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Arthralgias, Myalgias and COVID-19

Dx & Tx of Shoulder, Low Back & Knee Pain

Complaints Of 71 Patients At PM&R Clinic During 20 Days

44% Shoulder pain & SS tendonitis.
Tx: Inject Steroid, RC exercises

34% LBP & pelvic obliquity.
Tx: Trunk rotation & SB exercises.

31% Knee pain with PFD.
Tx: Inject Steroid; Tape; Exercise.

Rx: Low cost & effective Tx.

COVID-19 Infection & Musculoskeletal Problems

- Tuzun S, et al. 2020
- N=103: 68.7% non-severe; 31.3% severe.
- Fatigue: 85.3%
- Myalgia 68.0% not affected by COVID-19 severity.
- Arthralgia: 43.3% wrist 16.7%, ankle 16.0%, knee 15.3% joints; significantly higher among the severe group.
- Back pain 22.0%

- Batur, et al 2020
  - 80 patients hospitalized with COVID 19 infection.
  - 50% Fatigue
  - 46.1% Myalgia; increased CK & lymphocyte count P<.05

- Zhang, et al 2021. At one year post-COVID-19 infection:
  - Fatigue 27.7%; sweating 16.9%; chest tightness 13%; anxiety 10.4%; **myalgia 7.9%**

Bakılan, et al. 2021

Admission symptoms	
Back pain	80 (28.6%)
Fatigue	34 (12.1%)
Low back pain	30 (10.7%)
Neck pain	27 (9.6%)
Spinal pain more than one site	17 (6.1%)
Knee pain	15 (5.4%)
Joint pain more than one site	13 (4.6%)
Shoulder pain	11 (3.9%)
Widespread myalgia	11 (3.9%)
Radicular neck pain	6 (1.4%)

Symptom frequency of patients in postacute COVID-19 period

	Frequency n (%)
Musculoskeletal system	
Fatigue	
Initiated or aggravated with COVID-19	156 (55.7%)
Total	201 (71.8%)
Spine pain	
Neck pain	32 (11.4%)
Back pain	85 (30.4%)
Low back pain	45 (16.1%)
Spine pain > one site	36 (12.8%)
Initiated or aggravated with COVID-19	160 (57.1%)
Total	198 (70.7%)
Muscle pain >one site	
Initiated or aggravated with COVID-19	143 (51.1%)
Total	170 (60.7%)

References: COVID-19, myalgia, cytokine storm, & Tx.

- Soy, et al. Cytokine storm in COVID-19: pathogenesis and overview of anti-inflammatory agents used in treatment. Clinical Rheumatology. 2020.
  - NSAIDS, especially ibuprofen, is not recommended since it may increase ACE-2 expression.

- Wang, et al. A Review: The Manifestations, Mechanisms, and Treatments of Musculoskeletal Pain in Patients with COVID-19. 2022.
  - ACE-2 receptors: for spike protein to enter cells; in skeletal muscle & CNS; ACE-2 decrease in CNS may cause spinal hyperalgesia (Yamagata et al.2020).
  - Cytokine storms. Myalgia with prostaglandin E2 (PGE2) production. Cytokines (IL2, IL6, IL7, IL10, TNF alpha, e lymphopenia) higher in COVID-19 patients.

Shoulder Pain, Supraspinatus tendonitis, & Adhesive Capsulitis

- 53 yr man, LH. Lifts & delivers food.
- 4/14/22 mRNA COVID Booster right deltoid.
- 5/17/22 Lt>R shoulder pain, ROM decreased.
- DDx:
  - Local Inflammatory Response with SIRVA
  - Systemic Inflammatory Response.

SIRVA
Shoulder Injury Related To Vaccine Administration

- Vaccines injected into subacromial or subdeltoid bursa.
- Shoulder pain & limited ROM within 48 hrs.
- Pain for 859 patients: 1 month for 65%; >3 mos for 25% (Shimabukuro. 2017)
- Claims to Vaccine Injury Compensation Program:
  - 504 FY 2013; 1,243 FY 2017
- SIRVA with COVID-19 vaccines.
  - Subdeltoid bursitis & RC tendinopathy, n=1; AstraZeneca vaccine (Cantarlli Rodrigues, et al. 2021)
  - Massive shoulder effusion & synovitis, n=1; mRNA vaccine (Yuen, et al. 2022)
- Risk factors: Thin; female; small deltoid; poor injection technique.
- MOA: inflammatory cascade
- Tx: Corticosteroid injection within 5 d of symptom onset; Sx resolved < 1 month; n=1 pneumococcal polysaccharide vaccine; n=1 recombinant zoster vaccine (Macomb, et al 2020)

Shoulder Adhesive Capsulitis With COVID-19 Infection or Vaccine

Study	Vaccine or infection	Patients	Sites affected; Onset	Adhesive Capsulitis	SIRVA	Comments
Present case	mRNA (Pfizer)	53 yr, LH man	Polyarthralgia after booster.	Yes	No	
Ascani, et al. 2021	COVID Infection	N=12; 8 female, 4 males;	Shoulder: 5 right, 6 left, 1 B/L. Onset 1.5-3 months post-COVID-19 diagnosis	Yes	No	COVID-19 symptoms: nil for 7; mild for 5.
Sahu & Shetty. 2022	Covishield, n=9; Covaxin, n=1	N=10; 9F, 1M; 53±8 yrs;	Injected shoulder. Onset was: immediate for 6 & 48h for 1; at 10 days for 3.	Yes 6/9 no resolution at mean 1.4 mos.	Yes for 7 No for 3	Normal MRI for 3.

mRNA COVID-19 vaccine, Joint Pain & Adhesive Capsulitis

- 53 y M, LH. Lifts & delivers food.
- Hx: DM2, Vitiligo; hypothyroid; shoulder pain.
- 4/2021 mRNA COVID-19 vaccine; no pain.
- 5/2021 mRNA COVID-19 vaccine; mild right hip intermittent pain.
- 11/4/21 “normal ROM all joints.”
- 12/22/21 Minor discomfort Lt hip & shoulder with movement, & behind Rt knee; possibly started 5/2021. ED X-rays normal.
- 1/8/22 Pain hip, pelvis, thigh. ED x-ray normal.
- 1/31/22 Lt shoulder pain, PROM “restricted.”
- **4/14/22 Booster. Pain B/L shoulders, hips & knees; resolved except B/L shoulders.**
- **5/17/22 Lt>Rt shoulder pain, ROM decreased.**
- **6/9/22 PE LUE: limited AROM & PROM; TTP supraspinatus tendon of insertion.**
- Dx: mRNA vaccine induced systemic arthralgias, left shoulder pain with supraspinatus tendonitis & adhesive capsulitis.
- No SIRVA since: right shoulder injected, and systemic arthralgias.

Treatment for Shoulder Pain, Supraspinatus Tendonitis & Adhesive Capsulitis.
Post-mRNA COVID-19 vaccine Joint Pain & AC.

Dx: Shoulder Pain, Supraspinatus Tendonitis & Adhesive Capsulitis.
Tx: 6/9/2022 Jointinjected Bupivicaine & Triamcinolone.

Pre- vs Post Injection:

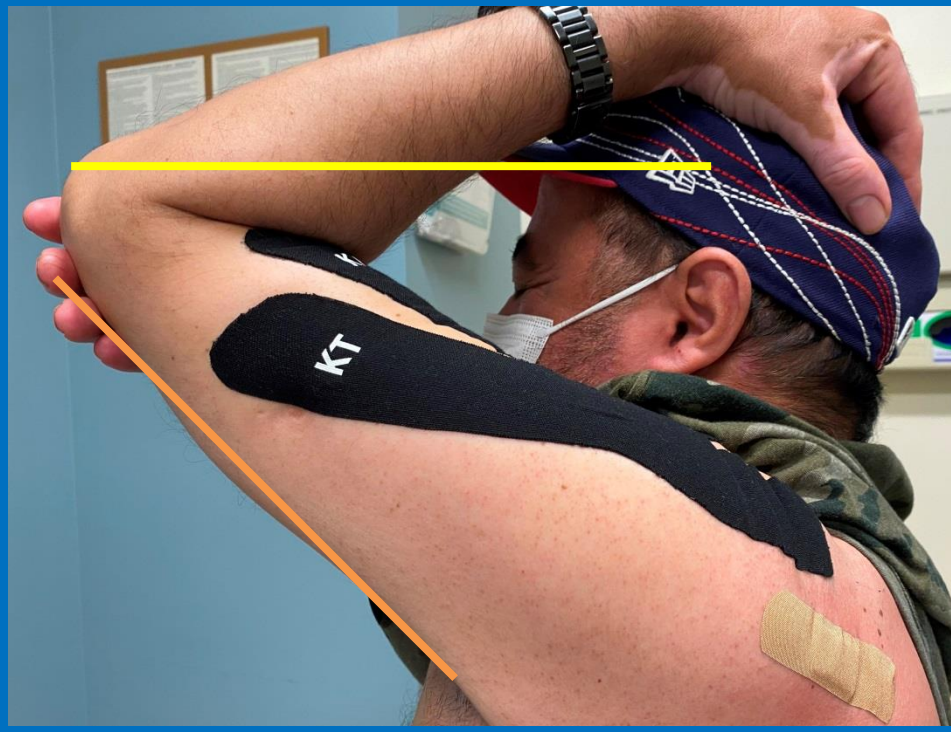
TTP SS tendon at insertion: right 3/10; left 6/10→0/10.

PROM flex: 90 →130; no pain.

Home Exercises:

*SS tendinitis: Rotator Cuff Exercises

*Adhesive Capsulitis: Stretching



Adhesive Capsulitis (Frozen Shoulder)

(Review Publications: Le, et al. 2017; Patel, et al. 2020)

- Glenohumeral capsule contracture. Synovial inflammation, capsule fibrosis, & vascular hyperplasia.
- Inflammatory cytokines in joint capsule & subacromial bursa of 14 patients with idiopathic AC (Lho, et al. 2013).
- Prevalence: 2-5% (Hand, et al 2008); 14% B/L.
- Risk factors: Age 40-70 yrs; Female; DM 1 or 2; Hypothyroidism; HLA-B27; autoimmune disease; cerebrovascular disease, especially SAH; COVID infection (MRI with AC was 16.7% vs 9.2% for 2020 vs 2019.Castro, et al. 2022)

Adhesive Capsulitis

(Review Publications: Le, et al. 2017; Patel, et al. 2020)

- Stages (Le, et al. 2017; Patel, et al. 2020)
  - 1. Pre-freezing: Pain, especially qhs; inflammatory cells in synovium..
  - 2. Freezing : severe pain, progressive stiffness; synovial proliferation.; 2-9 months.
  - 3. Frozen: Loss ROM; less pain @ rest but persists with movement; capsule with dense collagenous tissue. 2-4 months.
  - 4. Thawing: recovery phase with ROM gradually increasing; 5-14 months.
- Tx:
  - Inject capsule steroid alone or with saline for hydrodilation; NS difference (Buchbinder et al.2008)
  - ROM exercise. HEP as effective or superior to supervised exercise (Tanaka et al 2010). Shoulder function improved for 90% with “gentle exercise” vs 63% with intensive PT. Exercise with & w/o joint mobilization improved ROM (Lee, et al. 2023)
  - Manipulation; MUA
  - Capsulotomy.
- Outcome: recovery 1-3 years

COVID-19 Infection, Exercise & Adhesive Capsulitis

N=72 with AC at Orthopedic Clinic. Naderifar, et al. 2023

	COVID +	COVID --	P
Age 25-49.9 yrs	2 (11.11%)	20 (37.04%)	0.039
PA: Yes No	18 (24.8%) 13 (72.2%)	31 (57.4%) 23 (42.59%)	0.029
Pain, months	4.39 ±3.36	10.44 ±9.64	0.01
Pain, VAS	7.33±1.61	4.26±1.06	0.012

Conclusions:

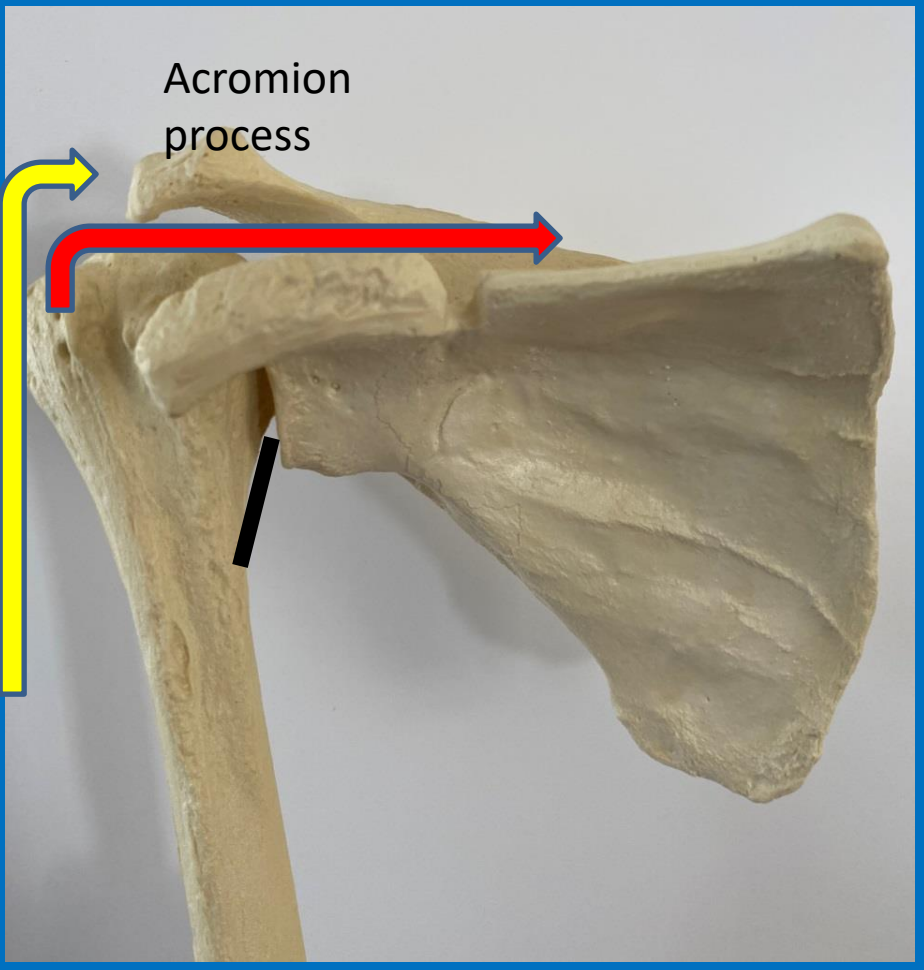
1. NS difference in incidence of AC for patients with or without COVID.
2. COVID-19 occurred less often for regular exercisers.
3. Pain was higher for COVID + patients; however, they were closer to onset of AC.

Roberts S, Dearne R, Keen S, et al. Routine X-rays for suspected frozen shoulder offer little over diagnosis based on history and clinical examination alone. Musculoskeletal Care. 2019

X-rays if trauma, dislocation, or r/o heterotopic ossification.

Supraspinatus (red) vs Deltoid (yellow):

Force vectors; Rotator Cuff Injury; Exercise Rx



- Supraspinatus pulls humeral head into glenoid fossa.
- Deltoid pulls humeral head toward acromion process; decreases subacromial space; increases risk for impingement syndrome with supraspinatus tendonopathy.
- Shoulder abduction increases EMG activity for both muscles.
- Dx SS tendinits: palpate insertion on humeral head.
- Rx: Exercise supraspinatus w/o deltoid.

Shoulder Exam: Rotator Cuff Muscles

(Supraspinatus, Infraspinatus, Teres Minor; Subscapularis)

- Palpate supraspinatus tendon at the insertion with humerus hyperextended.
- AROM & MMT (0-5) for rotator cuff muscles: “Empty Can Test” for supraspinatus muscle; ER for infraspinatus & teres minor muscles: IR for subscapularis muscle.
- If limited AROM, assess PROM to r/o contractures.

Muscle Fiber Types & Exercise Rx

- Type I: Slow twitch, high oxidative capacity.
- Type II: Fast twitch; high glycolytic metabolism.
- SS normally 54% type 1 fiber type.
- SS RC tear: atrophy of type 1 and 2 fibers; changes indicating a shift from type 1 to type 2 muscle fibers (Ravn, et al. 2020). Decreased endurance for SS muscle with RC tear.
- Rx: Endurance Ex (low resistance, many reps); advance to strength Ex (high resistance; few reps) when no pain & full AROM.

Infraspinatus Exercises:
One shoulder externally rotates with a concentric contraction.
The other shoulder resists with an eccentric contraction.

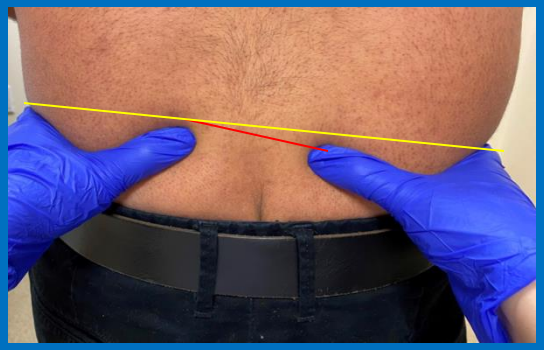
Supraspinatus Isometric Exercise: Shoulder is internally rotated & abducted about 20°

Avoid a Valsalva Maneuver

Left shoulder externally rotates against resistance by RUE.

Rotator Cuff Exercises

Low Back Pain: 30-80% prevalence (often non-specific). My patients: 34%, usually with a pelvic tilt.



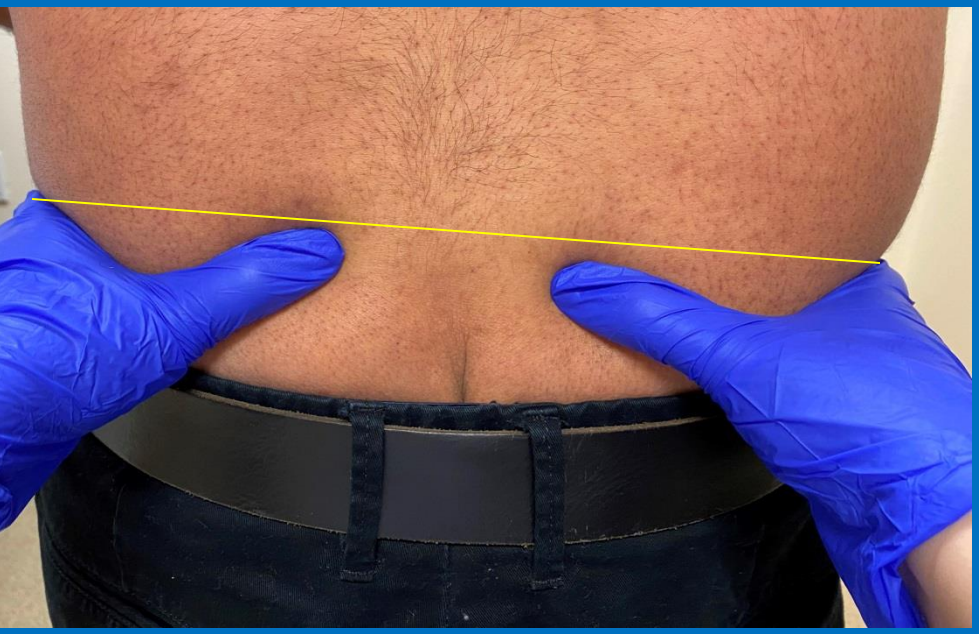
- Hx: R/O conditions exacerbated with exercise.
  - nerve impingement (bulging or herniated disc [pain in dermatome or myotome distribution]), radiculitis, radiculopathy, cluneal nerves.
  - Vertebral compression fx
  - Tumors, infection, nephrolithiasis, endometriosis,
- PE:
  - Provocative maneuvers to increase & decrease pain (sitting & standing)
  - Assess asymmetry for pelvis when standing erect & with trunk flexion.
- Dx: Muscle strain/spasm if pelvic tilt (lateral, anterior) resolves with trunk exercises.
- Tx: Exercise with trunk rotation. & lateral flexion.

Zaina, et al. 2023; Urits, et al. 2019; Qaseem, et al. 2017.

Muscles & Movements of Pelvis, Spine & Trunk

- Multifidi & Rotatores
  - Sidebend vertebra ipsilaterally
  - Rotate vertebra contralaterally
- Ipsilateral pelvic elevation
  - QL, ER
- Ipsilateral pelvic depression & anterior pelvic tilt.
  - Iliopsoas & Rectus Femoris

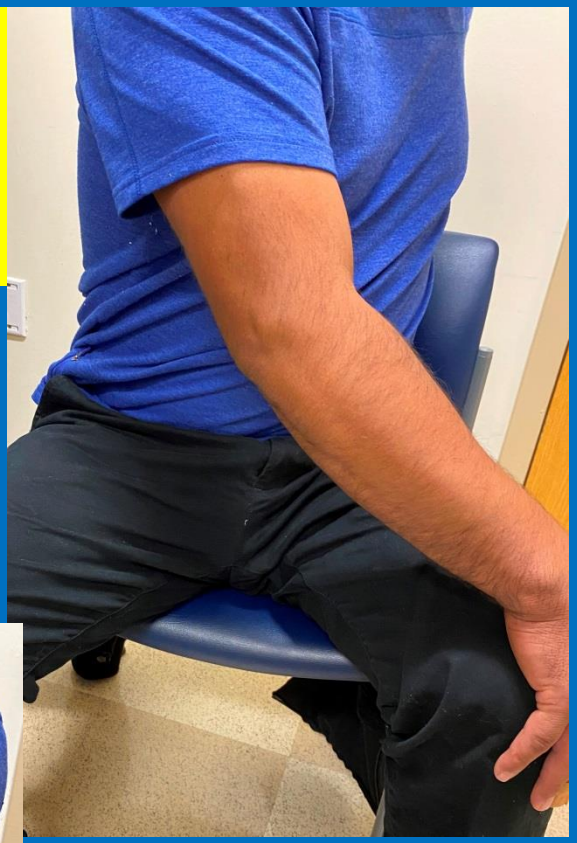
40y M. Pain: Right low back since 2020 (hit by car); severe when lifts heavy objects (construction work); mild relief with naproxen; no radiation to LE; transient relief with “pain Dr” injections.



Left iliac crest elevated via quadratus lumborum muscle & erector spinae.

After trunk rotation exercises, iliac crests symmetric; pain 6→4.

Lumbar Vertebrae: SB right, Rotated left via Multifidus



Limited trunk rotation right; improved with repeated trunk rotations.

Trunk Rotation: Stretch, Contract, Relax. (Muscle Energy Technique)

Left LBP after yard work; unable to stand upright. "Strain – Counterstrain"

Anterior pelvic tilt by Iliopsoas "spasm."

Pelvic tilt right as QL & ES elevate left iliac crest.

Stretch Rectus Femoris
With Knee Flexed & Hip Extended

“Tight” Hip Flexors
(RF & Iliopsoas)

Stand Upright &
“Lean Backwards”

Stretch Rectus Femoris

Stretch hip abductors & flexors (iliopsoas), & knee extensors

Use bottom leg to adduct & extend top hip.

Increase “stretch” by flexing knee.

Koes BW, Bouter LM, Mameren H van, et al. Randomised clinical trial of manipulative therapy and physiotherapy for persistent back and neck complaints: results of one year follow up BMJ 1992;304:601-5

- Conclusions-Manipulative therapy and physiotherapy are better than general practitioner and placebo treatment. Manipulative therapy is slightly better than physiotherapy after 12 months.
- N=256 patients; **non-specific back and neck complaints** ≥ 6 weeks. No physiotherapy or manipulative therapy in the past two years.
- **Interventions-At the discretion of the manipulative therapists, physiotherapists, and general practitioners**.
- Physiotherapy: exercises, massage, and physical therapy (heat, electrotherapy, ultrasound, shortwave diathermy).
- Manipulative therapy: manipulation and mobilization of the spine.
- General practitioners Tx : drugs (e.g. analgesics), advice about posture, home exercises, and (bed)rest.

Patellofemoral Dysfunction (PFD)
Patellofemoral Pain Syndrome (PFPS)

- Prevalence 25%; often <40 yrs & physically active.
- 31% prevalence for my patients.

Duong, et al. Evaluation and Treatment of Knee Pain: A Review. JAMA. 2023

Knee Pain 31%: Patellofemoral Dysfunction

Sunrise or Merchant view

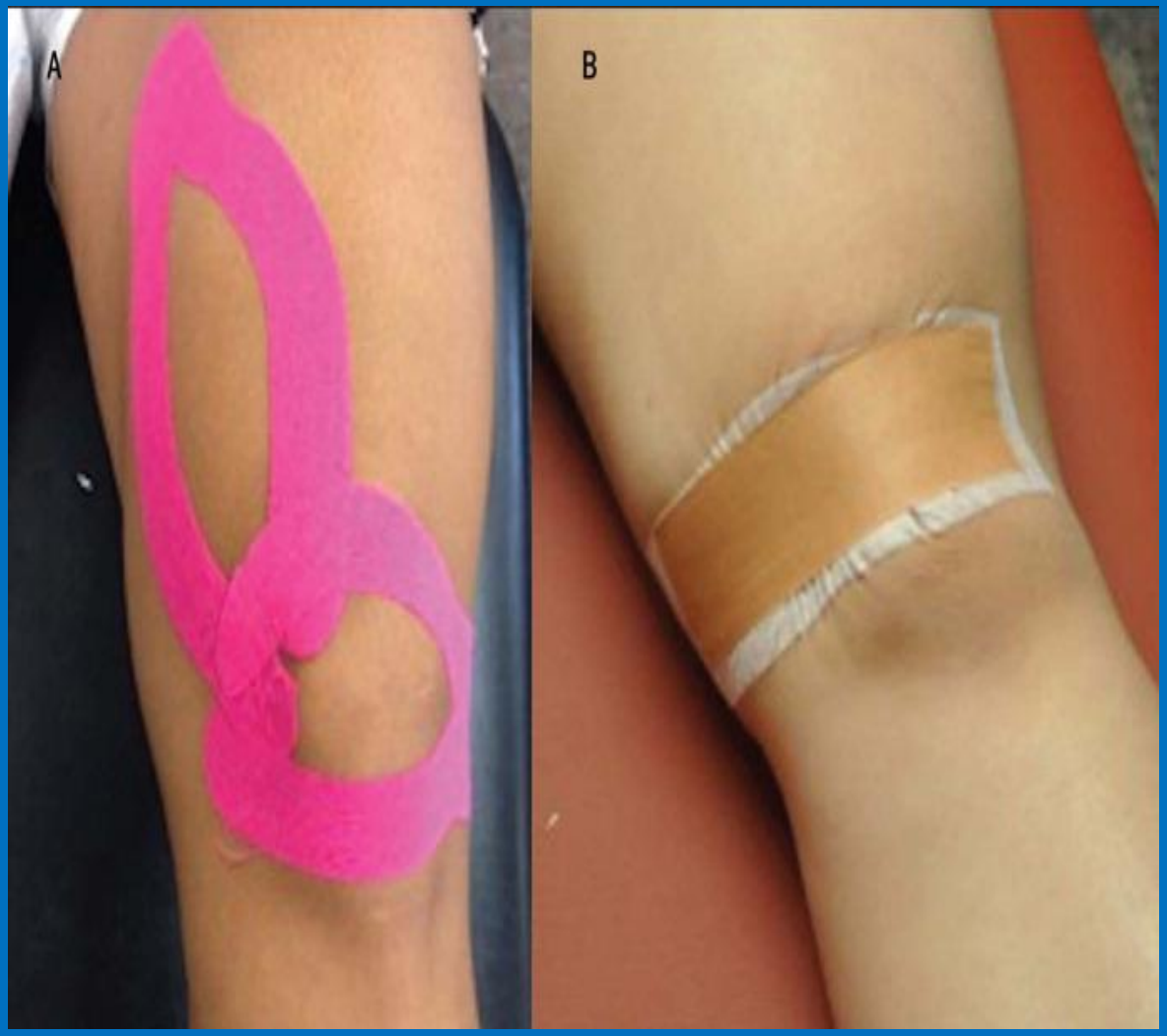
Patella is pulled lateral to femoral groove by 4 muscles: RF, VL, VI, TFL-ITB

PE: skin temperature; palpate for crepitus; patella mobility; patella tendon compression test.

Tx: Aspirate & inject.

Tape patella into groove.

Exercise: stretch muscles that pull patella laterally; increase endurance for VM (type 1 fiber) to pull patella medially.



(A) Kinesio taping method.
(B) McConnell taping method..
Ho-K-Y, JOSPT 2017.

Knee Pain & PFD

- Case: 59 yr man c/o B/L knee pain & difficulty walking.
- X-rays: tricompartmental OA
- 10/11/23: steroid injections at orthopedist office decreased pain from 10/10 to 8/10 B/L.
- 10/12/23: moderate crepitus. After patella taping, pain decreased from 8/10 B/L to 3/10 left and 1/10 right. Antalgic gait resolved.
- HEP: Self tape knees; Ex to stretch muscles that pull the patella laterally, & to increase endurance for Vastus Medialis (type I fibers).