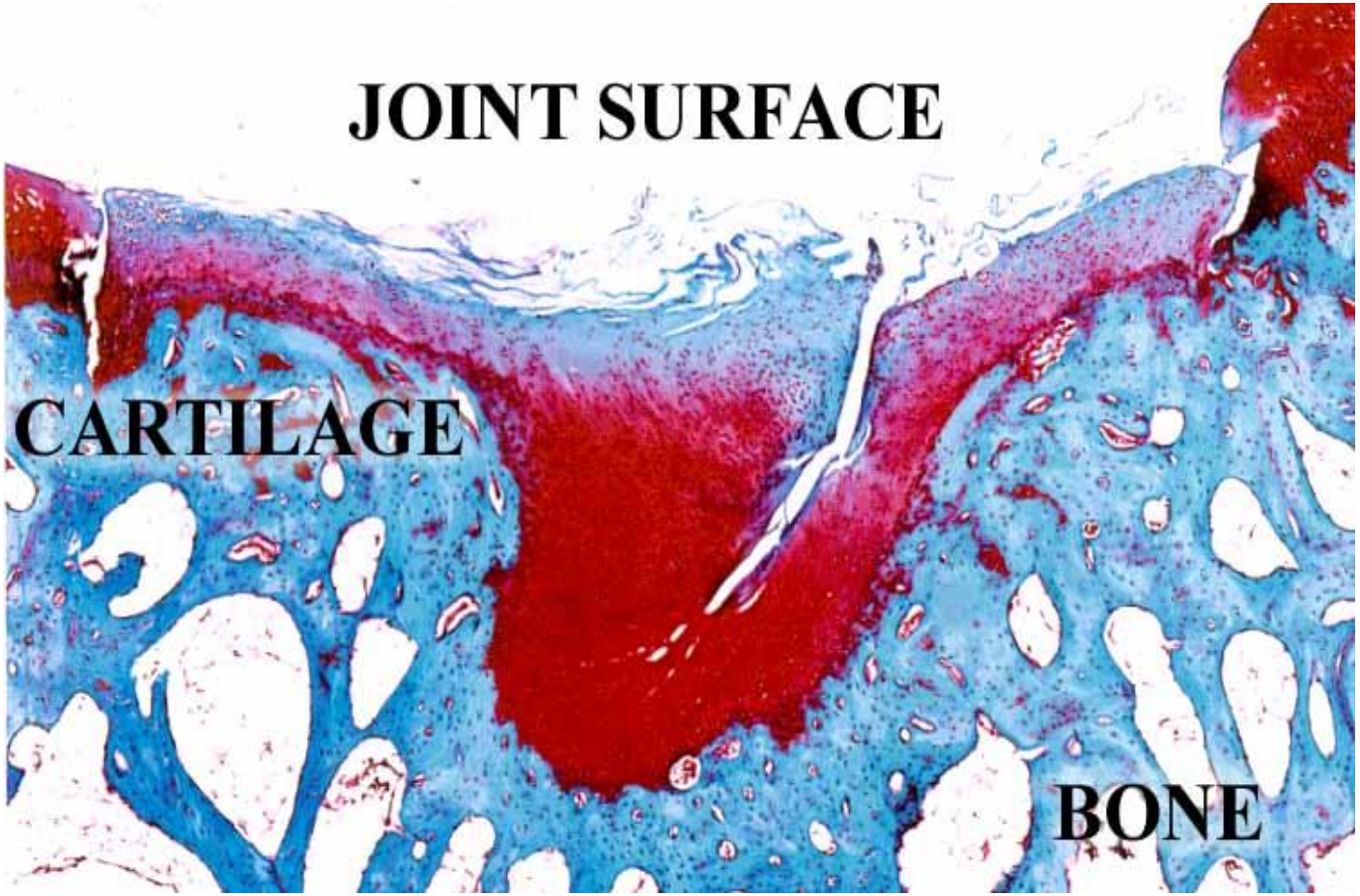

Normal Knee
Osteoarthritic Knee

This is typically the first joint affected by osteoarthritis
Look at the base of your thumb, do you see any bony hypertrophy?


Femur
Bone on bone
Sclerotic bone
Tibia

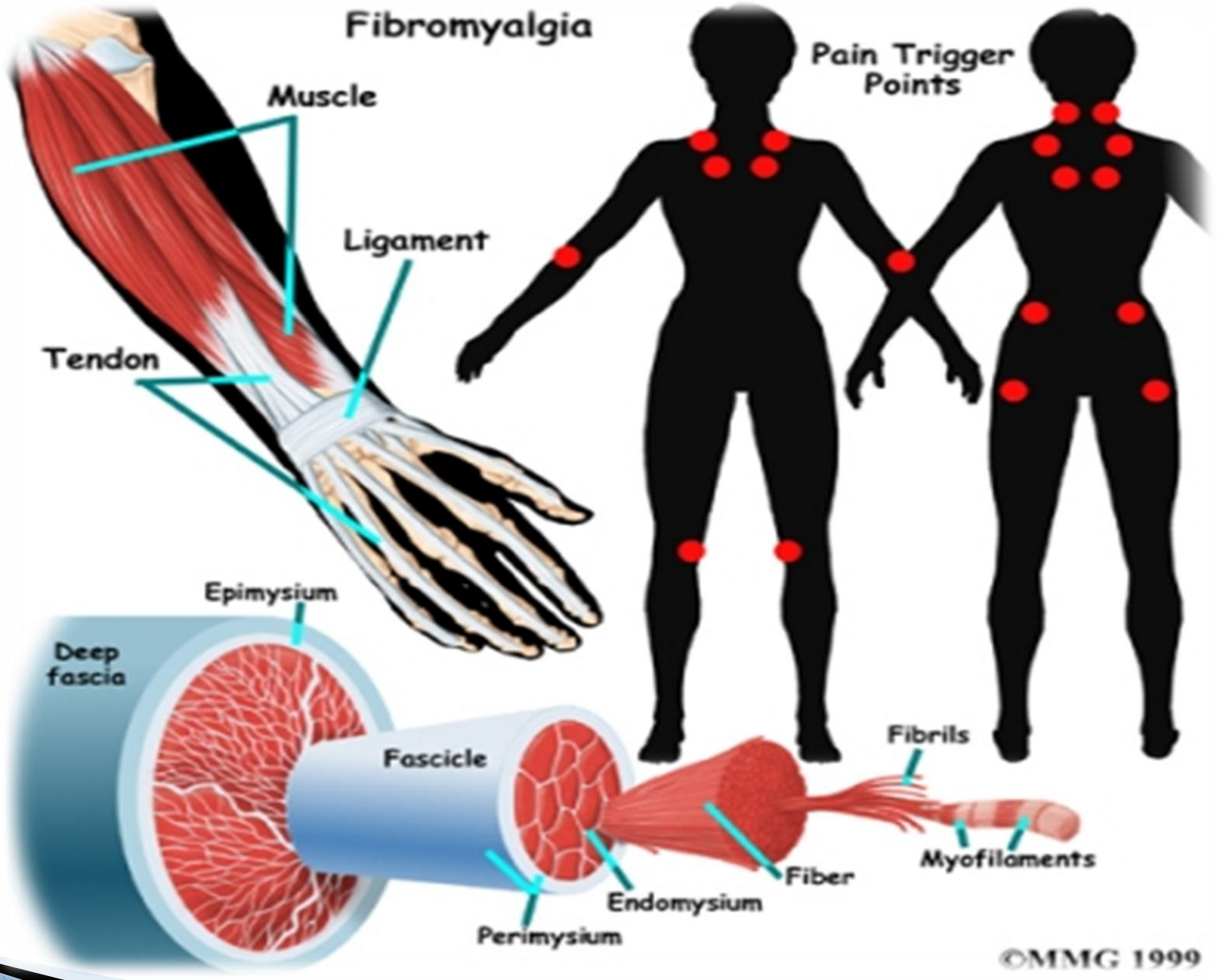


A normal joint surface



Arthritic cartilage

Fibromyalgia and Chronic Fatigue Syndrome


Fibromyalgia
Muscle
Ligament
Tendon
Pain Trigger Points
Epimysium
Deep fascia
Fascicle
Fibrils
Fiber
Myofilaments
Endomysium
Perimysium
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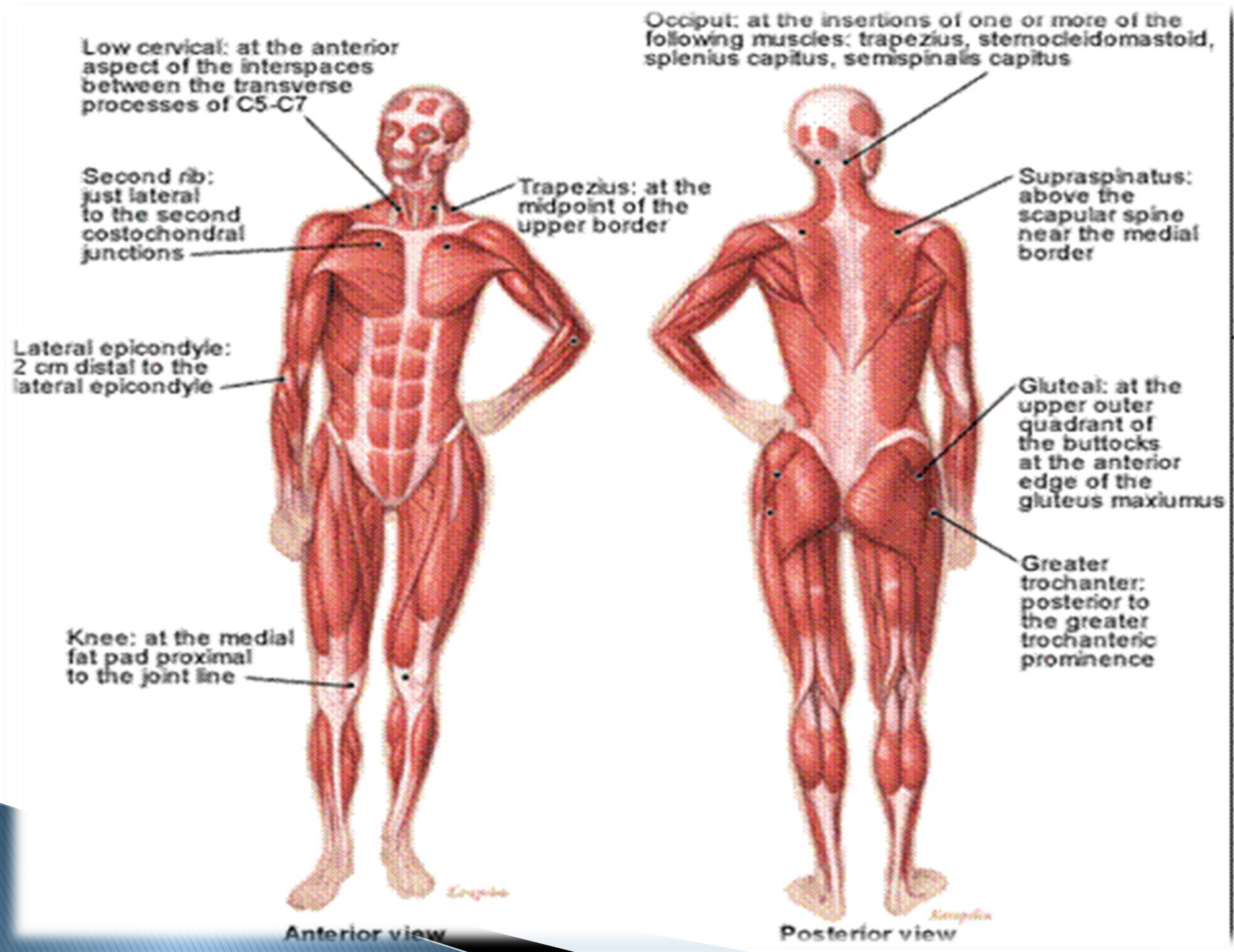
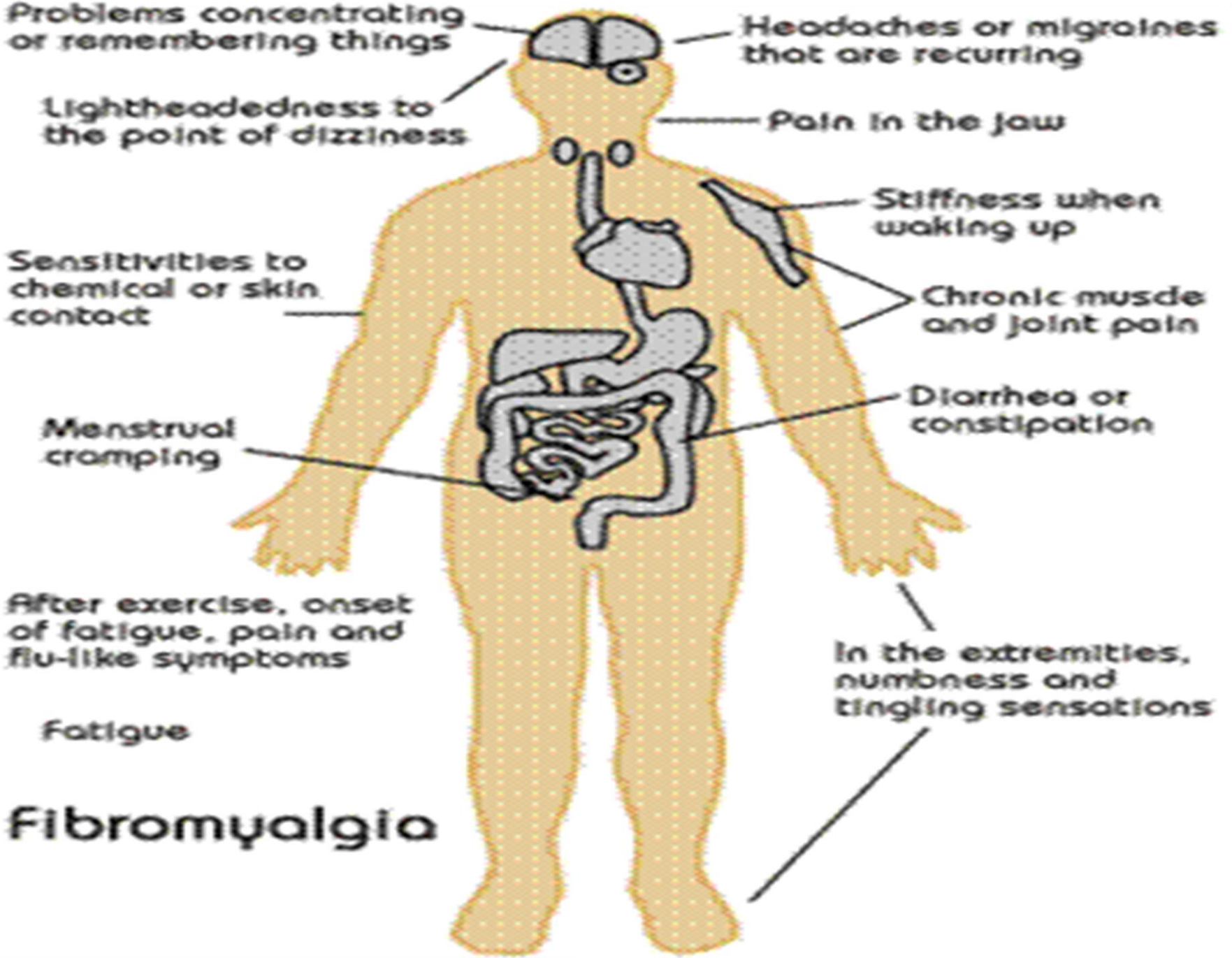
Pathophysiology

- The diagnostic criteria are twofold
  - Widespread pain and tenderness in 11 of 18 defined points
  - PMS Symptoms include non restorative sleep, chronic fatigue, stiffness, and headache, migraine, IBS, TMJ, and mood disorders

- CFS symptoms include
  - Profound fatigue, myalgia, sleep difficulties, low grade fever, pharyngitis, lymphadenopathy
  - Fibromyalgia


Low cervical: at the anterior aspect of the interspaces between the transverse processes of C5-C7
Second rib: just lateral to the second costochondral junctions
Trapezius: at the midpoint of the upper border
Lateral epicondyle: 2 cm distal to the lateral epicondyle
Knee: at the medial fat pad proximal to the joint line
Anterior view
Occiput: at the insertions of one or more of the following muscles: trapezius, sternocleidomastoid, splenius capitus, semispinalis capitus
Supraspinatus: above the scapular spine near the medial border
Gluteal: at the upper outer quadrant of the buttocks at the anterior edge of the gluteus maxiumus
Greater trochanter: posterior to the greater trochanteric prominence
Posterior view


Problems concentrating or remembering things
Headaches or migraines that are recurring
Lightheadedness to the point of dizziness
Pain in the jaw
Stiffness when waking up
Sensitivities to chemical or skin contact
Chronic musde and joint pain
Diarrhea or constipation
Menstrual cramping
After exercise, onset of fatigue, pain and flu-like symptoms
In the extremities, numbness and tingling sensations
Fatigue
Fibromyalgia

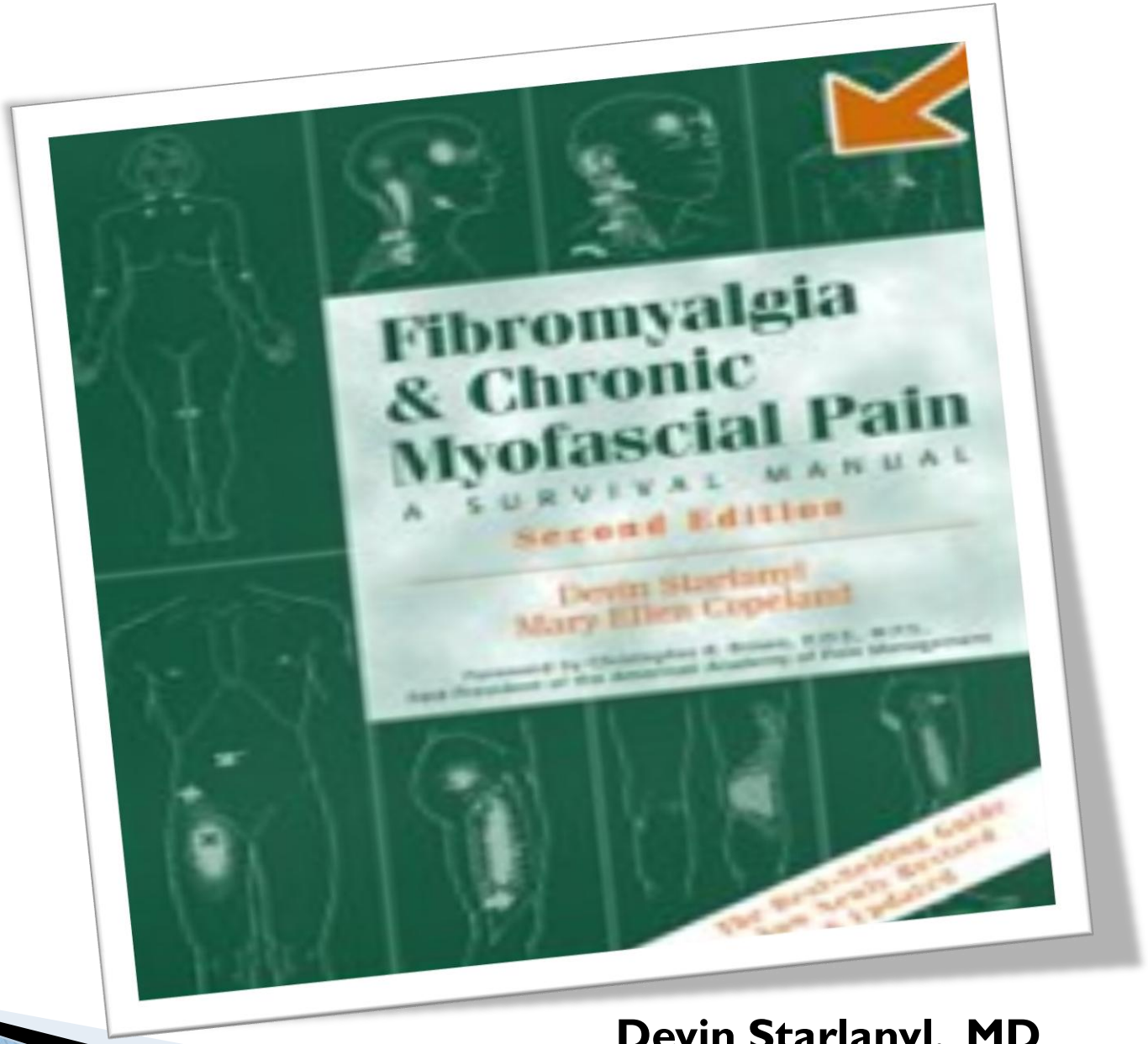
Exercise

- Exercise decreases symptoms, overuse increases symptoms
- Consider PT with TENS and massage therapy
- Tai chi – ROM Dance

Lifestyle Changes

- Eliminate consumption of coffee, smoking, and alcohol
- Consider aggravating factors of body mechanics at work and home

- Fibromyalgia treatment
  - In western care, it is best to treat softly and tenderly
  - Remember to not aggravate
  - Treat with TCM, IHH and CAM is best



Devin Starlanyl, MD

Rheumatoid arthritis

- An autoimmune disease causing chronic joint inflammation
- A progressive illness that has the potential to cause joint destruction and functional disability
- Affecting approximately 1.3 million people in USA
- Three times more common in women as in men
- It afflicts people of all races equally
- Can begin at any age, but it most often starts after age 40 and before 60
- In some families, multiple members can be affected, suggesting a genetic basis for the disorder

Juvenile rheumatoid arthritis (JRA) causes joint inflammation and stiffness for more than six weeks in a child aged 16 or younger

Affects 50,000 children

- What causes rheumatoid arthritis?
  - Cause is largely unknown
  - Has a strong genetic link
  - It is suspected that certain infections or factors in the environment might trigger the immune system to attack the body's own tissues
- Symptoms
  - Come and go, depending on the degree of inflammation
  - When body tissues are inflamed, the disease is active
  - The course of rheumatoid arthritis varies from patient to patient, and periods of flares and remissions are typical
  - Inflammation usually symmetrical and of the small joints
  - Pronounced morning stiffness – “morning gel”

PIPs markedly swollen with faint swelling of the MCPs

Rheumatoid nodules and deformity

Typical visible changes include ulnar deviation of the fingers at the MCP joints, hyperextension or hyperflexion of the MCP and PIP joints, flexion contractures of the elbows, and subluxation of the carpal bones and toes (cocked —up).

Rheumatoid nodule

Typical deformity of RA

- Rheumatoid arthritis and inflammation of organs – can affect organs and areas of the body other than the joints
  - Sjogren's syndrome is inflammation of the glands of the eyes and mouth and causes dryness of these areas
  - Rheumatoid inflammation of the pleura
  - Pericarditis
  - Can have lowered RBC (anemia) and WBC
    - Felty's Syndrome (lowered WBC and spleenomegaly)


Pericardial Sac

- Diagnosis
  - Positive RF (rheumatoid factor) and RF titer, ASO titer
  - WBC changes
  - Joint fluid with WBC and proteins
  - X-ray changes
- Treatment
  - Supportive and appliance measures
    - Hot and cold packs, walkers, etc
  - NSAIDs and COX2 inhibitors
  - Steroids are the main treatment
  - Rest and mild ROM exercises

Lupus arthritis

- A generalized autoimmune disorder involving the skin, joints, kidneys, mucus membranes and blood vessels
- 90% of cases are women teens to 30s
  - Discoid lupus – butterfly rash on cheek
  - SLE – systemic – most common form involving multiple organs
    - Lupus Foundation questionnaire
    - http://www.lupus.org/newsite/pages/lupusChecklist.aspx
  - Drug-induced (can be from TB and heart drugs)
    - Usually resolves when stopping drugs
  - Neonatal lupus
    - Often causes heart disease

- Signs and symptoms
  - Arthritis with facial rash, kidney disease, anemia, low grade fever, headaches, hair loss, mental changes, photophobia
- Diagnosis
  - Diagnosis is difficult, but is usually diagnosed with the non-arthritic component initially
  - Positive LE prep and Antinuclear Antibodies (ANA)
- Treatment with RA protocols and address the systemic complications
- Learn about Lupus Video

Gouty arthritis

- Familial disease affects men 90% of time
- Usually starts in 30s due to uric acid crystals being laid down in certain joints
  - By product of nucleic acid metabolism
  - Body also forms uric acid from high purine foods
    - Anchovies, sardines, asparagus, mushrooms, meat gravies and broth, all organ meats
    - Alcohol increases uric acid production and decreases excretion
- Usually involve great toe, can also affect ankle, knee, wrist or elbow

- Signs and symptoms
  - Episodes come on suddenly with severe excruciating pain
  - Attacks are worse with emotional stress, drinking, fatigue, surgery, eating and eating high purine foods
  - 25% of patients will develop nephrolithiasis
- Diagnosis with a history of typical monoarthritis with elevated uric acids on joint aspiration
- Treatment
  - Treated with Colchicine hourly for pain
  - NSAIDs and COX2 inhibitors
  - Codeine, demerol and morphine
  - Steroids – oral and injectables
  - Foot cradle for sleeping

- Preventative therapy
  - Avoid alcohol, weight reduction, avoid purine-rich foods, stress management, high water intake
- Prognosis
  - Progressively more severe with chronic inflammatory changes due to crystals

Rheumatoid nodule

Typical deformity of RA

As you can imagine this is very painful!!

Septic (infectious) arthritis

- Very dangerous infections caused usually by *staphlococcus, gonococcus, E. coli* or *pseudomonas*
- 10% mortality if in one joint, 30% if in two joints
  - Mortality from ARDS
- Septicemia can be from
  - Pneumonia, abscess, sever tonsillitis, dental or mouth infections, PID
  - Can also be post injury, post surgery
- Signs and symptoms include severe joint pain with high fever

- Diagnosis
  - History with high fever and joint pain
  - Pus on joint aspiration
- Treatment
  - Even for the patients that do not die, the joint can be completely destroyed with days without IV antibiotics
  - Daily joint aspiration

Lyme disease arthritis

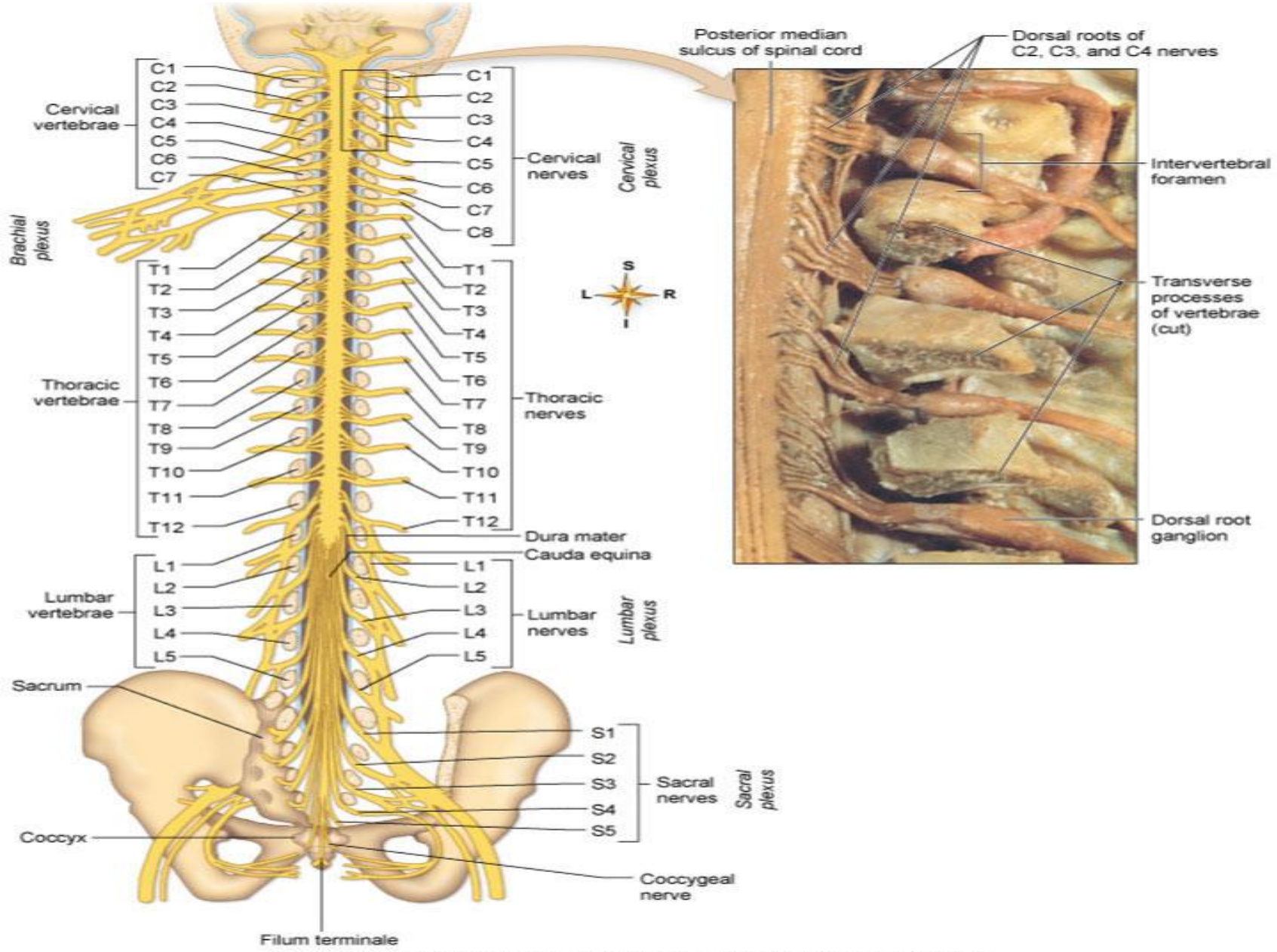
- Signs and symptoms
  - Initial stage
    - Initial bite is so small it may not be noticed
    - The tick must remain attached for 48 hours for infection to occur
    - 1-4 weeks after bite and red lesion occurs
    - Patient can have flu-like symptoms
  - Second stage
    - Weeks to months later causing Bell's palsy or meningitis-like symptoms of headaches, nuchal rigidity and mental changes
  - Third stage
    - Months to years later with fibromyalgia-like migratory athralgia

- Diagnosis of Lyme disease arthritis
  - Lab test of antibodies
- Treatment of Lyme disease arthritis
  - Doxycycline and amoxicillin

Psoriatic arthritis

- Up to 25% of psoriasis patients presents with arthritis which presents as a rheumatoid-like arthritis with a negative RF test
- Steroids, which help in RA, will make psoriasis worse
- Treated with methotrexate and infliximab

Lumbar Spine



Courtesy Vidic B, Suarez RF: *Photographic atlas of the human body*, St Louis, 1984, Mosby.

Fig. 14-1. **Spinal nerves.** Each of 31 pairs of spinal nerves exits the spinal cavity from the intervertebral foramina. The names of the vertebrae are given on the left and the names of the corresponding spinal nerves on the right. Note that after leaving the spinal cavity, many of the spinal nerves interconnect to form networks called plexuses. The inset shows a dissection of the cervical region, showing a posterior view of cervical spinal nerves exiting intervertebral foramina on the right side.

Low back pain

- 80% of population at some time in their lives
- Leading cause of disability
- Causes
  - Muscular or ligamentous strain
  - Mechanical back pain syndrome – facet syndrome
  - Obstetrical or gynecological
    - Pregnancy, PMS, fibroids, dysmenorrhea, uterine prolapse, endometriosis
  - Lumbar DJD
  - IVDS – intervertebral disc syndrome
  - Spinal stenosis
  - Compression fractures
  - Urinary tract problems

- Causes – continued
  - Ankylosing spondylitis
  - Bone cancer
  - Cancer in nearby organs
    - Prostate, colorectal, cervical/uterine, renal, pancreas
  - Osteomyelitis
  - Scoliosis
  - Aortic aneurysm
- Diagnosis
  - Always rule out everything else
  - “Have I missed anything?”
  - Always use algorithm reasoning
  - History is helpful
  - What was precipitating event?
  - What constitutional symptoms?

- Physical examination
  - Notes exact location of pain, local tenderness
  - Swelling or deformity?
  - Any pain with movement?
  - SLR test
  - Neurological and abdominal examination
  - Rectal exam may be needed
- Imaging studies
  - X-rays, CT scans, MRI scans

- Treatment
  - Chiropractic and manual therapies
  - Bedrest and NSAIDs
  - Muscle relaxants
  - PT with heat and cold
  - Massage, acupuncture, hydrotherapy
  - Bracing and TENS
  - Exercises and traction

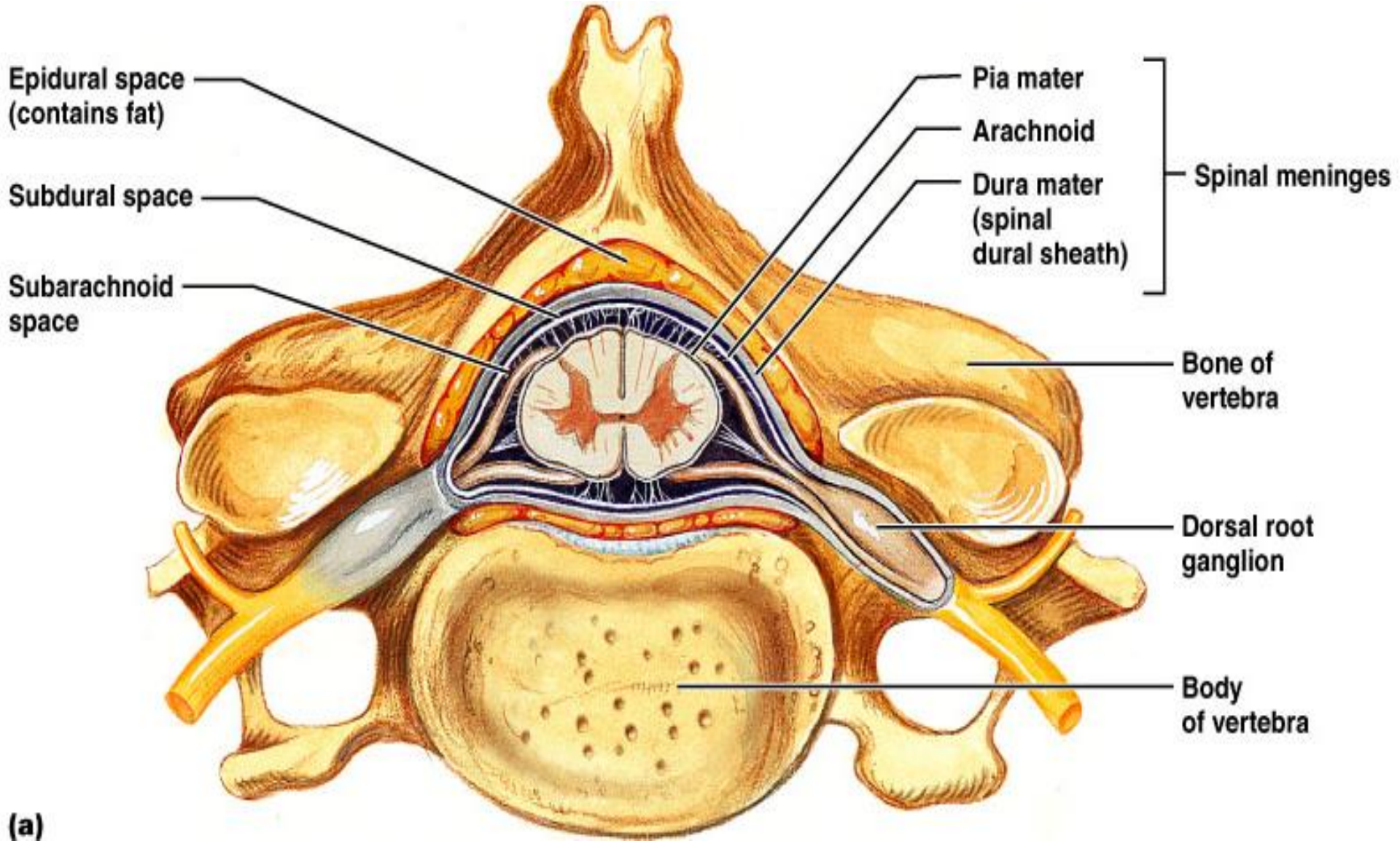
Cervical Spine

- Neck pain incidence at 15% of population at any given time
- Most common from 30-5O and decreases with age
- Whiplash
  - Hyperfelexion-hyperextension injury
  - Can also be caused by a fall
  - Treated with immobilization, manual care, NSAID and steroids (not very effective)
- Symptoms
  - Pain may feel sharp or dull
  - Stiffness
  - Altered ADL – activities of daily living
  - Shoulder pain in some cases
  - Back pain in some cases

Cervical disc syndrome

- Usually occurs from C5-C8
- Symptoms aggravated by Valsalva maneuver
  - Coughing , sneezing, straining
- Diagnosis
  - Neuro exam of dermatomes and myotomes
  - CT and MRI
- Treatment
  - Traction, mild exercise, PT, heat, NSAIDS
  - Mild manual therapy
  - Epidural steroid injections
  - Surgery for unresponsive pain

Cross-Sectional Anatomy of the Spinal Cord



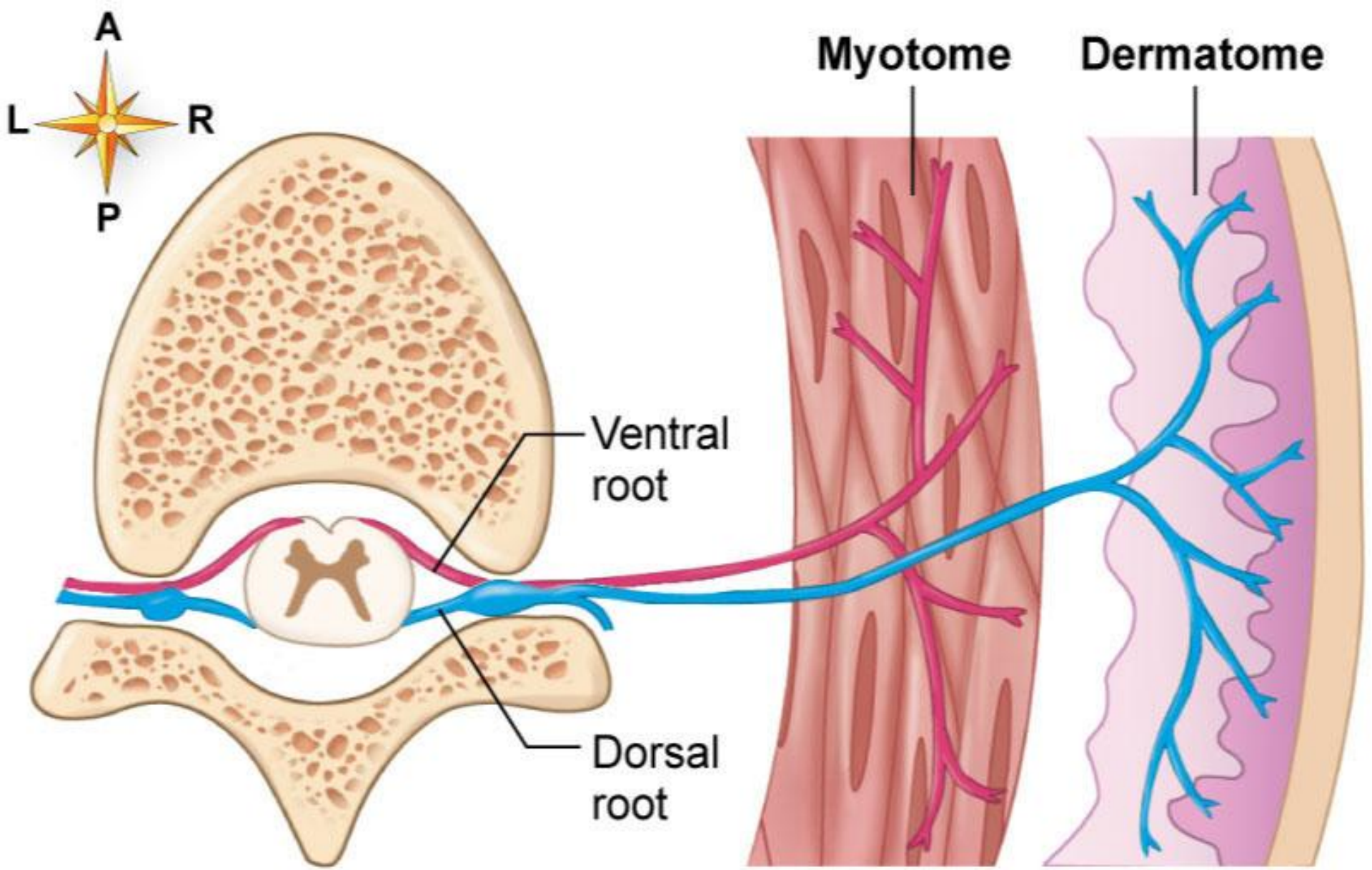


Fig. 14-6. **Segmental distribution of spinal nerves.** A dermatome is a region of skin supplied by afferent (sensory) fibers of a given spinal nerve. A myotome is a region of skeletal muscle innervated by efferent (motor) fibers of a given spinal nerve. Spinal nerves at different segments of the spinal cord innervate different sets of dermatomes and myotomes.

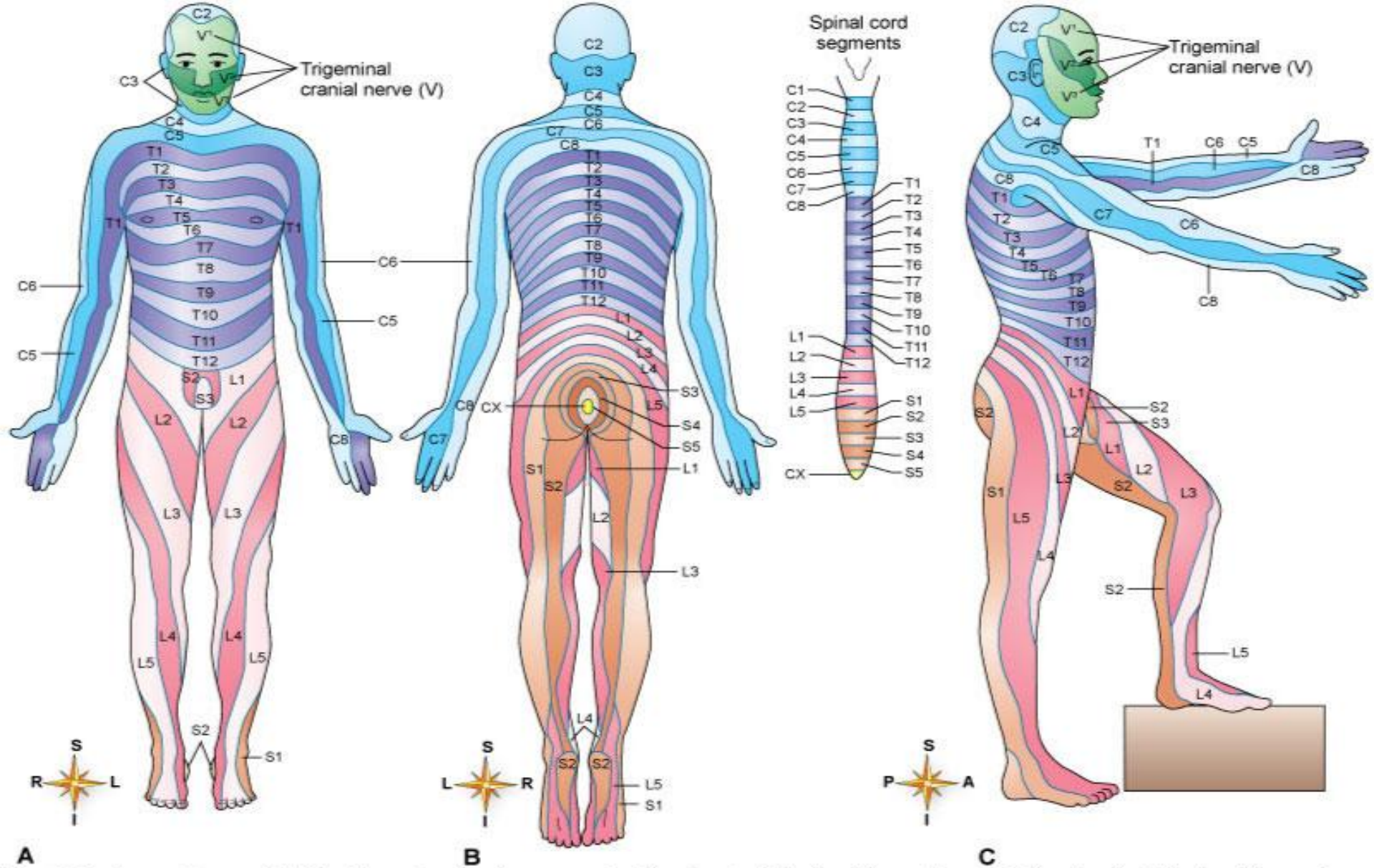


Fig. 14-7. **Dermatome distribution of spinal nerves. A,** The front of the body's surface. **B,** The back of the body's surface. **C,** The side of the body's surface. The inset shows the segments of the spinal cord connected with each of the spinal nerves associated with the sensory dermatomes shown. **C,** Cervical segments and spinal nerves; *T,* thoracic segments and spinal nerves; *L,* lumbar segments and spinal nerves; *S,* sacral segments and spinal nerves.

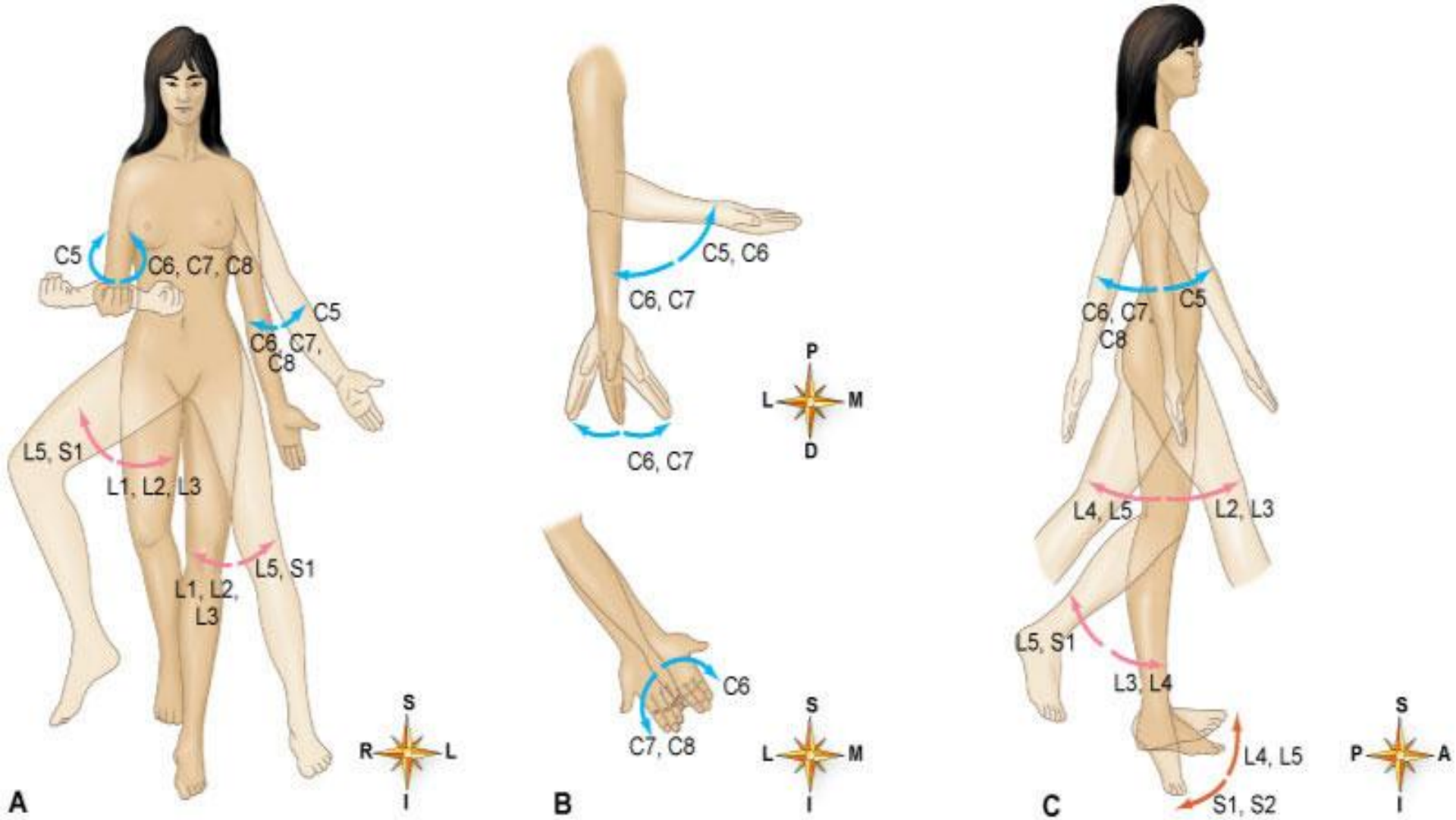


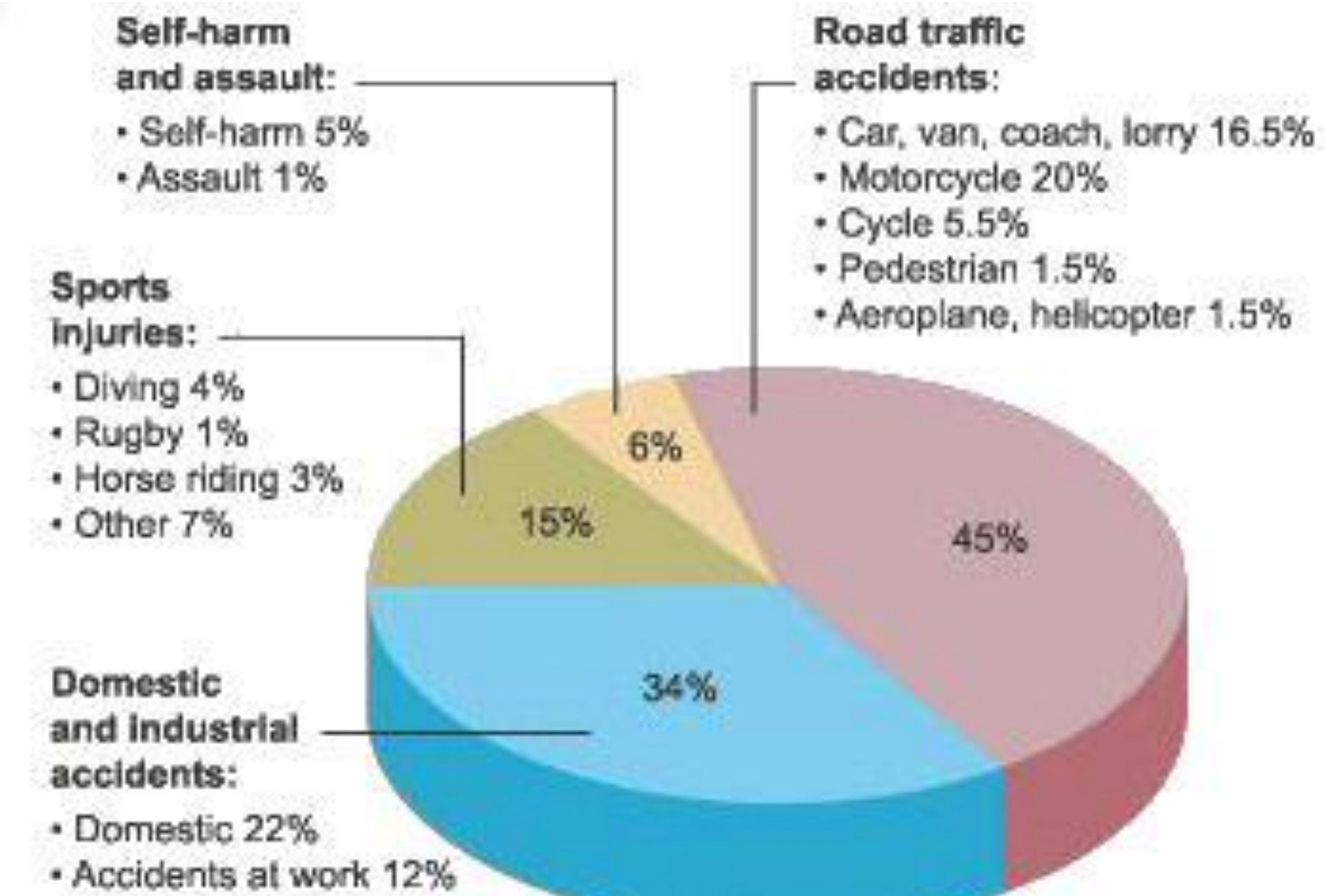
Fig. 14-8. **Myotomes and body movement.** Myotomes are skeletal muscles innervated by one or more given spinal nerves. These examples show which spinal nerves innervate the skeletal muscles that produce the movements indicated by the arrows. **A,** Rotation and abduction/adduction of arm and hip. **B,** Flexion/extension of hand and wrist; pronation/supination of hand. **C,** Flexion/extension/hyperextension of arm, hip, knee; dorsiflexion and plantar flexion of foot. *C,* Cervical spinal nerves; *L,* lumbar spinal nerves; *S,* sacral spinal nerves.

DJD of cervical spine

- Progressive thinning of disc over time with osteophytic proliferation

- Cervical DJD
  - Conservative with NSAIDs and immobilization
  - Mild manual therapy
  - Acupuncture
  - Surgery as a last resort
    - Discectomy and laminectomy
    - 70-80% success with neuropathy

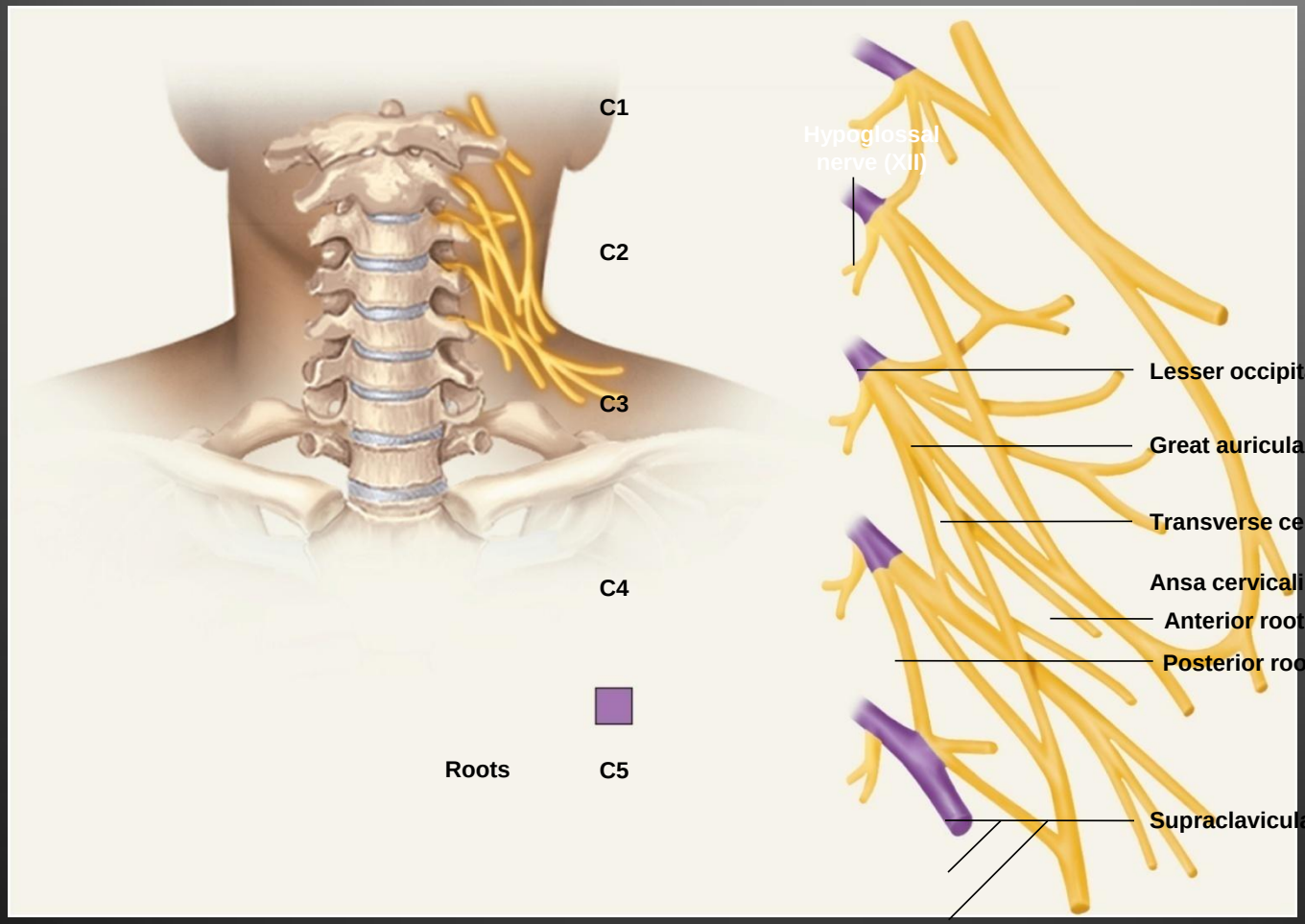
Causes of spinal cord injuries



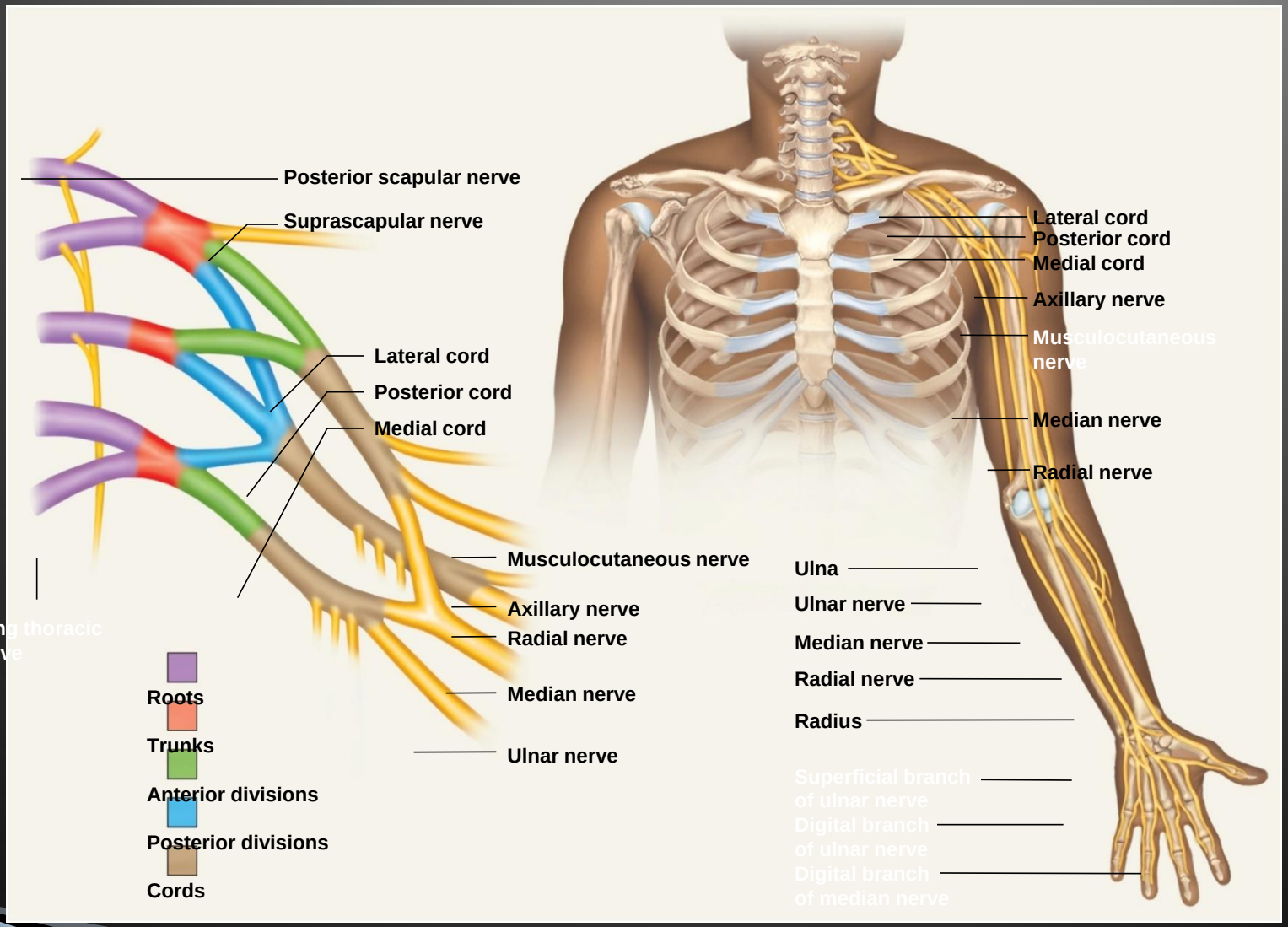
Nerve Compression Syndromes

- Radiculitis – inflammation of the nerve root, often idiopathic
- Radiculopathy – compression of the nerve root
- Plexopathy – compression of a nerve plexus, usually the brachial plexus

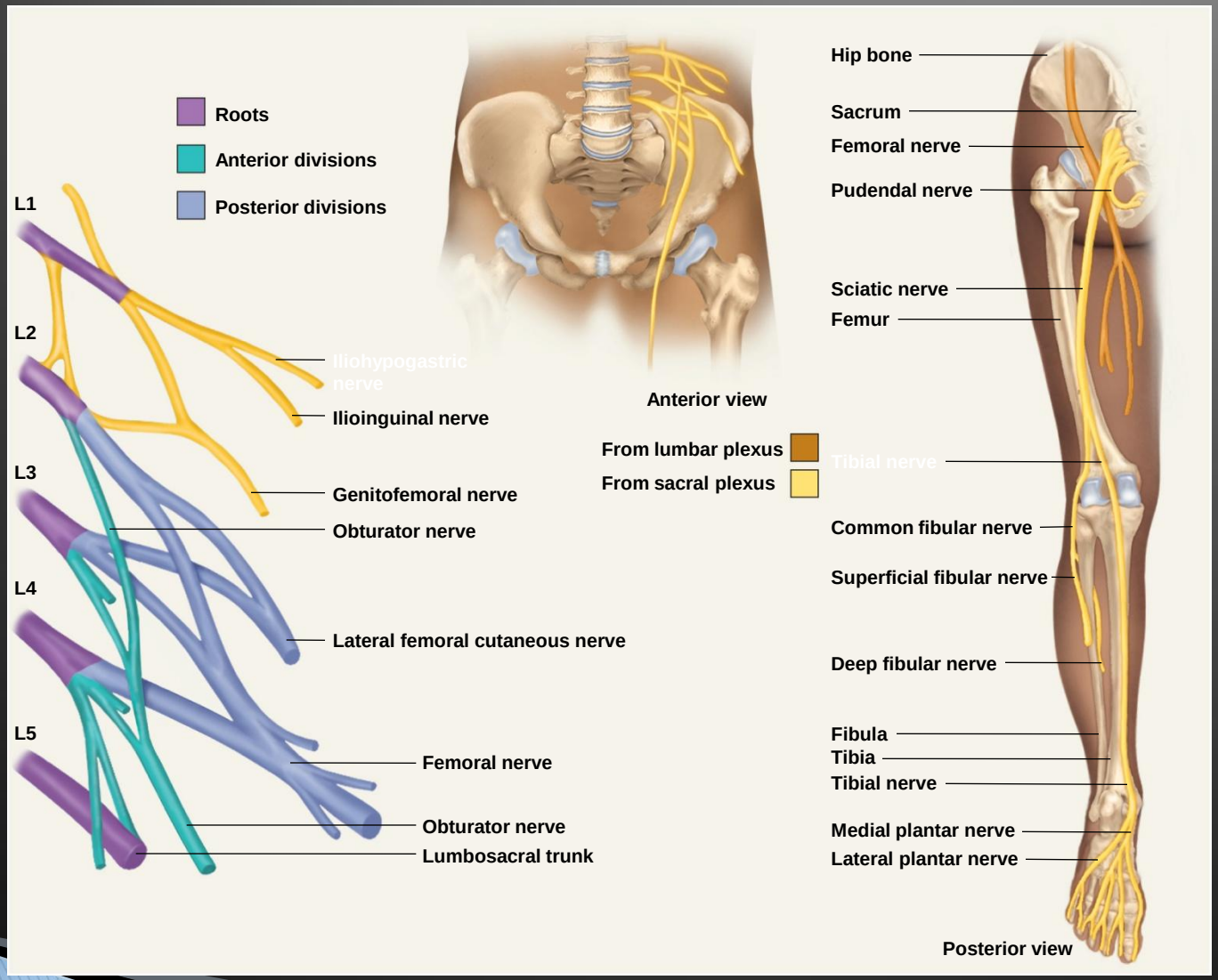
The Cervical Plexus



The Brachial Plexus



The Lumbar Plexus



UMN Lesion vs LMN Lesion

SIGN	UMN	LMN
Weakness	Yes	Yes
Atrophy	No *	Yes
Faciculations	No	Yes
Reflexes	Increased	Decreased
Tone	Increased	Decreased

* May have mild atrophy due to disuse

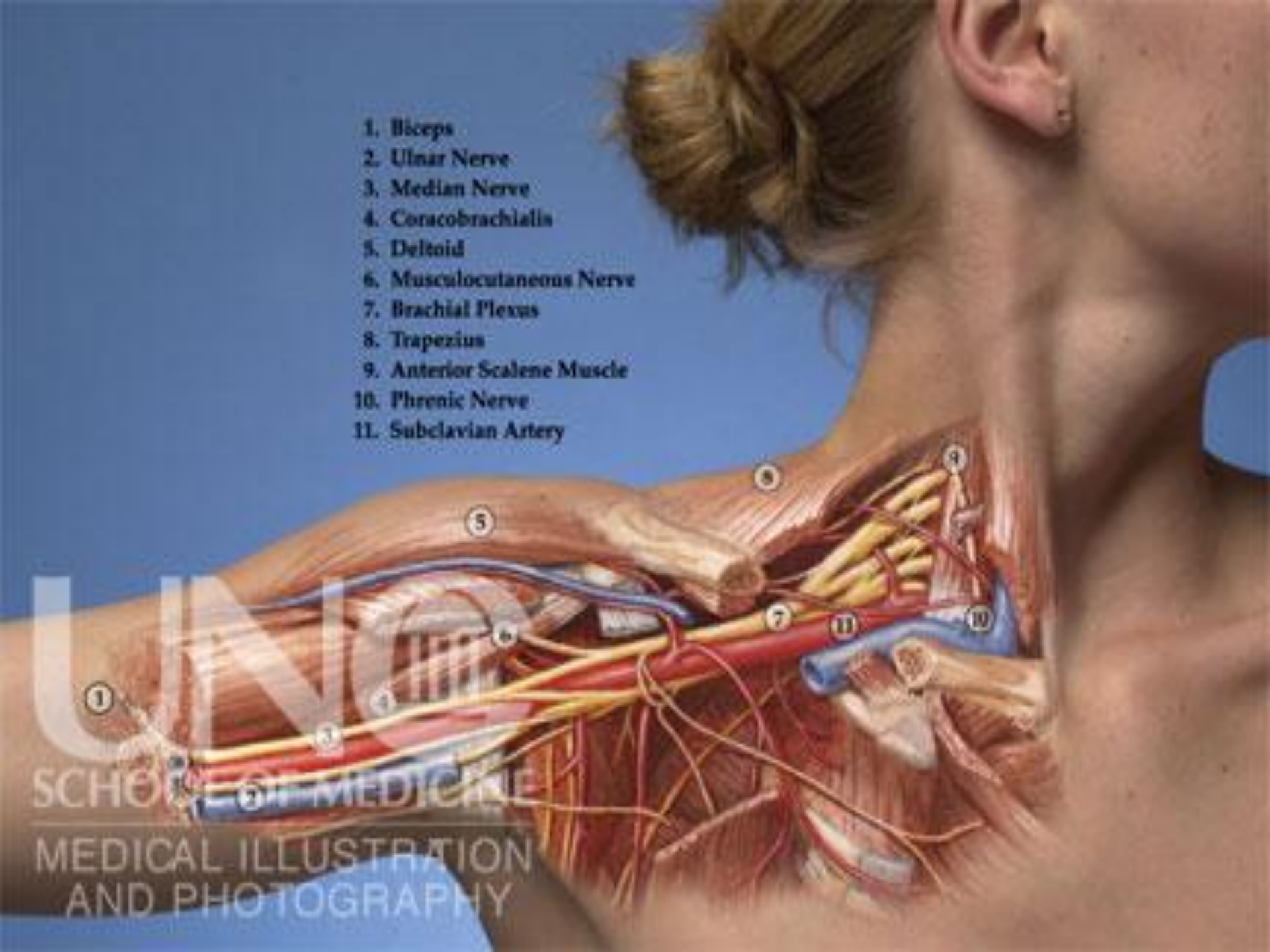
- Diagnosis of lower motor neuron dysfunction
  - Age of patient
  - History of onset (any repetitive motion)
  - Pain distribution, numbness and weakness
  - Presence or absence of neck pain with decreased ROM
  - Spurling's test for nerve root compression
  - Traction sign for discs
  - Carpal tunnel tests – Phalen's and Tinel's

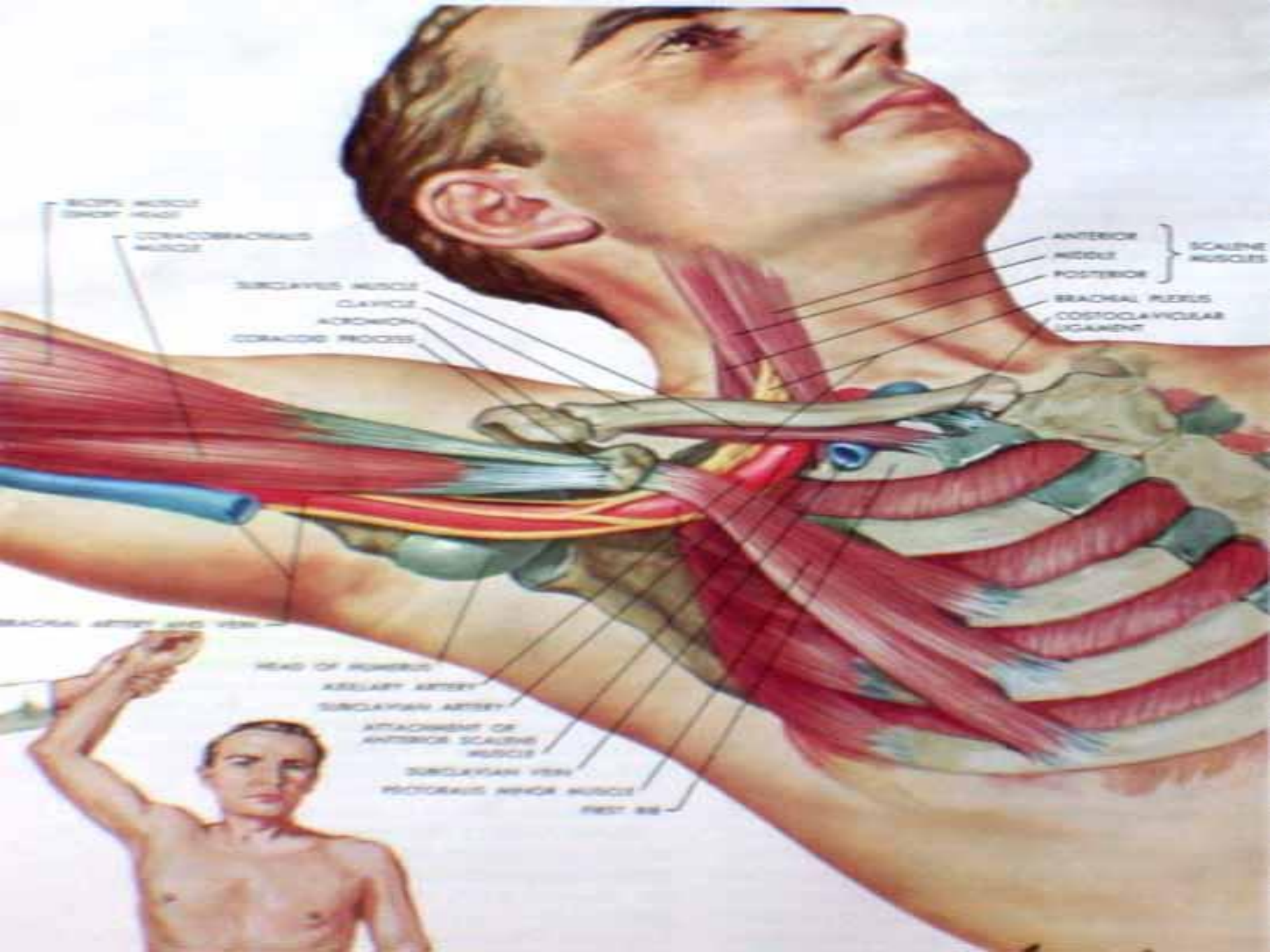
Cauda equina syndrome

- Compression can occur from tumor, IVDS, abscess or injury
- Causes low back and buttock pain with decreased sensation
- Can also have visceral symptoms (ED, incontinence)
- This is a red flag surgical emergency

Thoracic outlet syndrome

- Due to compression of neurovascular structures of the upper extremities
- Compression may be due to congenital cervical rib or scalene muscle involvement
- May cause venous occlusion, with swelling and congestion and arterial occlusion
- Presents with numbness, tingling and pain


1. Biceps
2. Ulnar Nerve
3. Median Nerve
4. Coracobrachialis
5. Deltoid
6. Musculocutaneous Nerve
7. Brachial Plexus
8. Trapezius
9. Anterior Scalene Muscle
10. Phrenic Nerve
11. Subclavian Artery
SCHOOL OF MEDICINE
MEDICAL ILLUSTRATION
AND PHOTOGRAPHY


CORACOBRACHIALIS MUSCLE
SUBCLAVIUS MUSCLE
CLAVICLE
ACROMION
CORACOID PROCESS
ANTERIOR
MIDDLE
POSTERIOR
SCALENE MUSCLES
BRACHIAL PLEXUS
COSTOCLAVICULAR LIGAMENT
HEAD OF HUMERUS
AXILLARY ARTERY
SUBCLAVIAN ARTERY
ATTACHMENT OF ANTERIOR SCALENE MUSCLE
SUBCLAVIAN VEIN
PECTORALIS MINOR MUSCLE
FIRST RIB

- Diagnosis
  - Chest x-ray for cervical rib
  - Nerve conduction velocity studies
  - MRI
- Treatment
  - Start treatment with conservative care of exercises, PT, postural training
  - May need to change ADL and or job
  - Surgical resection of cervical rib or fibrous bands

Carpal tunnel syndrome

- Compression of median nerve between carpal ligament and osseous structures
- A major disability with repetitive hand motions and work
- Primarily seen 30-65
- Contributing factors
  - Heredity is the most important factor
  - Hand use over time can play a role
  - Hormonal changes related to pregnancy
  - Medical conditions, including diabetes, rheumatoid arthritis, and thyroid gland imbalance can play a role


Carpal Tunnel
Syndrome


Numbness
Pain

- Diagnosis
  - Median nerve history
  - Phalen's and Tinel's Tests
- Treatment
  - Occupational modification or change
  - Acupuncture
  - Manual therapies
  - Steroid injections
  - Wrist splinting at night
  - Wrist rehab exercises
  - Surgical resection

Surgery

Arthroscopy

- Essentially “keyhole” surgery
  - In abdomen – laparoscopic
  - In chest – thoracoscopic surgery
- Advantages
  - Less invasive, less pain, shorter recovery, usually outpatient
- Disadvantages
  - Two-dimensional and things are sometimes missed

Sports medicine

- More than 3 million MVA per year and more than 10 million sports injuries per year that require treatment
- Knee injuries
  - Medial and lateral meniscus injuries
    - McMurray click test
  - Anterior cruciate and posterior cruciate ligaments
    - Drawer test
  - Medial collateral and lateral collateral ligaments
    - Lateral stability test

Taking a knee pain history

- Did an injury occur?
  - Yes – tear No – overuse or degeneration
- Was it a non-contact injury or contact injury
  - Non-contact – Torn ACL
  - Contact – usually multiple ligament injury
- Was there a “pop”?
  - Yes – common with ACL tear
- How long did it take to swell up?
  - Within hours – ligament tear Overnight – meniscus tear
- Does the knee lock up?
  - Yes – meniscus tear
- Exactly, where does it hurt?
  - Medial joint – MCL, medial meniscus
  - Lateral joint – lateral meniscus and IT band

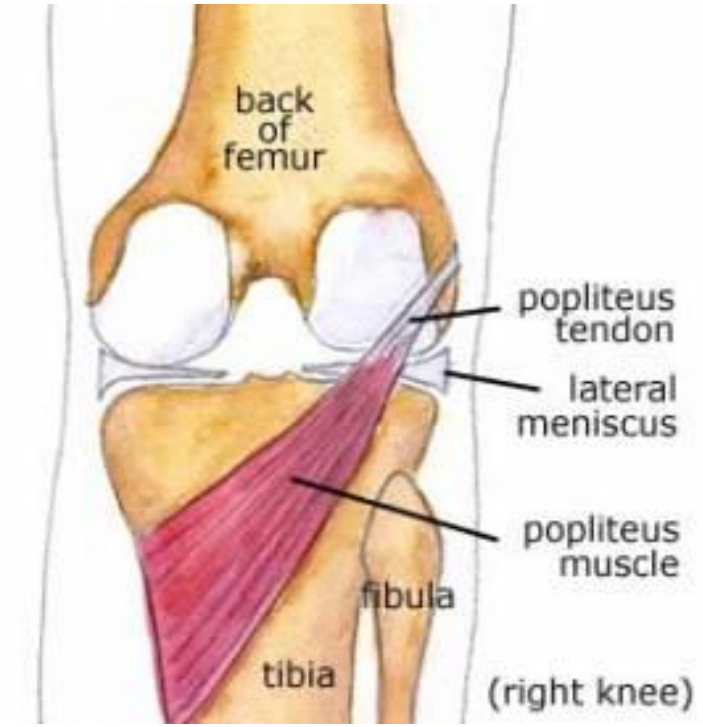
Stress fractures

- A stress fracture is an overuse injury
- It occurs when muscles become fatigued and are unable to absorb added shock. Eventually, the fatigued muscle transfers the overload of stress to the bone causing a small crack.
- Often are the result of increasing the amount or intensity of an activity too rapidly
- They also can be caused by the impact of an unfamiliar surface, improper equipment and increased physical stress
- Occur in the weight-bearing bones of the lower leg and the foot

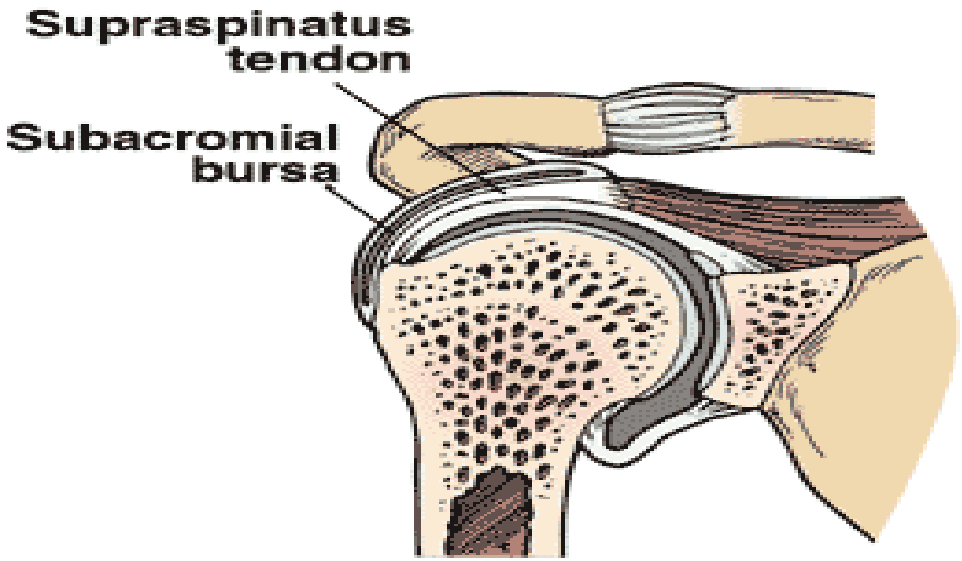
- Which sports are more prone to stress fractures?
- More common in women due to osteoporosis
  - Female athlete triad – eating disorders (bulimia or anorexia), amenorrhea (infrequent menstrual cycle), and osteoporosis
- Symptoms are pain with activity and better with rest
- Treatment with pain-free activity and rest 6-8 weeks

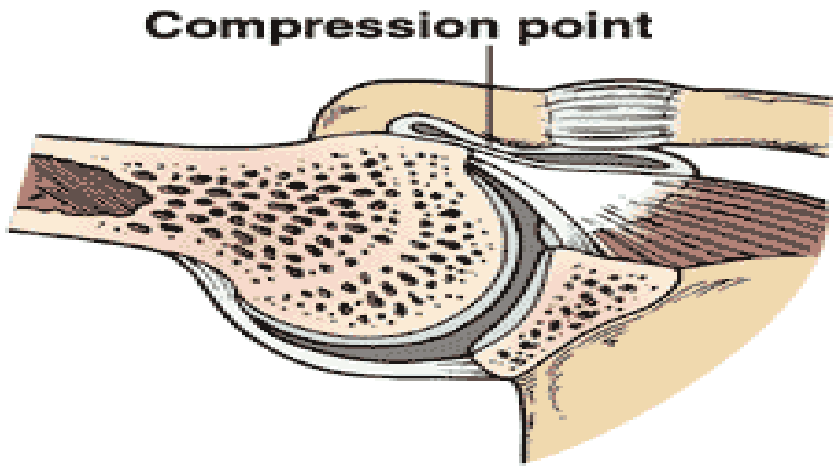
Tendonitis

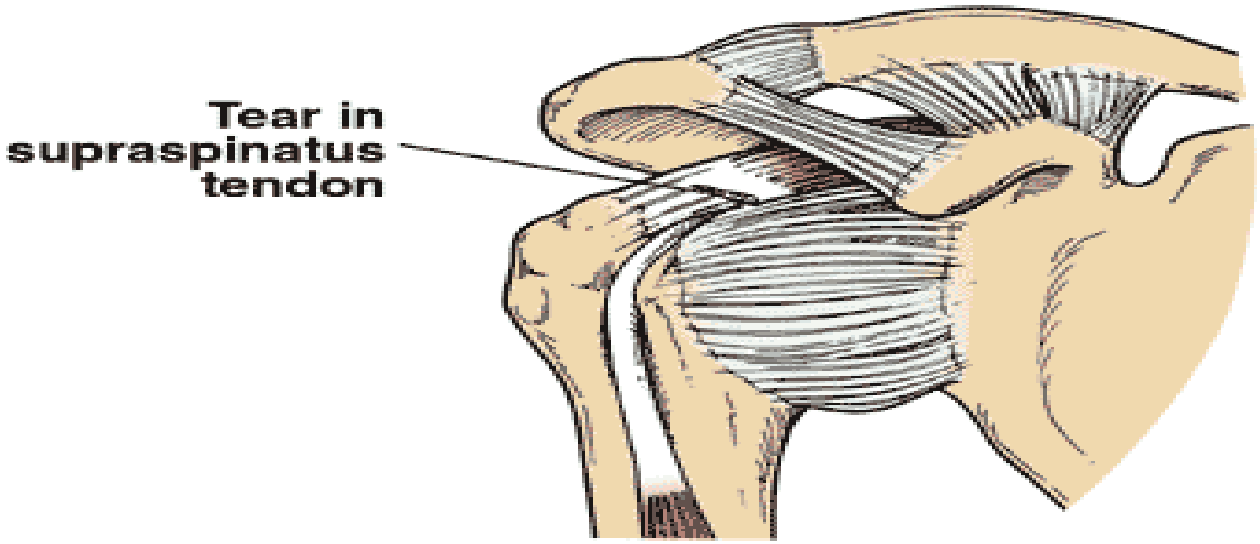
- Polpiteus tendon on lateral knee
- Achilles tendon at ankle
- Lateral epicondylitis
- Rotator cuff tendonitis



Rotator Cuff Injury







Acute Orthopedic Red Flags

- Acute RA or gout
- Infectious arthritis or osteomyelitis
- Acute low back pain with neuro symptoms
- Ankylosing spondylitis
- Signs of disc syndrome
- Guillain-Barre' syndome
- Cauda equina syndrome
- Hand infections
- Acute hand tendon tears
- Any fracture
- Severe ankle sprains
- Severe foot infections or ingrown toenails
- Severe ischemia or gangrene
- Acute sports injuries -especially knee

Sub-acute Orthopedic Red Flags

- Any new complication of autoimmune arthritis
  - Peripheral neuritis, pericarditis, pulmonary fibrosis
- Any new lupus
- Lyme disease arthritis
- Acute low back pain not responding to care
- Nerve root compression syndrome
- Bunions, neuromas, plantar fascites, heel spurs
- Moderate and severe ankle sprains
- Soft tissue tumors
- Tendonitis