Class 1 Notes

Orthopedic Assessment

Total musculoskeletal assessment (Orthopedic assessment)

1. First time patient - Comprehensive Patient history
    a. CC
    b. HPI
    c. PMH
    d. FH
    e. SH
    f. ROS
2. Previous patient, existing patient, local trauma/injury
    a. CC
    b. HPI
3. Observation/Inspection
    a. Patient must be adequately undressed.
    b. Tell patient what you are doing & why.
    c. Remember, “normal” covers a wide range.
    d. Posture
    e. Alignment abnormalities
    f. Bony & soft tissue contours
    g. Deformities
    h. Defects (visual or function)
    i. Asymmetries
    j. Scars & other skin changes
    k. Inflammation
    l. Gait
    m. Patient attitude/ willingness to cooperate
    n. Overt pain behavior – Guarding, Bracing, Rubbing, Grimacing, Sighing
4. Examination
    a. Tissue types examined: Contractile (muscles, tendons, insertions), Inert (ligaments, joint capsules, fascia, periosteum, bursa, meniscus), Neurological (nerve roots, nerve trunks, peripheral nerves)

b. AROM (active range of motion) – patient dose movements without assistance. Most of the time concentric. On AROM determine: When and where during each movement pain occurs, whether movement increases intensity and quality of pain, Reaction of patient to pain, Amount of observable restriction, Pattern of movement, Rhythm and quality of movement, Movement of associated joints, Willingness of patient to move part, Any limitations and its nature. Causes of active movement abnormalities:
   - Pain
   - Muscle weakness
   - Muscle paralysis
   - Muscle spasm
   - Tight or shortened structures
   - Altered length-tension relationships
   - Neuromuscular factors
   - Joint-muscle interaction
c. PROM (passive range of motion) – examiner is moving body part (joint) through the allowed range of motion. Test for end feels:
   - Normal: bone to bone, tissue approximation, tissue stretch
   - Abnormal: Muscle spasm, Spasticity, Bone to bone, Empty, Springy block, soft capsular
d. RIM (resisted isometric movements)
   - Contractile Tissue: contraction, stretching, compression
   - Nervous Tissue (motor nerve): contraction
   - Does contraction cause pain?
   - Strength of contraction
   - Type of contraction causing problem: Concentric (muscle shortens), isometric (no change in muscles length), eccentric (muscle elongates)

5. Special test
   a. Used to determine if disease, condition, or injury is present
   b. Also known as clinical accessory, provocative, motion, palpation, or structural tests
   c. Dependent on sensitivity and specificity
   d. They are never used alone or in isolation.

    e. Most accurate: Immediately after an injury (tissue shock), Under anesthesia, In chronic conditions
    f. If positive, they are strongly suggestive of a particular problem.
    g. If negative, they do not necessarily rule out the problem.
    h. Literature has shown that most special tests are not overly reliable and do not show good specificity or sensitivity
6. Dermatomes, Myotomes, Sclerotomes
7. Reflexes
    a. Deep tendon
    b. Superficial
    c. Pathological
8. Joint play movement
    a. An accessory movement that the patient cannot do actively that occurs at a joint
    b. Without this movement being available, the joint will not move through its normal physiological range of movement.
9. Palpation
    a. Discriminate between differences in tissue tension
    b. Discriminate between differences in tissue texture & thickness
    c. Identify different structures, tissue types, textures, & shapes
    d. Feel differences in tissue temperatures
    e. Note abnormal sensation
    f. Differentiate different types of swelling
    g. Identify abnormalities
    h. Determine joint tenderness
    i. Feel pulses, tremors, & fasciculations
10. Lab tests
    a. CBC
    b. CMP
    c. ESR, CRP
    d. Autoantibodies
11. Diagnostic imaging
    a. X-rays (roentgenograms): plain film radiography
    b. Arthrography
    c. Computed arthrography (CT arthrography)

d. Venogram & arteriogram
e. Myelography
f. Tomography & computed tomography (CT scan)
g. Radionuclide scanning (scintigraphy): bone scan
h. Discography
i. Magnetic resonance imaging (MRI)
j. Fluoroscopy
k. Diagnostic ultrasound

12. Referral

Common or concerning symptoms

1. Joint pain – OLD CHARTS, SIQOR AAA
   a. Location
   b. Quality
   c. Severity
   d. Frequency
   e. Onset and timing
   f. Alleviating/Remitting factors
   g. Aggravating/ Exacerbating factors
   h. Associated manifestations
2. Neck pain
   a. Radicular pain signals spinal nerve compression and/or irritation. Any level can be affected, but the C6 and C7 levels are most common. Unlike low back pain, foraminal impingement from degenerative joint changes is more common (70% to 75%) than disc herniation (20% to 25%)
3. Red flags for low back pain from underlying systemic disease
   a. Age <20 years or >50 years
   b. History of cancer
   c. Unexplained weight loss, fever, or decline in general health
   d. Pain lasting more than 1 month or not responding to treatment
   e. Pain at night or present at rest
   f. History of intravenous drug use, addiction, or immunosuppression
   g. Presence of active infection or human immunodeficiency virus (HIV) infection
   h. Long-term steroid therapy

i. Saddle anesthesia
j. Bladder or bowel incontinence
k. Neurologic symptoms or progressive neurologic deficit
l. Lower extremity weakness

General red/yellow flags

Red flags (referral)

1. Cancer
   a. Persistent pain at night
   b. Constant pain anywhere in the body
   c. Unexplained weigh loss (10-15 or 4.5-6.8 kg in 2 weeks)
   d. Loss of appetite
   e. New, unusual lesions, lump, mass
   f. Ulcers/erosions/sores that does not heal
   g. Unexplained bleeding or discharge
   h. Unexplained cough, hoarseness
2. Cardiovascular
   a. Shortness of breath
   b. Dizziness
   c. Pulsating pain
   d. Pain/discomfort/heavy feeling in the chest
   e. Change in the skin color of hands and feet
   f. Swelling with no history of injury
   g. Fainting
3. GI/GU
   a. Frequent or severe abdominal pain
   b. Nausea and vomiting
   c. Bowel habit changes
   d. Urination habit change
   e. Changes in menstruation
4. Neurological
   a. Sudden weakness
   b. Pins and needles
   c. Severe headache

d. Problems with balance and coordination
e. Changes in vision
f. Problem's swallowing
g. Fainting

5. Other
    a. Fever
    b. Night sweats
    c. Swelling and/or redness without history of injury

Yellow flags (Further examination)

1. Multiple inflamed joints
2. Progressive gait disturbance
3. Psychosocial stress
4. Multiple nerve root involvement
5. Neurological symptoms
6. Bilateral symptoms
7. Unusual (abnormal) signs and symptoms

Yellow flags (outcome of treatment, patient adherence to treatment)

1. Something that can alter assessment and treatment
2. Divorce, marital problems. Financial, job stress
3. Psychological stress – can increase pain and symptoms
4. Actual pain level would be 4, but patient feels it as 8

Musculoskeletal pain

1. Sharp, dull, superficial
2. Generally, lessens at night
3. Aggravated by mechanical stress
4. Associated with movement, trauma and overuse
5. Alleviated by rest, reduced movement, can be better at night

Systemic pain

1. Deep, aching, throbbing
2. Not affected by movement

3. Constant waves of pain and spasm
4. Disturbs sleep
5. Progressive symptoms

6. Associated – fever, weight loss, skin rash, weakness, signs of infection, migratory arthralgias, jaundice,

Neuropathic Pain

1. Nerve, bone, vascular, & muscle pain
2. Follows specific anatomical pathways
3. Affects specific anatomical structures (e.g., ankle sprain)

Somatic Pain

1. Severe chronic, aching pain
2. Degree inconsistent with injury or pathology
3. Cannot be explained by physical cause (e.g., psychosomatic pain)

Duration of pain/condition

1. Acute conditions – that is present for 7 to 10 days. I twisted my ankle 2 days ago and it is still swollen and painful.
2. Subacute conditions – that is present for more than 10 days and up to 7 weeks. I twisted my ankle 4 weeks ago, still swollen and painful.
3. Chronic conditions – that is present for more than 7 weeks. I twisted my ankle 3 month ago, still painful and swollen

Pain

1. Pain not associated with rest of activity – bone pain, organic/systemic pain, other severe pathology
2. Pain with activity that decreases with rest – mechanical pain – stretched, pinched, contracted
3. Pain and stiffness in the morning, which improves with activity – chronic inflammation, edema that decreases with activity

4. Pain and aching increased as the day progresses – overstressed joint with increasing congestion (Swelling)

Possible associations between pain and structure

1. Dull, aching, cramping (hard to localize) – muscle
2. Dull, aching – ligament and joint capsule
3. Dull, deep, nagging – bone
4. Sharp, shooting – nerve root
5. Sharp, bright, lighting like, - nerve
6. Burning, pressure like, stinging – sympathetic nerve
7. Throbbing/pulsating diffuse – vascular

Organ (that includes muscle) induced pain can radiate and can be felt in more distant areas.

Patient presents with dull, aching pain on the lateral side of upper arm, which increased on abduction of the shoulder joint. Injury to what structure most likely produces this pain? Supraspinatus, infraspinatus, teres minor

4-point assessment of pain and limitation (Roles-Maudsley score)

1. Grade 1 – Excellent – no symptoms, no pain, full movement and activity
2. Grade 2 – Good – occasional discomfort, full movement and activity
3. Grade 3- some discomfort after prolonged activity
4. Grade 4 – pain limits activity

Decreased ROM, locking, difficulty unlocking, instability, giving away

1. Decreased ROM – limitations of normal ROM allowed in particular joint. (shoulder joints limitation does not allow to raise hand above head).
2. Locking
3. Giving away – reflex inhibition of muscle or muscle weakness
4. Laxity or normal hypermobility
    a. Laxity – excessive ROM, but good muscle control of movement – ligaments and joint capsule
        - (Flexibility – muscle tissue resistance and effect of ligaments and joint capsule)
5. Instabilities

a. Anatomical instability – (clinical or gross instability, pathological hypermobility – at the end of the ROM patient feels that joint will dislocate or subluxation
b. Transitional instability – mechanical instability, loss of the control of small joint movements (Slide, roll, spin) when the patient tends to stabilize the joint during movement
c. Function instability – either anatomic or transitional, or both

Reaction to stress

1. Ache and pains
2. Anxiety
3. Changes in appetite
4. Chronic fatigue
5. Difficulty concentration
6. Difficulty sleeping
7. Irritability and impatience
8. Muscle tension
9. Tension headache
10. Sweaty hands

Deformities that can be observed

1. Structural deformities – present at rest, changing positions and movement
   a. Torticollis
   b. Fracture
   c. Scoliosis
2. Function deformity – appears in certain postures and disappears in other postures
   a. Scoliosis do to shortness of one leg – on standing scoliosis on bending forward no scoliosis
3. Dynamic deformity – deformity is caused by muscle contraction
   a. Not noticeable during the rest

Principles of orthopedic examination

1. Vital signs have to be done

2. Tell the patient what are you doing
3. Test the normal (uninvolved) side, first
4. Order of exam: AROM, PROM, RIM
5. Do painful movement last
6. End feel – apply overpressure with great care
7. Repeat the movements, or ask the patient to sustain posture
8. Resisted isometric movements (RIM) should be done in resting position
9. AROM – tests patient ability to move
10. PROM – remove muscle out of picture and is testing joint capsule and ligaments
11. RIM – challenges muscle without the movement
12. Myotome testing - hold resistance for at least 5 seconds
13. Warn patient for possible exacerbations
14. Refer if necessary

Dermatomes and Myotomes

Dermatomes (landmarks for spinal cord injury)

V1 – ophthalmic branch – forehead, nose

V2 – maxillary branch – face, nares to the top lip (over maxilla)

V3 – mandibular branch – face, bottom lip to jaw (over mandible)

C2 – occipital protuberance, superior aspects of posterior head

C3 – supraclavicular fossa, anterior neck, posterior neck and head

C4 – lower neck, upper shoulders, over the acromioclavicular joint

C5 – Lateral arm

C6 – lateral forearm, radial side of the hand and thumb

C7 – mid hand and middle finger

C8 – ulnar side of the forearm, hand, ring finger and little finger

T1 – medial aspect of the forearm

T2 – upper chest and back, the apex of the axilla, medial arm

T3 – upper chest and back at the level of lower axilla

T4 – upper chest and back at the level of nipple

T5 – mid chest and back at the level just inferior to the nipple

T6 – mid chest and back at the level of xiphoid process

T7 – upper abdomen and mid back

T8 – upper abdomen and mid back

T9 – upper abdomen and mid back

T10 – mid abdomen and back at the level of umbilicus

T11 – lower abdomen and mid back

T12 – lower abdomen and mid back just superior to pelvic girdle

L1 – lower back, hips, groin, and pelvic girdle superior to inguinal canal

L2 – lower back, anterior thigh below inguinal canal

L3 – lower back, medial side of thigh (femoral condyle), medial upper leg

L4 – lower back, medial side of the leg and foot, medial malleolus, medial surface of great toe, patella

L5 – lower back, anteriolateral aspects of leg, dorsal/plantar surface of foot lateral surface of big toe and toes 2,3,4

S1 – lower back, posterior thigh, lateral malleolus, lateral foot, fifth toe

S2 – buttocks, genitals, back of thigh, popliteal fossa, posterior calf

S3 – medial buttocks, ischial tuberosity, genitals

S4 – perianal area, genitals

S5 – perineal area, skin adjacent to the anus

Co1 – buttocks, coccyx

Myotomes

C2 – Neck flexion

C3 and CN XI– Lateral neck flexion

C4 and CN XI – shoulder elevation (shrugs)

C5 – shoulder abduction, external (lateral) rotation; and elbow flexion

C6 – supination at the elbow joint and wrist extension

C7 – elbow extension, wrist flexion and finger extension

C8 – thumb extension and finger flexion

T1 – finger abduction and adduction

L2 – hip flexion

L3 – knee extension

L4 – ankle dorsiflexion

L5 – great toe extension, toe extension

S1 – ankle plantarflexion

S4 – bladder and rectum motor supply

Review peripheral nerves

1. Cervical plexus (C1-C4) – phrenic nerve
2. Brachial plexus (C5-T1)
    a. Musculocutaneous – biceps