

MUSCULOSKELETAL INJURIES AND POSTURAL DYSFUNCTIONS

CLASSROOM EXPECTATIONS

- Be on time!
- The textbook supplements the powerpoints, read the chapters for further understanding, textbook material examinable
- Interactive class, need participation otherwise...zzzzzzzzzzzzzzzzzzzzzzzzz
- Do not be afraid to ask questions!
- Disruptive behaviour (talking, cell phones...) is not tolerated
- Be prepared– have your textbook on your desk and ready to be used
 - Have your linens present for all classes
- RESPECT!!! – respect yourself!– by being present and giving your best. Respect your classmates- treat them how you would want to be treated. There will be absolutely no negative comments about anyone's bodies tolerated.
- Respect your instructors.
- Listen and be attentive

TOPICS TO BE COVERED

Not necessarily in this order

- Fascial and muscle imbalances
 - ITB friction syndrome
 - Patellofemoral syndrome
 - Hyperlordosis/ kyphosis
 - Scoliosis
 - Pes planus
 - Pain syndrome management
-

PAIN MANAGEMENT

DEFINITION

- Pain perception is a product of nociceptive input that is progressively modified at the spinal cord and brain levels to provide a perception of pain, which may have little to do with the initial stimulus intensity.
- “Pain has many valuable functions. It often signals injury or disease, generates a wide range of adaptive behaviours, and promotes healing through rest. Despite these beneficial aspects of pain, there are negative features that challenge our understanding of the puzzle of pain, including persistent phantom limb pain after amputation or total spinal cord transection. Pain is a personal, subjective experience influenced by cultural learning, the meaning of the situation, attention, and other psychological variables.”
- *Reference: WIREs Cogn Sci 2013, 4:1-15. doi: 10.1002/wcs.1201*
- Physical pain- signals the presence of noxious, tissue-damaging conditions.
- Emotional pain- an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage

PHYSIOLOGY OF PAIN

- Nociceptors are the receptors for pain. They are free nerve endings found in every tissue of the body except for the brain.
- Intense thermal, mechanical or chemical stimuli can activate nociceptors.
- Tissue irritation or injury releases chemicals (prostaglandins, kinins, potassium ions) that stimulate nociceptors
- Pain may persist long after the pain-producing stimulus is removed because pain-mediating chemicals linger, and because nociceptors exhibit very little adaptation. This phenomenon is the focus of much investigation. Current research suggests that pain persistence may also be the result of stimulus arising from the glial cells within the CNS.

TYPES OF PAIN

- There are 2 types of pain, fast and slow
- Fast pain
 - Occurs usually within 0.1 seconds after a stimulus is applied
 - Nerve impulse transmits along a medium diameter myelinated A fiber
 - This pain is also known as acute, sharp, pricking
 - Fast pain is not felt by deeper tissues of the body
- Slow pain
 - Occurs a second or more after the stimulus is applied
 - It then gradually increases in intensity over a period of several seconds/ minutes
 - Nerve impulses are transmitted along unmyelinated C fibers
 - This type of pain is also referred to as chronic, burning, aching or throbbing pain
 - Slow pain can occur in skin and deeper tissue, or internal organs
- Fast pain = pin prick
- Slow pain = toothache

GATE CONTROL THEORY

- Melzac and Wall's Gate Control Theory of Pain- The “gate” is a network of nerves in the spinal region. When closed the gate can block the transmission of slow moving small fiber pain impulses to the brain. The blocking occurs by stimulating the larger, fast moving sensory nerve fibers through stimulation of the proprioceptive and cutaneous nerve receptors. Therefore pain intensity can temporarily be reduced over a period of minutes or hours through additional sensory input. The closing of the “gate” can be achieved by:
 - -Instinctively rubbing, massaging or brushing the skin the way one does when injured.
 - -Deep focal massage including frictions
 - - Rhythmic movement of the body including oscillations of joint play techniques.

ACUTE PAIN

- Either a symptom of a disease condition or a temporary aspect of medical treatment
- Acts as a warning sign
- It is usually of sudden onset and easily localized
- Client can usually describe the pain and usually subsides with or without treatment

CHRONIC PAIN

- Is a major health problem for approximately 25% of the population
- It is pain that persists or recurs for indefinite periods, usually longer than 6 months
- Usually has an obscure onset and characteristics and quality changes over time
- Anxiety, sleep disturbances and depression are common
- Usually diffuse and poorly localized
- Affected and modified by the following: culture, environment, emotional state, sleep deprivation, opiate effects, gender, patient related activities such as cigarette smoking or continued heavy labour with multiple re-injuries.

UNTRACEABLE PAIN

- When chronic pain persists even when treatment is provided or when it exists without certain disease
- Represents a great challenge to all health care professionals

REFERRED PAIN

- A type of pain that may be felt in a surface area from a stimulated organ
- In general the area to which the pain is referred and the visceral organ involved receive their innervation from the same segment of the spinal cord
- Referred pain can also be a result of a trigger point in a nearby muscle belly

FUNCTIONAL OR PSYCHOGENIC PAIN

- Believed to arise from emotions or the psyche.
 - It is experienced as though it originates from a disorder.
-

STRUCTURES AND RELATED PAIN DESCRIPTIONS

- Nerve pain – tends to run in the distribution of the specific nerve
- Nerve root: sharp, shooting
- Nerve: sharp, bright, lightening like
- Sympathetic nerve: burning, pressure like, stinging and aching
- Bone pain – deep, boring, nagging and localized Fracture: sharp, severe, intolerable
- Vascular pain – diffuse, throbbing, aching and poorly localized and can be referred to
- other areas of the body
- Muscle pain – hard to localize, dull and aching, cramping, often aggravated by injury and may refer to other area
- Ligament or joint capsule pain – dull, aching
- Somatic Pain – arises from stimulation of receptors of the joints, muscle, tendons and periosteum (layer of tissue enveloping the bones).
- Visceral Pain – results from stimulation of receptors of the internal organs
- Cutaneous pain- from superficial tissue damage. It is described as being bright, burning and well localized.
- Radicular pain- associated with nerve root compression. Sharp shooting pain may be accompanied by other neurological signs such as paresthesia corresponding to a dermatome or muscle weakness.
- Kick back pain- post treatment soreness for hours or days after a treatment. Can be prevented by using proper sequencing of techniques. general –specific- general and superficial- deep- superficial

SYSTEMIC PAIN

- Disturb sleep
- Deep aching or throbbing
- Reduced by pressure
- Constant or waves of pain and spasm
- It is not aggravated by mechanical stress

Associated with the following ...

- Jaundice
- Migratory arthralgias
- Skin rash
- Fatigue
- Weight loss
- Low-grade fever
- Generalized weakness
- Cyclic and progressive symptoms
- Tumors
- History of infection

MUSCULOSKELETAL PAIN

- Generally lessens at night
- Sharp or superficial ach
- Usually decreases with activity
- Usually continuous or intermittent
- Is aggravated by mechanical stress

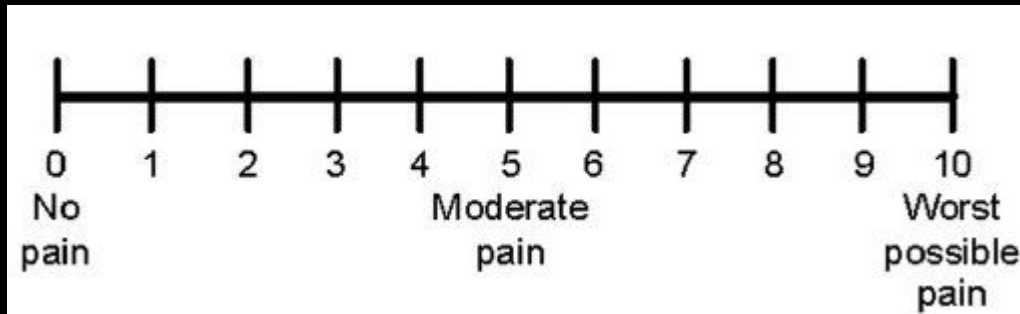
EFFORTS TO MODULATE OR REDUCE PAIN:

- Anesthetic (local) or analgesics (pain killers)
 - Hot and cold applications
 - Pressure
 - Epidural
 - Behavioural training
 - Meditation
 - Relaxation
-

ASSESSMENT

PAIN SCALES

- There are many different ways to measure pain.
- Chart formation (VAS)



- The Wong-Baker faces scale gives children and elders a useful way to communicate pain.



QUESTIONNAIRE

- Does the client have pain now?
- Where is your pain? (circle on a human figure)
- What does your pain feel like?
pulsing, beating, throbbing, pounding, jumping, flashing, shooting, pricking, stabbing, drilling, sharp, cutting, lacerating, pinching, pressing, cramping, tugging, pulling, wrenching, hot, burning, searing, tingling, itchy, stinging, dull, aching, sore, tender, taut, splitting
- How does your pain change with time?
- Does the pain move?
 - Ex. does it start in one place such as the back of the head and move to another place such as the forehead.

QUESTIONNAIRE CONT

- Which word would you use to describe the pattern of your pain?

Continuous rhythmic brief steady periodic
momentary consistent intermittent transient sporadic

- How strong is your pain?
 - *Mild/annoying*
 - *Uncomfortable*
 - *Dreadful*
 - *Horrible*
 - *Agonizing/excruciating*
-

NUMERICAL SCALE 1- 5

- On a scale of 0 – 5 how would you rank your pain.
 - 0 – no pain at all
 - 1 – little pain
 - 2 – moderate pain
 - 3 – quite bad pain
 - 4 – very bad pain
 - 5 – the pain is almost unbearable

TEN PAIN QUESTIONS:

- Location of complaint
 - Onset of the pain
 - Radiation of pain
 - Duration of complaint
 - Frequency of pain
 - Intensity of the pain
 - Character of the pain
 - Aggravating factors
 - Relieving factors
 - Associated symptoms
-

McGill Pain Questionnaire

Following is the short form of the McGill Pain Questionnaire (SF-MPQ). The long form (MPQ) takes 10-15 minutes to complete, while the short form should take 2-3. This is the most widely used instrument to measure pain clinically.

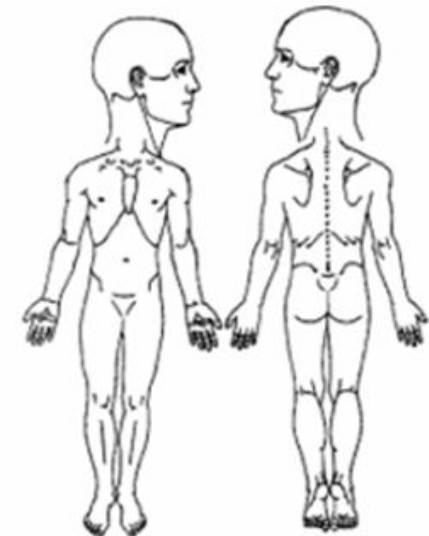
SHORT FORM MCGILL PAIN QUESTIONNAIRE and PAIN DIAGRAM

Date: _____

Name: _____

Check the column to indicate the level of your pain for each word, or leave blank if it does not apply to you.____

		Mild	Moderate	Severe
1	Throbbing	_____	_____	_____
2	Shooting	_____	_____	_____
3	Stabbing	_____	_____	_____
4	Sharp	_____	_____	_____
5	Cramping	_____	_____	_____
6	Gnawing	_____	_____	_____
7	Hot-burning	_____	_____	_____
8	Aching	_____	_____	_____
9	Heavy	_____	_____	_____
10	Tender	_____	_____	_____
11	Splitting	_____	_____	_____
12	Tiring-Exhausting	_____	_____	_____
13	Sickening	_____	_____	_____
14	Fearful	_____	_____	_____
15	Cruel-Punishing	_____	_____	_____



Mark or comment on the above figure where you have your pain or problems.

Indicate on this line how bad your pain is—at the left end of line means no pain at all, at right end means worst pain possible.

No Pain	_____	Worst Possible Pain
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S	/33	A	/12	VAS	/10
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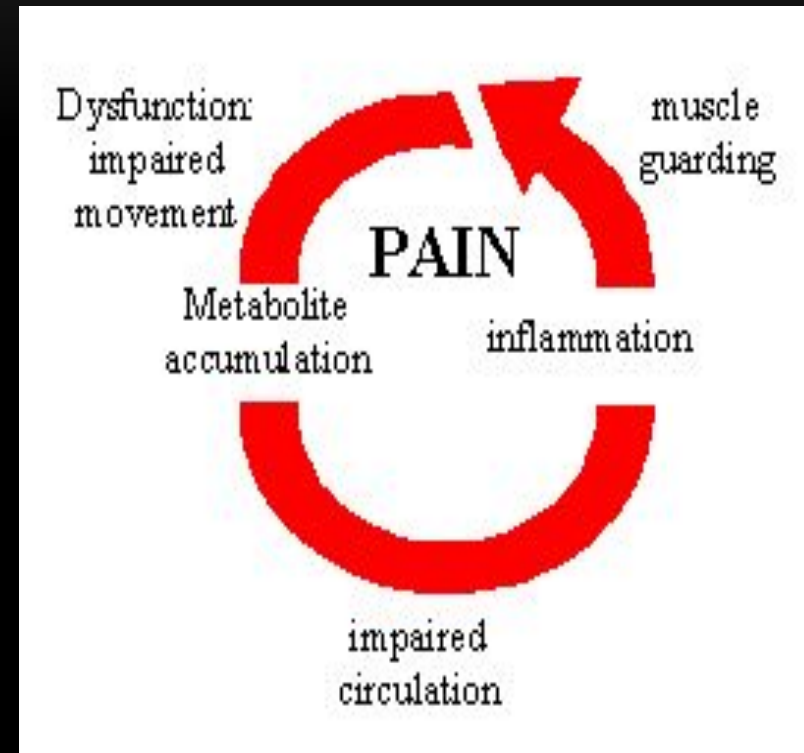
PURPOSE OF PAIN ASSESSMENT

MASSAGE AND PAIN

- Massage is believed to decrease local and referred pain by increasing circulation, thereby reducing ischemia
- Massage is believed to stimulate the release of endorphins (pain reducing neuro-chemical)
- General relaxation brought on by massage also has a diminishing effect on pain perception/awareness
- The pressure of massage may interfere with pain information entering the spinal cord by stimulating pressure receptors

CONT...

- Massage interrupts the pain cycle by relieving muscular spasms, increasing circulation and promoting rapid disposal of waste products
 - Pain cycle is initiated when painful stimuli result in reflex muscle contraction and local muscle guarding. The local muscle guarding restricts movement and decrease local circulation, which allows for an increase in swelling due to lack of oxygen and build up of metabolic waste. The increase in swelling creates more pain and the muscle guarding intensifies and the cycle repeats itself.
- Pain Threshold – is the point at which a stimulus is perceived as painful
- Pain Tolerance – refers to the length of time or intensity of pain that the person endured before acknowledging it and seeking relief



TREATMENT CONSIDERATIONS

- All techniques are viable as long as the application is maintained within the client's pain tolerance
- Increasing circulation and reducing sympathetic nervous system stimulation is the primary focus of treatment
- Massage can provide symptomatic and/or temporary relief from pain
- Massage may be able to decrease the stress associated with chronic pain
- Lighter depth of technique and application may be indicated, but do not make assumptions! Always check-in with the client and confirm their comfort.
- Utilizing hydrotherapy to assist in pain reduction prior to and post treatment may be indicated, however keep in mind the effects of the application. Cold hydrotherapy can decrease the client's ability to appropriately sense pain and pressure.
- Use your principles of treatment to stay within the client's pain tolerance, while still effectively applying the techniques in order to achieve the desired outcome.

CONTRAINDICATIONS/PRECAUTIONS

- Clear communication is a priority for patients suffering with pain. Do not engage in a treatment unless consent and communication are possible
- Avoid any painful techniques that will aggravate the already painful area
- Treatment should not be so long and vigorous as to fatigue the client
- Awareness of medications the client might be taking and their side-effects
- Deep and invasive work may need to be avoided based on the clients presentation
- Caution with certain assessment techniques may be required, for example PROM and RROM
- Hydrotherapy may need to be adjusted for the individual needs of the client
- Circulatory techniques to distal structures may painfully increase circulation to proximal structures
- Therapeutic exercises and homecare may need to be adjusted for the individual needs of the client

VISCERAL AND OTHER SYSTEMIC PATHOLOGY

PAIN REFERRAL PATTERNS

When results from assessment and testing are negative or inconclusive for a neuromusculoskeletal source of the pain there can be other referral patterns.

Angina

- perceived as mild to moderate vice like pressure
- usually lasting less than 10 minutes
- pain is located mostly along the sternum and left shoulder and down the left medial arm to the fingers.
- Rest or nitroglycerin relieves the pain

Pericarditis

- pain is continuous, moderate to severe and sharp
- leaning forward or sitting upright relieves the pain
- pain is concentrated over the sternum

Myocardial Infarction

- pain may be along the sternum and left shoulder and down the left medial arm, and also
- localized to the sternum, anterior neck and upper abdomen.
- pain is burning vice like and severe.
- lasting for approximately 30 minutes to 1 hour
- there are no relieving factors

Anxiety attack

- this is localized, non radiating stabbing pain, pressure or burning
- commonly located over the substernal area
- pain is relieved by relaxation rest and medication

Pleural

- sharp pain that is located close to the chest wall and is made worse by coughing,
- inspiration and movement
- palpation will not localize the pain
- possible causes include infectious disease, rib fractures, pneumothorax and pulmonary embolism

Breast

- pain is located in the breast itself and down the medial side to the affected arm
- this is a sharp, intermittent to constant aching pain, with possible signs of inflammation and edema of the breast tissue
- relief is gained temporarily through ice and rest
- possible causes include mastitis and benign or malignant tumors

Esophagus

- pain is projected around the anterior thorax at the level of the lesion
- the client feels a sharp, burning pain often associated with eating
- an esophageal stricture due to reflux or spasm may be the cause

Stomach and Duodenum

- pain is inferior to the xiphoid process which is occasionally referred to as the T-6 through
- T-10 vertebral level
- pain is mild to severe waves of aching cramp-like pain
- the pain is associated with eating
- possible causes are peptic ulcers and carcinoma including Kaposi's sarcoma

Small Intestine

- pain is located anteriorly around the umbilicus and posteriorly in the lumbar area
- pain is cramping and intermittent
- pain may not be relieved by defecation
- symptoms may be due to Crohn's disease, an increase in intestinal motility or neoplasm

Large Intestine

- poorly localized lower abdominal pain
- cramping and dull nature
- There may be constipation or diarrhea with relief often occurring after defecation
- Crohn's disease, ulcerative colitis, irritable bowel syndrome, long-term antibiotic use or carcinoma may be causes

Appendix

- right lower quadrant of the abdomen
- well localized, moderate to severe aching pain
- pain is first referred around the umbilicus, then to the right groin and upper thigh
- pain worsens over time and is associated with nausea, vomiting and fever

Liver

- pain is local to the right upper quadrant of the abdomen with a possible referral to the
- right shoulder and associated pain between the scapulae
- pain is dull and constant increasing over time or after exertion
- possible causes include hepatitis A or B (fever, jaundice, fatigue and malaise are often present) , cystic tumors, abscesses and cirrhosis (pallor and bleeding disorders are often present)

Gallbladder

- pain is located below the xiphoid process and into the right upper quadrant of the abdomen. There is a possible referral pattern to the right shoulder blade and between the scapulae
- the pain is dull and aching, and increases over two to three hours to become severe
- movement and respiratory inspiration increases the pain
- with gallstones, the pain and nausea occur several hours after eating
- with gallbladder inflammation, the pain strikes immediately after eating
- there is an intolerance of fatty food
- with prolonged obstruction the skin may be jaundiced or appear greenish

Common Bile Duct

- Location and referral pattern are similar to gallbladder pain
- dull and aching at first the pain steadily and constantly increases over a three to four hour period
- other symptoms include nausea after eating, fatty food intolerance and jaundice
- gallstones, common bile duct stricture and pancreatic carcinoma are possible causes

Pancreas

- pain is located inferior to the xiphoid process and typically is also referred to the left
- shoulder or low back
- constant burning , gnawing, severe pain of sudden onset can be accompanied by vomiting
- if the symptoms are related to digestion, pancreatitis may be a cause. If the symptoms are not related to digestion, the cause may be carcinoma

Kidney

- pain is usually located in the posterior costovertebral and subcostal regions on the side of
- the affected kidney. There may be a referral to the ipsilateral abdomen.
- chronic problems usually exhibit poorly localized, constant, dull and aching pain
- acute problems exhibit intense and severe pain sometimes accompanied by nausea'
- changing position does not relieve the pain and hyperesthesia of the T-9 and T-10 dermatomes occurs.
- the pain may arise from a prerenal impairment of blood flow, such as hypertension or heart failure, renal tissue damage from infection, diabetes mellitus or lupus and post-renal blockage due to calculi or tumors of the ureters or urethra.

Ureter

- pain at the costovertebral angle and referring into the ipsilateral lower abdomen and upper thigh are associated with passing calculi (kidney stones)
- excruciating waves of colicky pain are present
- hyperesthesia of T-10 and L-1 dermatomes is present
- pain is unrelieved by changing position

Bladder

- pain is felt in the lower abdomen and the suprapubic area
- pain is localized and sharp
- pain is intermittent and may be relieved by urination, which may be urgent and accompanied by a burning sensation.
- some possible causes are infection, tumor and an enlarged prostate gland

GROUP READ

- Page 10 RATTRAY
 - Massage and pain control

Page 513 RATTRAY follow along and highlight the points

FASCIAL AND MUSCLE IMBALANCES

NORMAL POSTURE CURVES

- At birth, the spine is in flexion (primary curve).
- At 3 months as the infant holds up their head, the secondary cervical lordotic curve forms.
- Between 6-8 months when the child starts to sit and walk the lumbar lordotic curve forms.
- The knees have a varus orientation until about 18 months of age.
- After this a valgus orientation is seen until the child reaches about 3 yrs old. This usually straightens out by 6 yrs old
- For a child it is normal to have an increase in the lumbar lordotic curve or hyperlordosis

THEORIES ABOUT POSTURAL DYSFUNCTIONS

- **Functional** posture change means that the soft tissues, such as muscles, fascia and ligaments, have adapted by either shortening or lengthening.
 - Because this is soft tissue it can be altered
- **Structural** postural change means that the bones have altered shape due to a pathological process or malformation. I.e. Vertebrae may be wedge shaped or only half formed.
- Bony changes that are present cannot be altered by the client or therapist. However, soft tissue have also adapted and may be treated to maintain tissue health.

POSTURAL DYSFUNCTIONS CONT...

- Muscles can be categorized into 2 groups according to how they react to dysfunction.
 - **Postural and phasic**
- Skeletal muscles have 2 main types of fibers: slow twitch (type 1) or fast twitch (type2)
- **Postural** have a larger number of slow twitch so this means that they fatigue slowly and respond to disuse or stress by shortening.
- **Phasic** have a larger number of fast twitch these fatigue rapidly and respond to disuse or stress by weakening.
- Postural primarily maintain upright posture- requires endurance
- Phasic are responsible for movement – requires speed
- Most muscles have both functions but one is more predominant
- Specific use of muscles can change the proportion of each fiber type

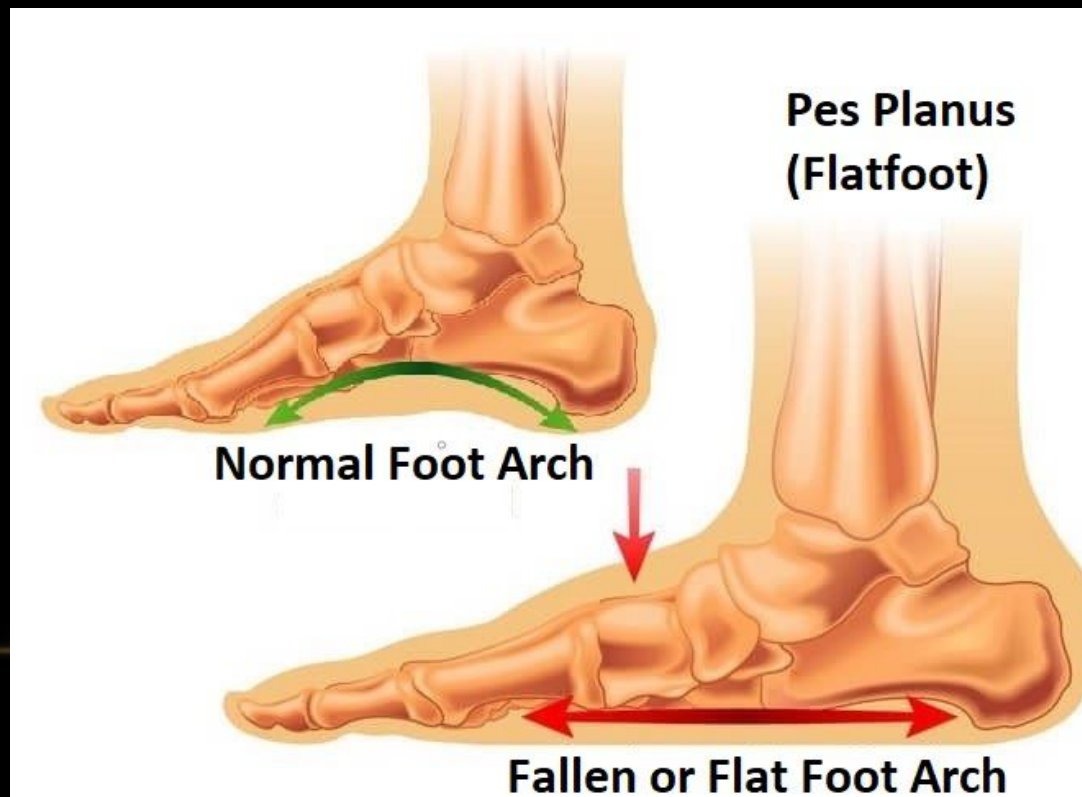


Page 517

PES PLANUS

WHAT IS IT?

- Decreased medial longitudinal arch and pronated hindfoot.
- Functional indicates ligamentous laxity or muscle weakness as a contributor to the condition.
- Structural or rigid pes planus results from bony malformation or change.



CAUSES

- Hypermobility
- Poor biomechanics
- Shortened muscles
- Weakness
- Congenital abnormalities on the bones of the foot
- Congenital abnormalities on the bones of the leg and thigh
- Habitual poor posture
- Nerve lesions
- Trauma
- Footwear

SYMPTOMS

- Pg 521 self read

HEALTH HISTORY

- Group read pg 522 health history questions

OBSERVATION

Gait- Look for pronation in the stance phase of the gait. In a normal gait cycle pronation occurs 15-20% into the contact phase

Postural- Mild pes planus has 4-6 degrees of hindfoot valgus in a standing posterior view

- Moderate pes planus has 6- 10 degrees of hindfoot valgus
- Severe pes planus has 10 -15 degrees of hindfoot valgus
- Achilles tendon has a valgus orientation
- Internal tibial torsion is possible
- Valgus may occur at the knees
- Internal rotation may occur at the hip
- Medial arch is flattened and the foot is pronated
- The talar head bulges medially. There can be redness or a callus where the clients shoe rubs against the talar head
- Valgus orientation of the first metatarsal joint or a bunion may be present.
- The forefoot may be abducted
- With a Morton's foot , the head of the second metatarsal is longer than the first. There may be callus formation over the heads of the first and second metatarsal
- Check for wear pattern on shoes

PALPATION

- There may be tenderness at –the spring ligament, the navicular and calcaneal attachment of the long plantar ligament and plantar fascia, the first and second metatarsal heads and the first metatarsophalangeal joint as well as muscles and tendons of the leg
- There may be heat on the first metatarsophalangeal joint(bunion) and on the Plantar surface (plantar fasciitis)
- The texture of the skin over the talar head and the first and second metatarsal may be rough and thick
- The intrinsic foot muscles, tib anterior, tib posterior, and long toe flexors are hypertonic and lengthened. Gastroc, soleus, peroneus longus, brevis and tertius are hypertonic and shortened.
- trp's are likely in longus and brevis.

TESTING

- AFOM of the foot, ankle, knee and hip
- PROM of the foot, ankle, superior tibiofibular jt and hip
- ROM of tib anterior, tib posterior and extensor hallucis longus
- Length testing of gastroc, soleus and peroneals

Special Tests

- Functional or structural pes planus test
 - Mortons neuroma test
-

CI'S

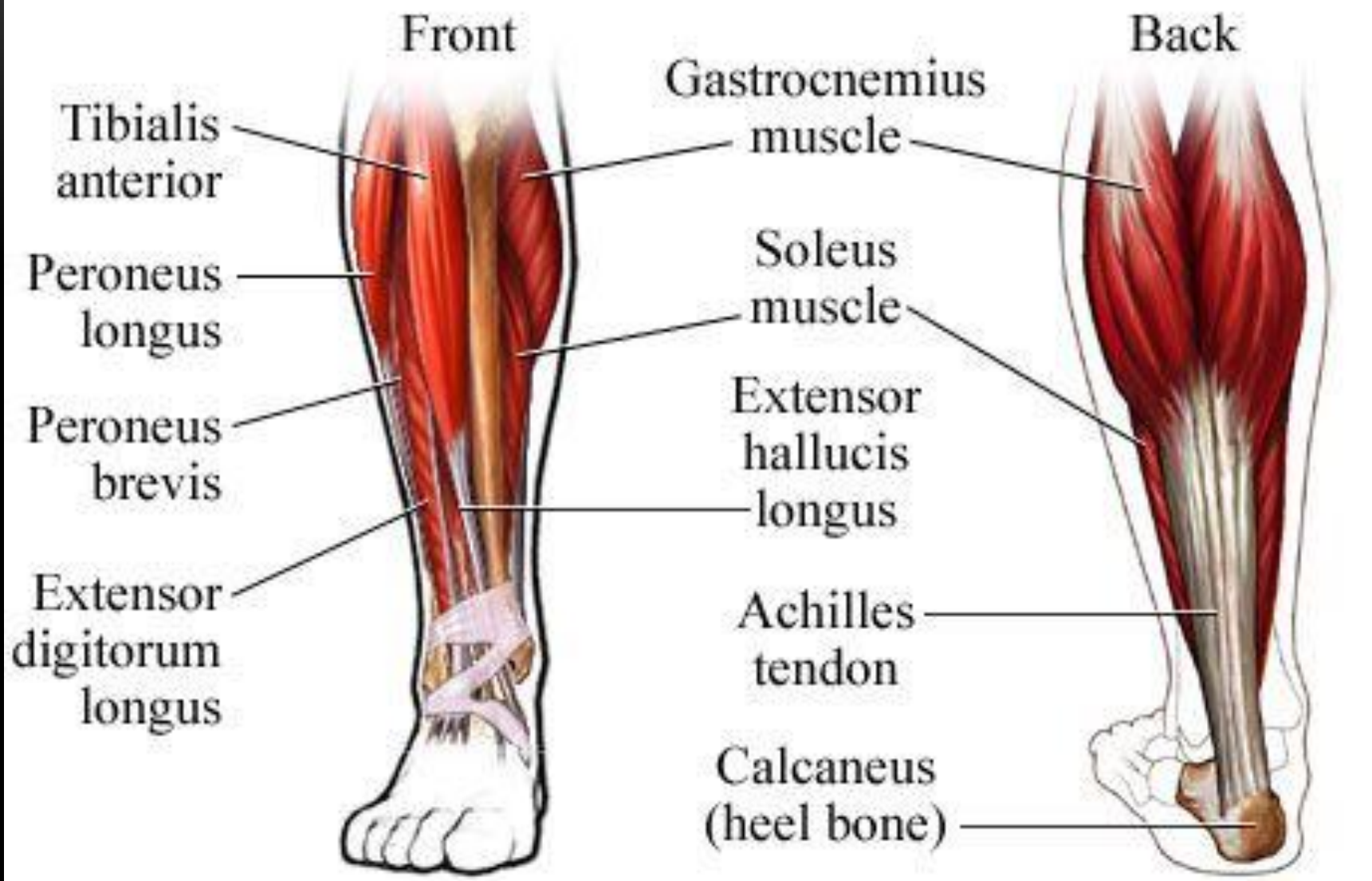
- Do not mobilize the hypermobile joints on the medial longitudinal arch
- Do not passively stretch tib anterior and posterior; since this will allow increased pronation of the foot.
- Avoid using heat on the plantar surface of the foot in the presence of an inflammatory process such as plantar fasciitis.
- Friction techniques are CI'd if the pt is using anti-inflammatory medication

TX PLAN

- With functional pes planus, the therapist lengthens the shortened muscles and the pt strengthens the fatigued muscles.
- With structural pes planus, the therapist maintains tissue health and treats compensatory structures.
- Positioning- start pt prone with pillows under abdomen and under ankles (to reach compensatory structures and to allow heat of hydro to take effect)
- Hydro- pre-tx contrast foot bath to increase circulation. DMH can be used before stretching the fascia of gastroc and peroneals

GENERAL TX

- Done in the context of relaxation tx. This includes diaphragmatic breathing.
- In prone: low back, glutes and thighs are treated with the focus on increasing circulation, reducing hypertonicity and treating hypertonicity. Effleurage, petrissage and muscle stripping.
 - ITB contracture can be treated at this time or left for following tx



SPECIFIC TX

- Reduced fascial restrictions-
 - Treat shortened gastroc with skin rolling crosshand spreading and fingertips spreading
 - Treat peroneals with connective tissue cutting, longitudinal fingertip spreading
 - Treat lateral border of plantar surface **not medial border**

REDUCE HYPERTONICITY

Effleurage, petrissage, wringing, muscle stripping and palmer kneading are used on shortened, hypertonic muscles;

- Gastroc
- Soleus
- All peroneals

Deep muscle stripping is avoided along the distal posterior medial border of the tibia where tibialis posterior is situated (muscle is already lengthened)

REDUCE PAIN AND TRP'S

- TRP's in peroneus longus and brevis should be checked
 - These refer pain into the lateral leg and around the lateral malleolus

REDUCE ADHESIONS

- Frictions may be appropriate on the Achilles tendon and peroneal tendons. Follow with ice and stretch
- Passive relaxed dorsiflexion and inversion of the ankle may be interspersed through the tx. **Eversion is avoided**

STRETCH SHORTENED MUSCLES

- Textbook pg 525

INCREASE CIRCULATION

- Effleurage on post leg and foot
- Turn client supine – work gastroc with hip and knee flexed
 - Pg 525 specific instructions

ENCOURAGE CIRCULATION IN WEAK, TAUT STRUCTURES

- Swedish techniques are used for overstretched muscles supporting the medial longitudinal arch.
- Tib anterior, tib posterior , toe flexors and intrinsic foot muscles are treated using brisk repetitive petrissage, tapotement and point kneading.
- Inferior aspect of tib posterior and flexor digitorum longus may be treated at the inferior medial aspect of the tibia

MOBILIZE HYPOMOBILE JOINTS

- Tibiofibular joint and ankle
- Stretch gastroc and soleus in supine
- Finish with effleurage on entire limb

SELF-CARE PLAN

- Group read pg 526

TREATMENT FREQUENCY AND EXPECTED OUTCOME

- Read pg 527



Pg 529

ILIOTIBIAL BAND CONTRACTURE

WHAT IS IT?

- Group read 529-530

OBSERVATION

- Look for an indent at the lateral aspect of the affected thigh
- There is a lateral pelvic tilt that is low on the affected side
- The knee on the affected side may present as valgus
- Affected foot may have pes planus
- If bilateral there can be an anterior pelvic tilt when viewed laterally
- Hyperlordosis may be present
- Redness or local edema may be observed at the lateral femoral condyle with Iliotibial band friction syndrome

PALPATION

- tenderness at the iliotibial band especially at the distal third section and at the greater trochanter
- Adhesions may be present
- If unilateral, on the affected side increased tone and trigger points are likely palpated in tensor fascia lata and gluteus maximus. On the non contractured side increased tone may be present in iliopsoas and the adductors
- If bilateral there is likely increased tone and possible trigger points in tensor fascia lata, gluteus maximus, rectus femoris, iliopsoas, adductors and quadratus lumborum
- With iliotibial band friction syndrome, heat swelling and point tenderness is present local to the affected lateral femoral condyle

TESTING

- Active free ROM of the affected knee, hip, sacroiliac joint and lumbar spine
- Passive Resistive ROM of the affected knee, hip and sacroiliac joint
- Active Resistive testing of tensor fascia lata, rectus femoris, gluteus maximus, gluteus medius, iliopsoas and quadratus lumborum

SPECIAL TESTS

- Thomas test – length testing of rectus femoris and iliopsoas
- Ely's test – length testing of rectus femoris and iliopsoas
- Ober's test or modified Ober's test – indicate shortened tensor fascia lata or itb
- Nobles test – indicates iliotibial band friction syndrome

CONTRAINDICATIONS

- Do not randomly stretch the fascia. Assess the fascia and only treat areas of restriction.
- Frictions are CI'd if patient is on anti-inflammatory meds

TREATMENT GOAL

- Use palpation and testing to determine whether the treatment focus is on reducing the contractures and fascial adhesions or on the muscular origins and the tibial insertion of the band or both. Is treatment unilateral or bilateral
- Pre TX: Deep moist heat can be applied to the iliotibial band. Hot wax strips can be used if you have access to them. Cool is applied after fascia work or if inflammation is present.

GENERAL TX

- This treatment is performed in the context of relaxation but there is some pain or discomfort possible. This is clearly stated in the consent to treat statement so the client may alter or stop the treatment at any point.
- Ensure the pain is tolerable at all times
- The treatment is started in the prone position with a general low back massage while the hydrotherapy is taking effect, Reduce hypertonicity and tp's.

- Change to a side lying position.
- Reduce fascial restrictions in the iliotibial band
 - skin rolling, crossed hand spreading, and deep longitudinal spreading.
 - c-bow and s-bow. J-stroke is effective on the most adhered tissues
- Reduce adhesions – frictions should always be followed by a stretch and ice
- If **Iliotibial band friction syndrome** is present ice is applied to reduce inflammation and lymphatic drainage techniques are used on the proximal leg.
- Treat tensor fascia lata for any hypertonicity, adhering or trigger points
 - skin rolling, petrissage, cross fiber at iliac crest and around the trochanter
 - golgi tendon release at trochanter
 - muscle stripping and ischemic compressions on trigger points

- Treat gluteus maximus for hypertonicity and trigger points using above techniques
- specific work is finished with effleurage to the lateral leg and gluteals
 - contrast hydrotherapy can be used post treatment
 - the rest of the affected leg is treated, including iliopsoas, quadriceps, hamstrings, adductors and muscles of the lower leg and foot to reduce hypertonicity and trigger points.
 - If there are hypermobile joints at the ankle, superior and inferior tibiofibular joints, knee, hip or sacroiliac –joint play is used
 - Passive relaxed ROM of the hip and knee are interspersed throughout the treatment.

- The iliotibial band is stretched using Ober's test position
- Post isometric relaxation will lengthen tensor fascia lata and stretch any muscles treated for tp's.
- If bilateral turn and treat other leg
- If unilateral treat adductors of non-contracted leg still in sidelying
- Turn prone, then supine for a general massage to increase circulation and decrease hypertonicity in the non contracted leg and to flush the affected side.

SELF CARE

- Group read pg 535 and tx frequency

Page 537

PATELLOFEMORAL SYNDROME

WHAT IS IT?

- Group read page 537-540 (including symptom picture)

ASSESSMENT

- **Postural**

- posterior view- pronation of the foot and a valgus orientation of the knee
- anterior view- with the clients feet parallel, a medial orientation of the patella (squinting patella) may be caused by internal femoral and tibial rotation.
- If patient is able to stand in their normal posture the feet appear externally rotated while the patella seems to have a medial position.
- in a lateral view hyperextension of the knees may be present as may patella alta

- **Gait**

- In an anterior view, the thigh internally rotates and adducts to midline, so the weight bearing foot is placed under the center of the pelvis
- With gluteus medius weakness, a Trendelenburg gait may be present.

- When the client is seated, hypotrophy of the vastus medialis may be noticed.

ASSESSMENT CONT

- **Palpation**

- the medial and lateral borders of the patella reveals tenderness and
 - possible swelling.
- The tissue just medial to the patella is palpated for a vertical taut band that may indicate a plica cord

- AF ROM of the knee may reveal excessive lateral motion of the patella in the first 45 degrees of flexion
- The patella is then lightly palpated for snapping of soft tissue over medial or lateral retinaculum while the client flexes the knee
- PR ROM the patella is palpated for crepitus and to check if the patella tracks in the same manner as in the AF ROM testing.
- Tightness of the lateral retinaculum is present when the patella is mobilized medially.
- The ankle, hip, sacroiliac joints and lumbar spine are also assessed for contributing hypomobility
- AR strength of gluteus medius may be reduced.
- A functional test for hip abductors is a single leg squat, with a weakness revealed by the pelvis dropping on the untested side.
- Length tests of hamstrings reveal reduced knee extension when the hip is first flexed to 90 degrees
- Gastrocnemius may also be short, placing the knee in slight flexion.
- The Q angle is greater than 18 degrees when the client is standing.

SPECIAL TESTS

- Waldron's, McConnell's and Clarke's patellofemoral grind tests are positive
 - A patellar apprehension test may be positive
 - Ober's test is positive with a tight iliotibial band
-
- **Differential Assessment**
 - for patellar tendinitis is pain with compression at the tendinous insertion at the inferior patella and pain at the inferior patella with knee squats.

CI'S

- If any inflammation is present, avoid using hot local hydrotherapy or local techniques, such as friction at the lesion site.
- Full flexion PROM with overpressure is ci'd if this produces pain

GENERAL TX

- The primary focus should be on the compensating structures that have contributed to the condition. I.e ITB friction syndrome
- Positioning can be prone, supine or side lying.
- Hydrotherapy can include deep moist heat on the iliotibial band and lateral retinaculum or contrast application to encourage local circulation.

SPECIFIC TX

- General Swedish techniques are used on the low back and gluteals in the prone position.
- Hypomobile joints in the lumbar spine and sacroiliac joints are mobilized using joint play.
- Fascial techniques are used on the iliotibial band and the hamstrings (same as the iliotibial band contracture)
- Transverse fascial spreading and skin rolling are indicated for the lateral knee and retinaculum
- The patella is mobilized in a medial direction
- Specific petrissage is used on the tensor fascia lata, gluteus medius, hamstrings and gastrocnemius to reduce their tone.
- In supine, adductors and quadriceps muscles are treated with petrissage.
- Muscle stripping and ischemic compressions are indicated in TP's in quadriceps muscles (can refer pain to the knee joint) and TP's in vastus medialis (can cause weakness and buckling of the knee while walking).
- Pain free PR ROM of the knee will help with successive action
- Passive stretches and post-isometric techniques for the shortened hamstrings and gastrocnemius are interspersed throughout the massage.
- Hypomobile joints such as the hip and ankle are treated using joint play.
- Massage the distal leg and foot (using pes planus instructions)
- Repetitive effleurage to the entire leg and thigh

SELF-CARE

- Self read page 542-543

WHAT IS IT?

- Group read 545-547

Page 545

HYPERLORDOSIS

POSTURAL ASSESSMENT

- slight ankle plantar flexion is possible
- slight knee hyperextension is possible
- the hip joints are flexed
- bilateral anterior pelvic tilt is greater than 10 degrees in females and greater than 5 degrees in males
- lumbar lordotic curve is increased
- there is often a compensatory hyperkyphosis and head forward posture
- bilateral pes planus may be noted in a posterior view.
- abdominal or lumbar scarring may be present from surgery

PALPATION

- tenderness, hypertonicity and trigger points may be present in the
 - lumbar erector spinae
 - quadratus lumborum
 - iliopsoas
 - tensor fascia lata
 - rectus femoris
- the texture of the lumbar and iliotibial tract fascia is thickened and reinforced.

TESTING

- AROM to test trunk and hip flexion reveals shortened lumbar extensors
 - and lengthened hamstrings
- AF extension of the lumbar spine in the standing position may aggravate
 - low back pain associated with hyperlordosis.
- PROM of the hip is reduced in extension
- AR strength testing reveals that both iliopsoas are strong while the abdominals are weak.

SPECIAL TESTING

- Thomas test is positive bilaterally, indicating that both iliopsoas and rectus femoris are short.
- Ely's test is positive bilaterally, indicating rectus femoris shortness
- Ober's test is positive bilaterally, indicating tensor fascia lata shortness
- Hip adductor length test is positive, indicating adductor muscle length shortness.
- Piriformis length test is also likely positive
- Straight leg raise test shows an increase in hamstring length.
- In the lumbar spine and thoracolumbar junction. Anterior and lateral spinous challenge tests may reveal areas of vertebral hypo- or hypermobility.

CI'S

- If low back pain is present, rule out pathology before tx. Refer to dr if necessary
- Avoid mobilizing hypermobile vertebral segments
- Do not randomly stretch fascia. Assess the fascia and only treat the areas of restriction.
- Do not compress over palatable vasculature, including the aorta, when massaging the abdomen or the femoral artery when massaging upper medial thigh.
- Avoid lengthening techniques on weak, overstretched tissues.

GENERAL TREATMENT

- Positioning is started supine with pillows under the knees. The client is then turned prone with pillows under the abdomen and ankles.
- Hydrotherapy is pre treatment. Heat over one rectus femoris. The heat is moved to the other thigh once work is started. When the client is prone heat is over the lumbar fascia.
- Cool applications are used to stimulate the gluteals and hamstrings

- Fascial techniques are used on the pre-heated anterior hip including slow skin rolling and connective tissue cutting along the rectus femoris and tensor fascia lata.
- Ulnar border stripping from the patella to the anterior superior iliac spine along rectus femoris is also indicated.
- Treat the other limb
- Myofascial release on the hip flexors
- Client is draped so the abdomen and the affected thigh are uncovered. Pg 551

- The therapist's forearms are crossed and the proximal hand is placed gently on the client's abdomen over iliopsoas muscle. The distal hand is placed on the upper thigh and the slack is taken up. The pressure used by the proximal hand is just sufficient to stabilize the abdominal fascia, while the distal hand applies the majority of the pressure in a distal direction. This technique can be facilitated by allowing the clients leg to hang off the table, while the other leg is flexed at the hip and the knee.
- If the adductors are also affected, first the client's abdomen is redraped. The client's lower limb is positioned so the plantar surface of the foot is on the medial side of the untreated knee, with the affected knee flexed and the hip flexed, medially rotated and abducted.
 - A pillow is placed between the clients affected knee and the therapists torso, allowing the affected knee to rest against the torso. Slow ulnar border stripping is applied to the adductors, working in a distal to proximal direction.

- Swedish techniques for rectus femoris, tensor fascia lata and the adductors include effleurage, palmer kneading, wringing and muscle stripping
- The trigger point in rectus femoris is located inferior to the anterior superior iliac spine. It refers pain into the knee
- Finish work to the thigh with repetitive effleurage.
- The limb is placed back on the table with the hip and knee in flexion to relax the abdominal muscles. The abdomen is undraped in preparation for treating iliopsoas
- Abdominal massage may be needed before working on iliopsoas, or it may be possible to start on iliacus if the client is comfortable with this.

- In rhythm with the clients breathing, increasing pressure is slowly applied through the abdominal muscles just medial to the anterior superior iliac spine. The fingers apply tolerable pressure as the client exhales and are held in place as the client inhales. You can get the client to flex the hip if you are having trouble finding iliacus. Once iliacus is contacted, slow muscle stripping and the origin and insertion technique are used to treat the muscle belly. The fingers are smoothly and softly withdrawn when the work to iliacus is completed.
- The same careful approach is used for psoas major. The lateral border of rectus abdominis is landmarked at the level of the umbilicus. Slowly increasing pressure is applied at this location, allowing the viscera to slide away from the palpating fingers. Pressure is applied at an oblique angle toward the spine. If a pulse is palpated the pressure is redirected. Slow muscle stripping and ischemic compression are used on the muscle belly.

- There are three trigger points in iliopsoas.
 - - One is located in iliacus, in the iliac fossa on the inside surface of the pelvis, just superior to the anterior superior iliac spine and deep to the abdominal muscles.
 - - The second is located in psoas at the level of L3. Both refer pain to the low back.
 - - The third trigger point is located at the insertion of the tendon onto the lesser trochanter of the femur. It refers pain to the anterior thigh and the low back.
 - Abdominal work is finished with effleurage and stroking.

PIR

- PIR is used to lengthen iliopsoas. The client slides to the side of the table so the limb to be treated can hang freely over the side of the table. The hip and knee of the untreated limb are flexed with the foot flat on the table. This stabilizes the low back against the table. Further stabilization is applied at the anterior superior iliac spine of the untreated with the proximal hand. The thigh of the treated side is moved into extension with the distal hand, until the iliopsoas is beginning to be stretched. The client submaximally flexes the hip against the therapists resistance for 10 seconds and relaxes, allowing the limb to fall into extension. Repeat at least 3 times.
- If a sacroiliac joint is hypomobile, joint play is used.
- One hand is placed palm up between the lumbar spine and the table. The thumb points towards the client's head and the fingers stabilize the sacrum at S2. The posterior superior iliac spine rests on the proximal phalanges. The other hand cups the anterior superior iliac spine, with the heel of the hand resting on the bone. The forearm is pronated so the thumb points towards the clients feet and the fingertips are on the lateral hip.

- The pelvis is mobilized posteriorly by the hand on the anterior superior iliac spine. The motion between the sacrum and posterior superior iliac spine is monitored.
- The pelvis is then mobilized anteriorly by the proximal phalanges under the posterior superior iliac spine.
- Repeat several times until the joint is mobilized.
- Medially directed pressure is applied bilaterally to the outsides of both anterior superior iliac spines, flaring the posterior superior iliac spines.

- A combination of full passive hip flexion and submaximal isometric contraction of the hamstrings is used to decrease the anterior pelvic tilt. The client's hip and knee are fully flexed so the thigh is against the client's abdomen. The therapist leans against the client's anterior leg using a pillow to maintain full flexion.
- The ischial tuberosity is grasped and used as a lever to rotate the pelvis posteriorly at the sacroiliac joint. When the slack is taken up in the hip and sacroiliac joint, the client's untreated thigh will come slightly off the table. When this happens the client is to contract the hamstrings by pushing into the therapists torso. This helps to pull the pelvis into a posterior tilt.
- The contraction is maintained for 10 seconds while the therapist continues to carefully, passively rotate the pelvis posteriorly.

- In the Prone position, heat is applied to the lumbar fascia. Rhythmic techniques can be used to mobilize the low back.
- Fascial techniques are used on the lumbar fascia. These include skin rolling, crossed- hand spreading, fingertip spreading and the connective tissue cutting technique around superior attachments at the iliac crest, the inferior attachments at the twelfth rib and the lateral attachments at the lumbar vertebrae.

- Any hypomobility of the lumbar spine or thoracolumbar junction is treated with spinous process oscillations, anterior challenge or lateral challenge joint play.
- Swedish techniques are used on the lumbar erector spinae and quadratus lumborum, including effleurage, and ulnar border stripping.
- Trigger points in quadratus lumborum refer into the lateral hip, sacroiliac joint and inferior portion of the gluteals.

- PIR may be used to lengthen rectus femoris. The client's knee is flexed, bringing the heel towards the gluteals until the client feels a stretch on rectus femoris. The client submaximally extends the knee against the therapist resistance for 10 seconds and relaxes, allowing the knee to be moved into more flexion by the therapist. Repeat at least 3 times.
- If piriformis is short, Golgi tendon organ release is used on the insertion at the greater trochanter, followed by PIR with clients knee flexed.
- The gluteals and hamstrings are treated with brisk, stimulating Swedish techniques such as alternating palmar kneading and tapotement.
- Cool hydrotherapy can be used to stimulate the gluteals and the hamstrings.
- Effleurage is used to encourage circulation.

SELF CARE PLAN

- Pg 554-555

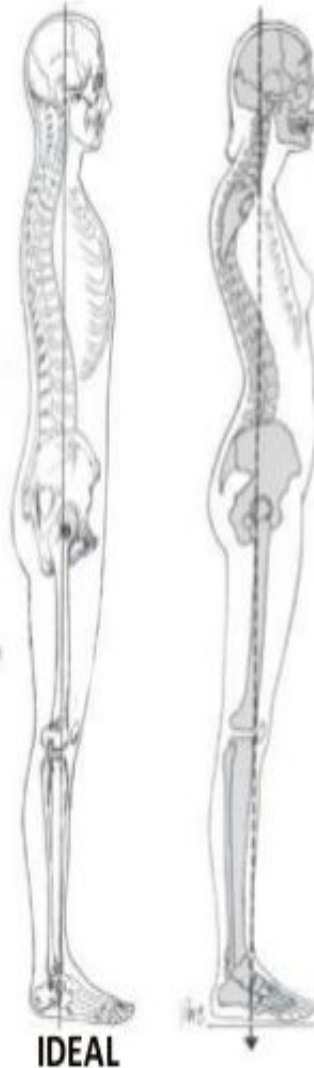
TX FREQUENCY AND EXPECTED OUTCOME

- Pg 555

HYPERKYPHOSIS

Pg 557

Kyphotic-Lordotic Posture



Head- Forward

Cervical Spine- Hyper-lordosis
(hyper-extended)

Thoracic Vertebrae- increased
flexion

Lumbar Vertebrae- Hyper-
lordosis; (hyperextended).

Pelvis- Anterior tilt (forward and
down)

Knees- hyperextended

Ankle joints- plantar flexed, legs
are behind midline

WHAT IS IT?

- GROUP READ 557-560 INCLUDING HEALTH HISTORY

OBSERVATION

- Slight ankle plantar flexion is possible with knee hyperextension
- Accompanied hyperlordosis
- Flat back
- ACJ anterior
- thoracic curve is increased
- cervical lordotic curve is increased
- head forward posture
- scapulae are protracted and often winged

SPECIAL TESTING

- straight leg raise indicates an increase in hamstring length
- Pec major length indicates shortened muscle
- Pec minor length test indicates shortened muscle
- Shoulder adductor length test indicates shortened muscles

DIFFERENT TYPES OF THORACIC PAIN

- Pg 562

TX

- Supine
- Heat on one Pec pre treatment then move to the other side
- Cool on the stretched rhomboids
- *Fascial* work on pec major including attachments, lower anterior intercostals (abdomen uncovered)
- Effleurage, fingertip kneading, *muscle stripping* and *O and I* technique for pec major, pec minor, subclavius, deltoid and anterior intercostals

- The diaphragm is treated using border scooping and muscle stripping under the costal border using the clients breath
- Cover the abdomen
- Work *trigger points* in pec major, minor and serratus anterior
- Sternal attachments of pec major are worked with fingertip kneading and fascial spreading
- Strip Pec minor Place the clients hand on the abdomen with the humerus
 - In slight abduction. Therapists thumbs are under the lateral border of Pec Major. Get the client to depress the shoulder to contract pec minor effleurage and petrissage to shoulder protractors
- *Joint play* to sternoclavicular and acromioclavicular is indicated rib springing
 - * *PIR for clavicular portion of pec major*
 - * *PIR sternal portion of Pec major*
 - * *Latissimus Dorsi stretch*
 - * *PIR pec minor*

- Effleurage, fingertip kneading and *Golgi tendon release* is used on the upper cervical muscles
- *P ROM to cervical spine*
- Prone- place pillows under the abdomen and ankles. Two towel rolled up are placed under the shoulders
- Rhythmic, Swedish techniques and *trigger point* work is used on latissimus dorsi, serratus posterior superior, subscap and the rotator cuff muscles
- Trigger point in serratus posterior superior is found by letting the clients
 - Arm hang off the side of the table
- Rhomb *trigger points*
- Rhomb, middle traps, and thoracic erectors are treated with stimulating Swedish techniques,

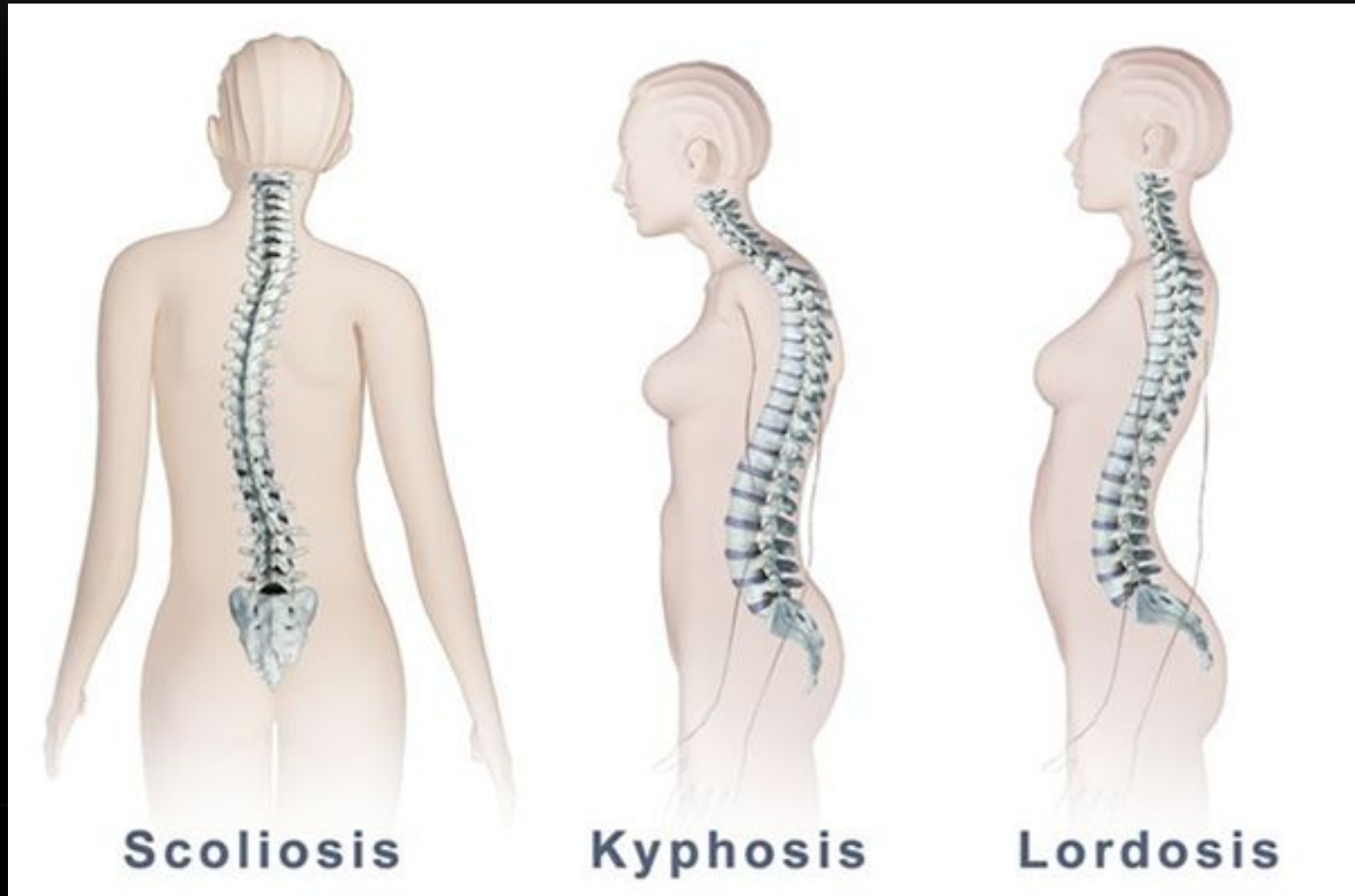
HOME CARE

- cool can be used on rhomboids
 - heat can be used on the pecs
 - Avoid maintaining 1 posture for long periods
 - Client should avoid sleeping in a curled up side lying posture
 - Self massage to shoulder protractors is indicated
 - A lumbar support or roll for the clients chair will help maintain the normal lumbar lordosis
-

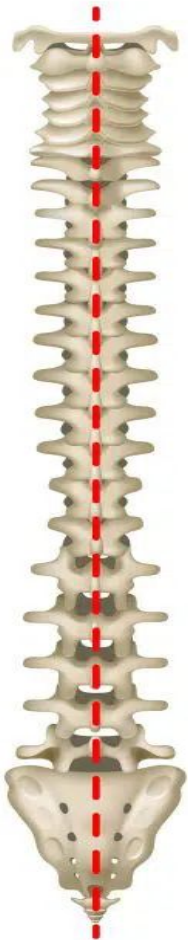
TX FREQUENCY AND OUTCOME

- Pg 567

Difference between Hyperlordosis/kyphosis and Scoliosis



TYPES OF SCOLIOSIS OF SPINE



NORMAL



THORACIC



THORACOLUMBAR



LUMBAR



DOUBLE CURVE

WHAT IS IT?

- Is a lateral rotary deviation of the spine

- ❑ Scoliosis curves are described according to the side that the CONVEXITY is on.
- ❑ Curves are labelled as:
 - ❑ C-Curves: one curve
 - ❑ S-curves: two curves
- ❑ There is usually a compensatory curve in the cervical spine
- ❑ A person can have an S-curve and still have the occiput centered over the sacrum because the intervening curves cancel each other out.

Two main types of curves:

FUNCTIONAL: also known as postural or non-structural curves

- ❑ may be voluntarily altered/reversed by positional changes or muscular action
- ❑ Can be corrected with passive soft tissue stretching, jts, and active strengthening

STRUCTURAL: curves are fixed due to bony changes

- ❑ cannot be corrected by positional changes or voluntary effort
- ❑ usually have a childhood onset
- ❑ corrections requires bracing/surgery

What is “SPAN”? Types and definitions

SPAN: the distance on the spine that the curves covers

- ❑ Ex: thoracolumbar curve spanning T8-L3 or a cervical curve between C1-7.

APEX: vertebra is the one in any curve that is farthest from the midline

MAJOR: in an S-curve scoliosis is the largest curve with the greatest angulation

MINOR: is a smaller, compensatory curve

TRANSITIONAL: vertebra is the one that marks the end of one curve and beginning of the next.

How to measure scoliosis:

- ❑ Severity of scoliosis is measured in degrees.
 - ❑ mild (up to 20 degrees)
 - ❑ moderate (20-50 degrees)
 - ❑ severe (50+degrees)
- ❑ mild scoliosis of less than 10 degrees is considered within its normal limits
- ❑ Mild curve, if detected early, may be corrected with stretching/strengthening.
- ❑ Moderate curve, is associated with the beginnings of bony change and is usually treated with bracing.
- ❑ Severe curve, associated with decreased life expectancy in children due to reduced pulmonary function, and osteoarthritis in adults. This is treated with surgery.

Presentation of Scoliosis:

- ❏ Think of the:
 - ❏ PELVIS
 - ❏ SPINE
 - ❏ RIB CAGE
 - ❏ as a three dimensional structure
- ❏ Scoliosis is not just the spine, but also the ribs, and pelvis that are laterally bent, rotated, and distorted.
- ❏ The pelvis may be torqued: one innominate bone may be more ANT that the other, this may occur at the shoulder girdle.

What is the “RIGHTING REFLEX”?

- ❑ Responsible for the development of secondary compensatory curves.
- ❑ Is the body's attempt to establish center of gravity
- ❑ Keeps an eye on a horizontal plane
- ❑ Permit normal function
 - ❑ With single curve it would not be possible and the head would always be tilted

The effects of the righting reflex can be easily demonstrated by tilting the head to one side for several minutes while trying to perform ADLs.

What is WOLFF's principal?

- ❑ Over time bones remodel themselves along the lines of force that are placed on them.
- ❑ This can be extended to connective tissue, muscle and viscera
- ❑ The entire body from feet to cranium can be involved in a scoliosis

Causes of Scoliosis: IDIOPATHIC

- ❑ 85% of all reported scoliosis cases and occurs in approximately 8% of population
- ❑ Appears in 3 age groups:
 - ❑ Infantile: more common in boys from birth - 3 yrs
 - ❑ Adolescent: girls from 10-16 yrs
 - ❑ Juvenile: both males/females equally between ages 4-9 yrs
- ❑ May be a symptom rather than single disease
- ❑ May develop in adults
- ❑ Lumbar scoliosis w/ associated rib humping develops in 6% of persons over 50 yrs of age.

Causes of Scoliosis: IDIOPATHIC

❑ CNS

- ❑ Altered proprioceptive and Vestibular sources:

- ❑ Abnormal MM spindle response to proprioception in paraspinal mm

- ❑ Asymmetry in labyrinth of the inner ear may be a factor influencing spinal posture

- ❑ Break down of postural control

- ❑ Study: found increase labyrinth sensitivity on the convex side of the curve and that RT eye dominance may be associated with LT sided curves

❑ Biomechanical Factors:

- ❑ RT halves of vertebral bodies, RT ribs, and RT humerus are larger than LT

- ❑ Femur, fibula, clavicle and bones of skull are slightly larger on the LT side

- ❑ Adolescents w/ idiopathic scoliosis were 17% more flexible than a non-comparable mon-scoliotic age group.

- ❑ Torsion to the spine in mechanical model was due to the actions of the paraspinal mm.

- ❑ No connection between hand dominance and the direction of curve

Causes of Scoliosis: IDIOPATHIC

- ❑ MM Imbalances
 - ❑ Fibrosing and associated fatty deposits in mm on the *Concave* side of curve
 - ❑ Increase mm activity on *Convex* side
 - ❑ This is believed to counter the pull from the concave side
 - ❑ Collagen abnormalities have been reported with scoliosis, may be result of curve, but not the cause
- ❑ Hereditary Factors
 - ❑ May be a factors
 - ❑ environmental factors more likely to play role
 - ❑ Study: in Europe has decreased since 1930s/40s when there was widespread malnutrition

Causes of Scoliosis: IDIOPATHIC

- ❑ Growth and Sex hormones
 - ❑ within all racial groups, both female and male adolescents with idiopathic scoliosis were taller and thinner than non-scoliotic adolescents in same age group
 - ❑ Minor curves:
 - ❑ Little difference in distribution between males and females
 - ❑ Risk of progression of the curve is higher in females than males
 - ❑ Leads to female-male ratio of 1.5 to 1 for 10 degree curve 5 to 1 for 20 degree, and 10 to 1 for 30 degree curve

Causes of Scoliosis: FUNCTIONAL

- ❑ FUNCTIONAL
 - ❑ Musculoskeletal in nature
 - ❑ Related to functional scoliosis
 - ❑ Can be by altering position
- ❑ Bony Asymmetries below pelvis
 - ❑ leg length inequality due to unilateral pes planus, short tibia, short femur or small hemipelvis places sacral base on an oblique angle in a standing person
 - ❑ Fracture of the tibia/femur may shorten limb length
 - ❑ in seated, small hemipelvis can cause pelvic obliquity
 - ❑ Spine must curve to compensate

Causes of Scoliosis: FUNCTIONAL

- ❑ Trigger Points
 - ❑ TPs in QL causing shortening of mm raising pelvis on affected side and giving appearance of short leg.
- ❑ Habitual Asymmetric postures
 - ❑ persons stands/sits with the weight shifted to one side
 - ❑ result in asymmetric soft tissue shortening
 - ❑ causes: occupational posture or sitting for long periods of time with a wallet in one pocket.

Causes of Scoliosis: FUNCTIONAL

- ❏ Soft tissue restrictions/contractures
 - ❏ Occur above/below the pelvis
 - ❏ Unilateral TFL and ITB contracture cause LAT pelvic tilt
 - ❏ Unilateral shortened ABD obliques/LATS lead to curving of the T/S and LAT pelvic tilt
- ❏ Antalgic Scoliosis
 - ❏ Temporary curve caused by mm spasm accompanying disc herniation/sciatic nn irritation
 - ❏ Convexity may be towards or away from the affected side

Causes of Scoliosis: NEUROMUSCULAR

- ❑ Conditions such as:
 - ❑ Cerebral palsy
 - ❑ Friedreich's ataxia
 - ❑ Muscular dystrophy
 - ❑ Spinal cord Lesion
 - ❑ lead to mm weakness and imbalance
- ❑ Paralysis following polio
 - ❑ result in long C-curve on the side of the mm impairment

Causes of Scoliosis: CONGENITAL

- ❑ Congenital
 - ❑ bony abnormalities
 - ❑ Hemivertebra
 - ❑ incomplete formation of one side of the vertebra
 - ❑ Vertebral wedging
 - ❑ increased pressure on bone's epiphyseal plate, slowing rate of growth
 - ❑ occurs on the concave side resulting in wedge-shaped vertebrae

Causes of Scoliosis: LATROGENIC

- ❑ Pneumonectomy/open heart surgery
 - ❑ Ribs are resected
 - ❑ Allows LAT curve to develop later
 - ❑ Incision through intercostals alone are recorded as provoking scoliosis in children

Progression of Curves

1. Normal passive resistance of the spine/ribs/ligs that will limit excessive movement.
2. Contraction of the mm on the convex side
 - a. Infantile idiopathic scoliosis often regressed spontaneously
 - b. regression of adolescent scoliosis is less common
 - c. Single curves increase more than double curves
3. Damaging effects on pulmonary function seem to occur in children where curves have progressed past 60 degrees
4. Adolescents with similar degree of curve rarely show signs of significantly reduced pulmonary function

Bony And Soft Tissue Imbalances In Scoliosis

- ❑ True length inequality is measured precisely to the millimetre only with an x-ray tech that includes both legs and pelvis
- ❑ Measuring from MED malleolus to ASIS in supine client
 - ❑ assessing component of limb: malleolar height/length of tib and femur
- ❑ On transverse plane
 - ❑ vertebrae ROTs around axis of spinal foramen so spinal cord not compressed
- ❑ LAT curve
 - ❑ Vertebral bodies ROT around this axis **towards** the convexity of a curve
- ❑ Vertebral bodies have greater mass and convex side of the curve has more space to ROT into
- ❑ Spinous processes have less mass, ROT to concave side where there is less space.
- ❑ Curve increases, vertebral ROT increases
- ❑ Greatest ROT occurs at apex of curve

Bony And Soft Tissue Imbalances In Scoliosis

- ❑ Degree of curve present may be much greater than that which is indicated by the apparent position of the spinous processes pushing against the skin
- ❑ True position of the vertebral bodies is observable only on x-rays
- ❑ Ribs articulating with vertebral bodies and TVP become distorted
- ❑ POST view
 - ❑ TVP are more POST on convex side
 - ❑ Ribs on convex side more POST and prominent
 - ❑ Called “Rib humping”
 - ❑ On concave side, TVP and ribs more ANT, ribs appear flattened
 - ❑ On convex side ribs are farther apart, concave side are closer together
- ❑ ANT view
 - ❑ Ribs more prominent on concave side and flattened on convex side

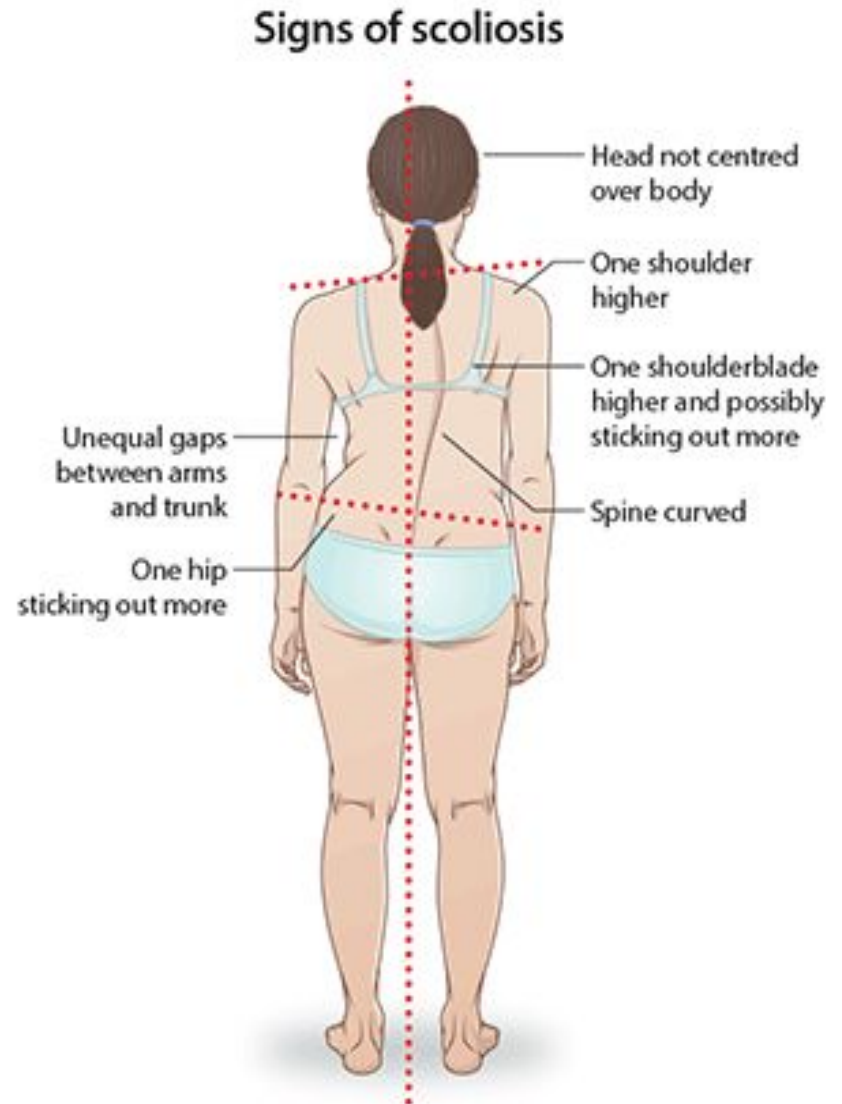
Bony And Soft Tissue Imbalances In Scoliosis

- ❑ True mm bulk of paraspinal mm is misleading
- ❑ mm appear bigger on convex side
 - ❑ pushed POST by ribs/TVP
- ❑ Ribs more prominent on concave side from being pulled ANT by bones
- ❑ Deep transverse mm, including Multifidi, seem to play larger part than more LAT and SUP erector spinae group
- ❑ Multifidi, erector spinae, and intercostal mm on concave side of curve shorter/tighter/fibrosed
 - ❑ similar to how a bowspring pulls a bow into a curve
- ❑ Paravertebral and intercostal mm on convex side
 - ❑ increased activity in attempt to keep spine upright
- ❑ attachments of these mm are pulled apart by tethering effect of fibrosed mm on concave side.
- ❑ Convex activity shown to disappear following spinal fusion in idiopathic scoliosis

Bony And Soft Tissue Imbalances In Scoliosis

- ❑ Abdominal obliques, psoas, LATs, intercostals, and erectors mm acting unilaterally were shown to increase severity of a curve
- ❑ Tight QL, psoas, and ADDs on one side, plus TFL/Glute MED on other side can maintain pelvic obliquity
- ❑ Shoulder on convex side of Thoracic curve is elevated by actions of upper traps/levator
- ❑ Scap is more prominent on this side

C-CURVE – RIGHT THORACOLUMBAR FUNCTIONAL CURVE



- Posterior view
 - With the plumb line as reference, the occiput is checked to see if it is
 - Centered above a point midway between the calcanei
 - The level of the occiput is assessed
 - There may be a left cervical compensatory curve
 - The right acromioclavicular joint is higher
 - Humeral lengths are assessed bilaterally
 - The right scapula is higher and possibly winged
 - The distance between the medial borders of both scapulae and the spine is checked.
 - Right rib humping is present
 - There may be asymmetrical skin folds on the torso, with more folds on the concave side.
 - Iliac crest levels are higher on the left
 - There is an asymmetrical negative space between the torso and the arms.
 - PSIS levels are checked
 - with lateral pelvic tilt only, the PSIS is low on the dropped side
 - with pelvic torsion, the PSIS is high on the anteriorly rotated, short leg side
 - knee valgus is possible
 - heights of the malleoli, fibular heads and greater trochanters are checked
 - any of these on the right may be lower with a short right leg as the scoliosis source
 - right foot pronation is possible

- Lateral View

- knee hyperextension is possible
- increased anterior pelvic tilt is seen on the short limb side (females 5- 10 degrees, males 0-5 degrees are normal limits- the pelvis should be compared bilaterally for torsion)

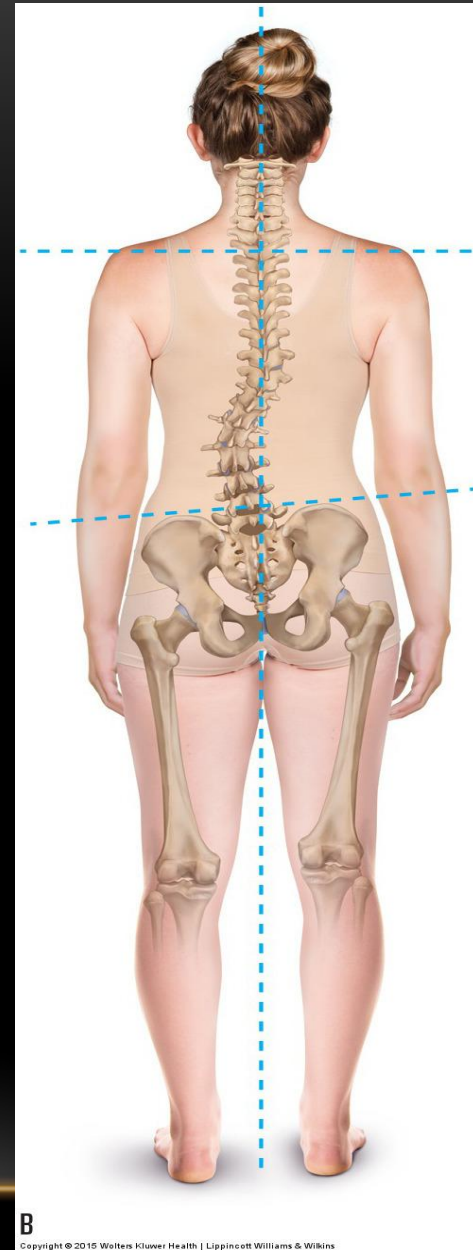
- Anterior view

- the right ASIS is lower than the left with a short right limb or pelvic
 - torsion
- the left ribs are prominent
- facial bones are frequently smaller on the same side as a small hemipelvis

- Superior view

- It is possible that the ASIS and acromioclavicular joint on one side are
 - Anterior, giving a unilateral torsion, or that one ASIS and the other acromioclavicular joint are anterior, giving an opposing torsion.

S-CURVE – RIGHT THORACIC LEFT LUMBAR FUNCTIONAL CURVE



- Posterior view
 - With the plumb line as reference, the occiput is checked to see if it is centered above a point midway between the calcanei
 - The level of the occiput is assessed
 - There may be a left cervical compensatory curve
 - The right acromioclavicular joint is higher
 - Humeral lengths are bilaterally assessed
 - The right scapula is higher and possibly winged
 - The distance between the medial borders of both scapulae and the spine is checked
 - Right rib humping is present
 - There may be asymmetrical skin folds on the torso, with more folds on the concave side
 - Iliac crest levels are higher on the right
 - There is a symmetrical negative space between the torso and the arms
 - PSIS levels are checked
 - With lateral pelvic tilt only, the PSIS is low on the dropped side
 - With pelvic torsion, the PSIS is high on the anteriorly rotated, short leg side
 - Knee valgus is possible
 - Heights of the malleoli, fibular heads and greater trochanters are checked – any of these on the left may be lower with short left leg as the scoliosis source
 - Left foot pronation is possible

- Lateral view
 - knee hyperextension is possible
 - increased anterior pelvic tilt is seen on the short limb side
- Anterior view
 - the left ASIS is lower than the right with a short left limb or pelvic torsion
 - the left ribs are prominent
- Superior view
 - it is possible that the ASIS and acromioclavicular joint on one side are anterior, giving a unilateral torsion, or that one ASIS and the other acromioclavicular joint are anterior, giving an opposing torsion.

PALPATION

- depending on the shape of the curve, the therapist palpates the erector spinae, quadratus
 - lumborum, intercostals, trapezius and gluteus medius for hypertonicity and trigger points.
- the therapist palpates for fibrosing in the concave side of the curve

TESTING

- AF ROM of the spine in lateral bending abd flexion reveals decreased range toward the Convex side
- PR POM of the hip reveals decreased range in extension with an anterior pelvic tilt.
- PR ROM of the protracted shoulder is decreased in external rotation.
- PR ROM of the cervical spine may also be decreased
- AR strength testing reveals weakness in the abdominals and in the muscles on the concave side of the curve. With an anterior pelvic tilt, gluteus maximus is weak on the side with the anterior tilt. With a lateral pelvic tilt, gluteus medius is weak on the high side.
- A functional or structural scoliosis test is positive

- Scoliosis small hemipelvis is positive
- Scoliosis short leg test is positive
- Functional leg length is assessed with the supine to sit test
- True tibia and femur length are assessed with the client supine
- Sacroiliac joint motion is assessed with the sacroiliac joint motion test and Gillet's test
- Anterior spinous challenge, lateral spinous challenge, motion palpation and static palpation of the spine may reveal areas of hypo and hyper mobility in functional and structural curves. In addition rib motion is asymmetrical and hypomobile

- Length tests for muscles attaching to the pelvis and shoulder girdle should be performed this includes- Thomas
 - Ely's
 - Adductor length
 - Piriformis length
 - Ober's
 - Quadratus lumborum length
 - Shoulder adductors length
 - Pectoralis major length
 - Pectoralis minor length
- The results will vary depending on the type of curve and amount of torsion present in the
 - Pelvis
- the therapist is advised to bilaterally compare and record the lengths of the involved
 - muscles and lengthen the ones that are short
- Valsalva's, Kernig's and straight leg tests are positive with space occupying lesions.
- Kemp's is also positive with space occupying lesions or facet joint irritation

CI'S

- If pathology is suspected but undiagnosed, refer to dr
- If pt has a fusion or immobilization from rods, do not attempt to mobilize
- Avoid mobilizing hypermobile joints
- Do not use longitudinal work or stretching techniques on the muscles on the convex side because they are already overstretched
- Avoid heat over rods
- Do not randomly stretch fascia. Assess and only treat the restricted directions

GENERAL TREATMENT

- Positioning can be started prone, supine or side lying depending on the area to be worked.
- Heat is applied to the tight muscles and rotated from one area to another before being treated. Cool can be applied to the weak muscle after treating
- Treatment is performed in a relaxation context

SPECIAL TX

- This treatment addresses a right thoracic , left lumbar functional S-curve.
- Treatment is started prone with pillows under the abdomen and ankles. A small towel folded or rolled up can be placed under the ASIS of the anteriorly rotated left pelvis to encourage a posterior rotation.
- Following the pre-heated areas, the fascial work to the short and tight muscles on the concave sides zigzags across the client's body, inferior to superior.
- Heat is applied to the left lateral hip while petrissage is used on the short tight adductors.
- Heat is moved to the right quadratus lumborum while fascial spreading and connective tissue cutting techniques are used on the left gluteus medius.
- Heat is next moved to the left thoracic erector spinae and intercostals while the muscles in the concavity of the lumbar curve are treated
- Skin rolling and crossed hand spreading are used over the entire lower right quadrant
- The right erector spinae are treated with longitudinal and transverse spreading
- The attachments of quadratus lumborum at the iliac crest, lumbar vertebrae and twelfth rib are outlined using connective tissue cutting and fascial spreading

- Heat is moved to the right upper trapezius while fascial techniques are used on the left latissimus dorsi left erector spinae and left intercostals.
- One group of intercostals is systematically treated with fingertip fascial stroking laterally to medially. This is repeated three to four times, with the pressure tolerably increased each time. The technique is repeated on the next intercostals. A group of three or four intercostals may be the maximum treated in a single appointment.
- If necessary fascial techniques are used on the right upper trapezius and levator scapula
- A variety of Swedish techniques is used on the thigh structures, working inferiorly to superiorly, including effleurage, ulnar border stripping and muscle stripping

- Trigger points in gluteus medius and quadratus lumborum refer into the sacroiliac joint and lateral hip.
- Trigger points in multifidi refer locally
- Trigger points in iliocostalis and longissimus refer along these muscle groups and occasionally down into glutes.
- Hypomobile vertebrae are treated with posterior- anterior and lateral joint play.
- Rib springing is used to mobilize the ribs on the concave side.
- The stretched, weak and tight intercostals and paraspinal muscles on the convex sides of the curves are now treated.
- Any stimulating petrissage or tapotement techniques may be used, providing the work is transverse to the muscle fibers.
Treat the left adductors, right gluteus medius, left upper trapezius and levator scapulae.
- Trigger points in the rhomboids on the convex side, which are activated by scapular winging, are treated with ischemic compression

- Active resisted exercise is used to strengthen the intercostals on the convex side. The therapist compresses the ribs with both hands while the client inhales against this resistance.
- Cool washes are applied to the stretched muscles
- PIR rectus femoris - the clients knee is flexed, bringing the heel toward the gluteals until the client feels a stretch on rectus femoris. The client submaximally extends the knee against the therapists resistance
- With the client sidelying on the left side, a small towel roll is placed under the left waist, between the ribs and pelvis. The client is asked to position the right lower limb on the table so the right hip is extended, while the left hip and knee are flexed. The right arm is placed in full flexion in front of the head. This allows the pelvis to be pulled away from the rib cage, stretching the tight right quadratus lumborum

- Skin rolling and fascial stroking are used on the tight right external abdominal obliques, following the attachments at the iliac crest and costal margins. This is followed by petrissage to these muscles.
- PIR for quadratus lumborum proceeds from the sidelying position described above. The client allows the lower limb to drop off the table. Both the therapists arms are crossed, stabilizing the inferior ribs with one hand and the iliac crest with the other. The client minimally contracts the quadratus lumborum against the therapists resistance for 10 seconds and then relaxes, allowing the lower limb to drop farther off the table. Repeat at least 3 times.

- Turn to supine
- For the pelvis, both fascial and Swedish techniques and PIR are used for the tight and short left iliopsoas, rectus femoris and right adductors
- PIR iliopsoas – the client slides to the side of the table so the limb to be treated can hang freely over the side of the table. The hip and knee of the untreated knee are flexed with the foot flat on the table. Further stabilization is applied at the ASIS of the untreated side with the proximal hand. The thigh of the treated side is moved into extension with the distal hand, until the iliopsoas is beginning to be stretched. The client submaximally flexes the hip against the therapists resistance.
- PIR right adductors – the client has their hip and knee flexed so their feet are on the table. The hip drops into abduction and the client resists pressure downward on the leg
- A hypomobile sacroiliac joint is mobilized with joint play
- The left anterior pelvic tilt may also be treated with P ROM and AR ROM

- The tight left latissimus dorsi and right pectoralis minor are also treated with fascial and Swedish techniques
- PIR latissimus dorsi – arm in 180 degrees of abduction. Flex the clients hips and knees so their feet are flat on the table. Therapist places pressure on the distal humerus and the client horizontally flexes the humerus against the therapists resistance.
- PIR pectoralis minor- the arm is at the client's side with the hand on the abdomen. The client slides to the side of the table so the scapulae is free to hang over the side of the table. The heel of the therapists hand is placed on the coracoid process and the client submaximally protracts and depresses the scapula against the therapists resistance.
- The flattened right anterior ribs are treated with fascial and Swedish techniques and rib springing as outlined in the prone section above
- The diaphragm, if tight , is treated using ischemic thumb pressure inferior to the costal margins. Working with the clients breathing, the therapist applies pressure with exhalation and the thumbs are held in place with inhalation. Cross fibre thumb kneading is used on the diaphragm attachments. The thumbs are drawn out slowly on completion of this technique
- The tight right scalenes, right sternocleidomastoid and left suboccipitals are treated with muscle stripping

SELF CARE PLAN

- Pg 587-588

TX FREQUENCY AND OUTCOME

- Pg 588