Objectives

Upon completion, participants should be able to:
1. Understand and apply to patient care the pathophysiology of various obstetric musculoskeletal disorders commonly seen in this population.
2. Practice and apply treatment interventions to the pregnant and postpartum client for these musculoskeletal dysfunctions.
3. Develop appropriate home programs for clients with such musculoskeletal dysfunction.
4. Appreciate current evidence for the interventions the participants discuss and practice.

The Cases

• Pregnant client with a Herniated Nucleus Pulposus (HNP)
• Post-partum client with L&D-related coccydynia
• Pregnant client with Transient Osteoporosis of the Hip (TOH)
• Pregnant client with dysfunction and pain in her thoracic spine and ribs

The Format

• Expectation of Participation-bringing the wisdom in the room into the course!
• Weaving into the discussion:
  – Evidence
  – Examination concerns
  – Intervention options (exercise, manual therapy, belts/supports, advice)
• Lab practice: driven by discussion, the cases, and participant requests/needs

Herniated Nucleus Pulposus in Pregnancy

• 1/10,000 De Novo disc herniations in pregnancy
• Much more common to see women with previous Hx of HNP who are now pregnant

Epidemiology-HNP in Pregnancy

• Much more common to see women with previous Hx of HNP who are now pregnant

www.backpainhelptoday.com
Medical Management-HNP in Pregnancy

- Opiods sometimes given as pain relief (Matsumoto 2009)
- Surgery is an option (Brown and Levi, 2001)
- Mode of Delivery: C-Section vs. Vaginal

Review of Osteopathic Mechanics

- Fryette's laws on neutral and non-neutral mechanics
- Type 1 and Type 2 lesions
- FRS and ERS
- Sacral Torsions
- Pubic Shears
- Response of the sacrum to Lumbar spine motion

HNP in Pregnancy-the Case

- A 30-year-old G2PI woman presented at 22 weeks gestation with complaints of right buttock and lower extremity pain.
- Mechanism of Injury (MOI): lifting 2–year old from floor to changing table.
- Previous Medical Hx: Mild backache in previous pregnancy
- Physical examination:
  - left lateral shift
  - flattened lumbar lordosis
  - positive right straight leg raising at 30°
  - positive crossed straight leg raising at 45°
- MRI: moderate right posterolateral disk protrusion at the L4-5 level with probable compromise of the L5 nerve root.

HNP in Pregnancy

Patient Interview Findings

- CC: Sharp, intermittent R LE pain and P/N and mild-moderate LBP. No c/o bowel/bladder dysfunction
- MOI: lifting her 2-yr old from floor
- Hx: No c/o LE pain in 1st pregnancy. Had mild-moderate LBP in this pregnancy prior to onset of LE pain. No previous LB or LE pain outside of pregnancies
- Location: R lateral calf and dorsal aspects of R foot.
- Aggravation: FB, sitting > 15 min, childcare, lifting
- Alleviation: supine lying
- Nature: Sharp, some P/N when aggravated. Intermittent. Ranges from 3-8 on 0-10 pain scale

HNP in Pregnancy

Physical Examination Findings

- Left lateral shift
- Flattened lumbar lordosis
- Neuro exam:
  - Positive right straight leg raising at 30°
  - Positive crossed straight leg raising at 45°
  - Diminished sensation R LE in L5 distribution
  - DTR’s WNL
- Increased T-S kyphosis, mildly increased C-S lordosis
- Forward head posture
- Flat feet with mild pronation bilaterally
**HNP in Pregnancy**

**Physical Examination Findings-cont.**

- FRS L @ L5
- PA pressure at L5 restricted and painful, Gr II
- Increased paraspinal tone L low lumbar
- Leg Sx worsened with FB; slightly minimized with repeated BB
- Shift correction $\rightarrow$ ↑LB pain, but ↓LE Sx
- Provocation tests for PGP negative
- Gait is unremarkable, though slow

**PT Interventions**

- Manual Left Lateral Shift correction
- Self-Correction of lateral shift
- BB exercises: 4-point; standing, leaning against wall (with lateral shift correction); standing, leaning on table
- Traction: in pool; holding onto doorframe (with lateral shift correction)
- Body Mechanics instruction for childcare, ADL’s and IADL’s, use of lumbar support
- Lumbar support garments

**PT Recommendations for L&D**

- **First Stage**
  - Walk, if comfortable
  - Rest with lumbar support
  - Maintain lumbar lordosis in positioning choices
  - Avoid squatting or FB
- **Second Stage**
  - Push with open glottis
  - Avoid FB postures including squatting (use L-S support, e.g., in semi-reclining)

**Summary of Position Modifications for Women with Pre-existing Spinal or Pelvic Ring Dysfunction (Boissonnault JS, 2002)**

<table>
<thead>
<tr>
<th>Dysfunction</th>
<th>Position to Avoid</th>
<th>Recommended Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar or Thoracic Disc Herniation or Slippage</td>
<td>Standing</td>
<td>Side-lying/hands on hips support, side-lying/thumb on iliac crest, prone with knees flexed, prone with knees extended</td>
</tr>
<tr>
<td>Intervertebral Disk Herniation</td>
<td>Standing</td>
<td>Side-lying/hands on hips support, side-lying/thumb on iliac crest, prone with knees flexed, prone with knees extended</td>
</tr>
<tr>
<td>Spinal Stenosis</td>
<td>Standing</td>
<td>Side-lying/hands on hips support, side-lying/thumb on iliac crest, prone with knees flexed, prone with knees extended</td>
</tr>
<tr>
<td>Sacroiliac Dysfunction</td>
<td>Standing</td>
<td>Side-lying/hands on hips support, side-lying/thumb on iliac crest, prone with knees flexed, prone with knees extended</td>
</tr>
<tr>
<td>Pubic Symphysis Dysfunction</td>
<td>Standing</td>
<td>Side-lying/hands on hips support, side-lying/thumb on iliac crest, prone with knees flexed, prone with knees extended</td>
</tr>
<tr>
<td>Coccyx Dysfunction</td>
<td>Standing</td>
<td>Side-lying/hands on hips support, side-lying/thumb on iliac crest, prone with knees flexed, prone with knees extended</td>
</tr>
</tbody>
</table>

**Correction of Left Lateral Shift**

- Exercise (self correction and PT directed)
- Manual correction
- and muscle energy for FRS L L5
- Extension and flexion bias exercise options (McKenzie-adapted to the pregnant client)
- Body Mechanics instruction
- Supports/belts
Pregnant Woman Press-Up

Trunk Extension on Wall with and without shift correction

Trunk Extension in 4-Point

MET: FRS correction Sidelying

Correction of an FRS Left in Sitting

PNF D2 Flx: Also an FRS L HEP
Restoration of Trunk Flexion and Rotation in Standing

Restoration of Trunk Flexion and Rotation in 4-Point

Transverse Abdominis Ex in 4-Point

Transversus Abdominis Exercise While Sitting or When Driving

Body Mechanics Instruction

Auto-Traction in Doorway
Coccydynia Etiology & Pathology

- Theory of “coccygeal instability” = luxations and hypermobility (> 25° of fix)
  - MRI study (Maigne, Spine 2000)
  - Debated by some (Grasso 2006)
- Role of body mass index: ↑ risk (Maigne, Jnl Bone Jt Surg 2000)
- Role of coccygeal trauma (Maigne, Jnl Bone Jt Surg 2000, Nathan 2010)

Post-partum Coccydynia

www.xtracareequipment.com.au

References

- Laban MM; Rapp NS; von Oeyen P; Meerschaert JR; The lumbar herniated disk of pregnancy: a report of six cases identified by magnetic resonance imaging. Archives of Physical Medicine & Rehabilitation, 1995 May; 76 (5): 476-9.


Epidemiology & Pathophysiology of Post-partum Coccydynia

- After external trauma, delivery appears to be the 2nd most common cause of coccydynia in women
- Prevalence in vaginal births: Unknown (Nathan 2010).
- Role of maternal position (theoretical-I B)
  - ↑ Risk: Lithotomy on delivery table & Semi-reclining on a birthing bed
  - Protective: bottom off any surface (squatting, 4-point, sidelying, upright kneeling, standing)
- Risk factors: BMI > 27, Parity > 2, FORCEPS DELIVERY, ventouse, PROM/PPROM.

CMO Mother-To-Be Support for L-S Dysfunction

Post-partum Coccydynia

www.xtracareequipment.com.au

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**Medical Management of Post-partum Coccydynia**

- Steroid injection to SC jt.: Pts with < 6 mos. pain are good candidates (Mitra, 2007)
- NSAIDS
- Coccygectomy - Doursounian 2004 good ref: Surgery only in those refractory to conser. care
- Referral to PT (usually categorized as diathermy and electrical stimulation)
- Post-partum doughnut
- Intra-rectal manipulation


**Evidenced-Based PT Intervention for Postpartum Coccydynia**

  - Mobilization of the coccyx via muscle contraction
  - Mobilization of the Sacrum at the SC jt while holding the coccyx still intrarectally
  - Distraction of the coccyx with/without lateral deviation
  - Ventral/caudal glides with/without distraction
- Intrarectal Soft Tissue Mobilization (Thile 1937, 1963)
- Assessment and Rx of bowel dysfunction especially to avoid constipation (Lande 2011)
- Physical Agents for associated Levator Ani Syndrome or PFM hypertonus: (proposed, but not well researched)
  - High volt electrical stimulation - Iontophoresis (see chart on next slide)
  - TENS
  - Interferential therapy
  - Pulsed electromagnetic energy - US
  (Stephenson 2008, Johnson 2006)
- Positioning-multiple authors; no research given

**The Case**

- 38 yr old Gravida 6, Para 4, 8 weeks postpartum. Pt. is stay-at-home mom and investment consultant working from home
- CC: Coccyx pain @ 5/10
- Hx of CC: Pt. noticed the pain day 2 pp. Pain has remained the same since.
- Rx to date: ice, Tylenol 3, donut from hospital
- Pt. Goals: Sit at home office desk > 2 hrs; Sit to nurse baby without pain

**Physical Exam Findings: Post-partum Coccydynia-Visit 1**

- Palpation: tender all around coccyx externally; Exquisite tenderness at SC jt line
- Springing SC jt: Painful and reproduces her pain
- Sitting Posture: Antalgic
- Observation: Pt. can contract PF mm but not clear how well she relaxes

**Patient Interview Findings: Post-partum Coccydynia**

- Location of Pain: Coccyx and surrounding buttock area. C/o pain with her one attempt at intercourse (last wk) since the birth of the baby
- Nature: deep ache; constant when seated
- Agg: sitting > 5 minutes (nursing, work); hard surfaces worst
- Alev: ice, meds, getting off bottom
- Radiograph negative for Fx
- Orthopaedist offering coccyectomy if PT is unsuccessful
PT Interventions: Post-partum Coccydynia-Visit 1

- Unweight the coccyx in sitting
  - Cushion or toweling
  - Provide lumbar support to maintain lordosis
- Review sitting postures in all activities
  - Work, nursing, eating meals, driving, etc.

PT Visit 2: Assessment: Post-partum Coccydynia

- Internal rectal exam
  - Assessed coccyx position: slight deviation to the Right
  - Pain along ventral margin of SC jt line
  - Pain in coccygeal mm bilaterally
  - PF mm contraction: 4/5 strength, 10 sec hold, 10 reps, but unable to fully relax (could not feel a softening of the tissues-finger unable to sink in)

PT Visit 2-6: Post-partum Coccydynia, cont.

- RX:
  - Biofeedback with rectal probe to down-train PFM, specifically, coccygeus
  - Reviewed sitting posture
  - Began first of 6 visits of iontophoresis with TMJ-size electrode and dexamethazone to SC jt
- Prevention
  - Discussed need to let tissues heal and avoid prolonged pressure on coccyx for many months, even if pain is 0/10
  - Future births: she planned on one more child: discussed positioning for L&D next time

PT Recommendations for L&D- Client with Hx of Coccydynia

- First stage and second stage avoidance of direct pressure on coccyx
- Positioning options:
  - Squatting or sitting on a birthing stool
  - Sidelying
  - Upright kneeling
  - 4-point
  - Standing

Post-partum Coccydynia - Lab Practice

- External palpation of PF contraction
- Unweighting the coccyx in sitting

Post-partum Coccydynia References

Transient Osteoporosis of the Hip (TOH) in Pregnancy

What is TOH?
- TOH is a subset of Osteoporosis in pregnancy
- Other osteoporotic areas seen in pregnancy:
  - Lumbar spine
  - Wrist
  - Tibia
- Diagnosis made by MRI, radiographs (pp), bone scans, and R/O diagnosis
- Referred as transient osteoporosis during pregnancy due to the self-limiting nature and spontaneous recovery.
- Fractures are infrequent (1%)
- True incidence during pregnancy is unknown

Pathophysiology of TOH in Pregnancy
- CA requirements to mineralize a fetal skeleton should not challenge maternal bone stores of CA (Sowers, 2000)
  - Maternal skeleton calcium store is approximately 1000 grams.
  - 30 grams of calcium are required for fetal skeleton mineralization
- Theory
  - Women with osteopenia or bone density challenges who become pregnant are at risk for osteoporosis in pregnancy (Drinkwater 1991, Khastgir 1996)
  - Genetic link (Carbone 1995, Dunne 1993)
  - Chemical/Hormonal mediation? (Chigira, 1988)

A Genetic Link?
- Carbone, et al, 1995. Described two patients with osteoporosis during pregnancy. Daughters demonstrated osteopenia at the wrist as did the two patients at 10 year FU.
- Dunne, et al, 1993. Studied 35 women with Hx of pregnancy related osteoporosis. Found a significantly higher prevalence of Fx occurring at a younger age in the mothers of these women.

Risk Factors for Osteopenia during Pregnancy
- Family history
- Immobilization/inactivity (bed rest in high risk pregnancies)
- Dietary deficiencies (Ca intake below 1200-1500mg, ↓Vitamin D)
- Toxins (tobacco and alcohol)
- Medications (anti-coagulants-thromboemboli)
- Comorbidities

Medical Management of TOH in Pregnancy
- Imaging: only if they suspect a Fx. Likely wait until pp
- Rest and restricted WB (NWB or WB as Tolerated) with assistive devices prn
- Work restrictions as needed
- Postpartum: imaging, bisphosphonates (rare), calcium, calcitonin, continued WB restrictions and gait-aid prn
**TOH Presentation and Prognosis**

Common presentation
(Samdani, 1998)
- Onset: Generally in 3rd trimester
- Pain locale: inguinal or greater trochanteric regions with referral to anterior thigh.
- ROM: limited at the hip
- Functionally restricted weight bearing

**Prognosis**

---

**The Case**

- 32 year old, gravida 1, para 0, 29 weeks gestation.
- credit records specialist (sits all day)
- Referred to PT from Nurse midwife/Obstetrician 2 weeks prior to initial PT visit
- Diagnosis of “R sciatica”. Pt. had been seen in PT before for same Dx, but on the Left.
- PMH: L5-S1 HNP (1996), forearm Fx age 19

---

**Patient Interview Findings - TOH in Pregnancy**

- Chief complaint: Deep right groin pain varying from 4-9/10, sharp and throbbing, “deep inside my hip”.
- Groin symptoms present for 4 weeks, initially as intermittent stiffness, then, 10 days prior to PT, became intense and sharp.
- Insidious groin stiffness/pain onset.

---

**Aggravating & Alleviating Factors TOH Case**

- **Aggravation:**
  - Standing: 10 minutes
  - Walking: 2-3 blocks
  - Transitional movements
  - Activities of daily living such as dressing that required hip flexion
- **Alleviation:**
  - Sitting
  - Recumbency

---

**Pt. Interview: Secondary Symptoms TOH Case**

- Ache: low lumbar, right buttock and lateral thigh, intensity of 2-5/10.
- Insidious onset 12 weeks prior to initial PT visit (approximately 17 weeks gestation)
- Slow, progressive worsening
- Aggravated by sitting > 10 min., F-Flex postures
- Alleviated by changing positions, supine lying
Pt. Interview: Secondary Symptoms, continued, TOH Case

- Paresthesia right lateral lower leg with insidious onset 12 weeks prior to initial PT visit.
- Aggravated by sitting > 10 minutes and F-Flx postures
- Alleviated by recumbency
- Previous Hx: similar Sx in Left LE 1996

Differential Diagnosis

- Origin(location) of CC considered:
  1. Pubic Symphysis
  2. SIJ *
  3. Lower T-spine/L-Spine
  4. hip joint or soft tissue lesion

NOTE: Use of patellar-pubic percussion test (PPPT) would help R/O Fx

Physical Examination Findings TOH Case

- Slow, antalgic gait
- Stance: minimal WB on Right LE
- Palpation: moderate to severe tenderness right femoral triangle
- Pubic Symphysis non-tender to palpation and springing
- Neuro exam: decreased light touch right, lateral lower leg; right Achilles reflex 1+

Physical Exam, continued TOH Case

- Trunk ROM: CC provoked with FB and right SB; limited in FB, Right SB and BB (with c/o right L/S pressure)
- SLR *: CC provoked at 30°
- SIJ screening/provocation tests were neg.

Physical Exam, continued Hip ROM, TOH Case

<table>
<thead>
<tr>
<th>Motion</th>
<th>Right Hip (AA/P ROM)</th>
<th>Left Hip (AROM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>85/85</td>
<td>125</td>
</tr>
<tr>
<td>Internal Rotn</td>
<td>5/5</td>
<td>40</td>
</tr>
<tr>
<td>External Rotn</td>
<td>50/55</td>
<td>55</td>
</tr>
<tr>
<td>Abduction</td>
<td>20/20</td>
<td>45</td>
</tr>
<tr>
<td>Extension</td>
<td>5/8</td>
<td>15</td>
</tr>
<tr>
<td>Adduction</td>
<td>NT</td>
<td>NT</td>
</tr>
</tbody>
</table>

Physical Exam, continued End Feel, hip, TOH Case

- Empty end feel: with hip flx and IR, and SLR to 30°
- Spasm end feel: with hip abduction
- Capsular end feel: with ER and extension
Assessment of Clinical Presentation

TOH Case

Symptoms
• Sudden onset of CC
• Insidious onset of CC
• Severe pain, 9-10/10
• No relief of pain with rest
• Inability to actively lift LE
• MD and CNM unaware of ↑ Pt.Sx

Signs
• Severe ROM loss * hip
• Empty end feel Fix, IR, SLR
• Spasm end feel Abd
• Prov. CC SLR 30°

Referral Generated back to CNM with specific concerns about R hip

PT Interventions and Medical Management, TOH Case

• Crutches
• Off work with decrease in Sx
• Seen 10 days PP in PT S/P vaginal delivery with similar presentation, so referred back to CNM/OB with subsequent referral to an Orthopedist.
• Subsequent Plain films and MRI suggested TOH: ↓ BMD in femoral head, neck, and acetabulum without collapse.
• Lab tests negative

Management of TOH, Postpartum

• WB to tolerance with crutches
• Aquatic PT for ambulation, strengthening, ROM and pain relief.
• FU plain films at 10 weeks pp
• FU MRI at 12 weeks pp
• Told to progress to land-based program to rebuild bone density (Pt. moved away after this)
Follow-up conventional radiograph of the pelvis and hips taken approximately 13 weeks after the initial radiograph. According to the radiologist, this radiograph revealed normal mineralization of the right femur and acetabulum.

MRI axial follow-up of the right hip taken approximately 3 months after the initial physical therapy visit. Slight residual high-signal intensity area in the right femoral head and acetabulum noted by the radiologist.

PT Recommendations for L&D- TOH in Pregnancy

- Semi Reclining with hip supported by pillows in Flx, (limited) AB and ER
- Avoid WB postures and consider hip ROM limitations
- Regional Anesthesia concerns: no pain feedback

TOH in Pregnancy -Lab Practice

- Assess end feels in hips (Flx, ext, abd, IR, ER)
- Palpation: about hip joint region
- Provocation tests to R/O pelvic jts
  - Spring pubis
  - Sacrum: spring ILA’s, apex and Sacral Sulci in sitting
- Patellar-pubic percussion test (PPPT) (Fla, 1998)

(Springing the Sacrum in Sitting)

(Magee, 2002)

<table>
<thead>
<tr>
<th>Normal and Abnormal End Feel</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>Bone-to-bone</td>
<td>Elbow extension</td>
</tr>
<tr>
<td>Soft tissue approximation</td>
<td>Knee flexion</td>
</tr>
<tr>
<td>Tissue stretch</td>
<td>Knee flexion, shoulder lateral rotation, finger extension</td>
</tr>
<tr>
<td>Abnormal</td>
<td></td>
</tr>
<tr>
<td>Early muscle spasm</td>
<td>Protective spasm after injury</td>
</tr>
<tr>
<td>Late muscle spasm</td>
<td>Spasm caused by instability</td>
</tr>
<tr>
<td>Hard capsular</td>
<td>Frozen shoulder</td>
</tr>
<tr>
<td>Soft capsular</td>
<td>Symptosis, soft tissue edema</td>
</tr>
<tr>
<td>Bone-to-bone</td>
<td>Osteophyte formation</td>
</tr>
<tr>
<td>Empty</td>
<td>Acute subacromial bursitis</td>
</tr>
<tr>
<td>Spring block</td>
<td>Meniscus tear</td>
</tr>
</tbody>
</table>
Patellar Pubic Percussion Test

TOH References


Thoracic Spine and Ribcage Dysfunction in Pregnancy

Fig A

Fig B

Fig C

www.whittlesey-osteopaths.com

Anatomic Thoracic Spine and Ribcage Change in Pregnancy

• Anatomical changes in Ribcage during pregnancy
  – Costal angles
  – Dimension changes
  – Costal vertebral joints
  – Costal transverse joints
  (Strahaul 2011)
• Thoracic Spine Changes:
  – ↑ T-S kyphosis
  (Bullock 1987, Franklin 1998)

• NO WONDER THERE IS DYSFUNCTION!

Medical Management of Thoracic Spine and Ribcage Dysfunction

• NONE! “Live with it” mentality
• Common dysfunction and complaint in pregnancy; probably 2nd or 3rd in incidence after PGP and LBP complaints
• Remember to screen for medical disease! (Boissonnault and Stephenson, 2010)

visceral sources of T-S/rib-cage pain:
  – Gallbladder
  – Upper urinary tract infection
  – AAA
  – Heart

The Case

• 31 yr old Gravida 1 para 0, office worker @ 32 wks gestation
• CC: Mid back pain, intra-scapular and sometimes left ribcage, posterior-laterally
• MOI: insidious
• Hx: Began 6 weeks ago and has ↑ in intensity. No c/o back pain prior to pregnancy
• Pt. goal: to be able to continue working until delivery; to ↓ pain
Patient Interview Findings- Thoracic Spine and Ribcage Dysfunction

- Pain is intermittent and 2-8/10; worse at end of work day
- Agg: computer work, doing dishes
- Alev: sleep (once it comes), local heat, spouse massaging area
- Function: pt. reports difficulty doing her computer work due to pain; Feels she needs to lie down once she gets home at the end of day, and has trouble falling asleep due to pain

Physical Exam Findings- Thoracic Spine and Ribcage Dysfunction

- Intra-scapular pain reproduced by AROM of T-S in FB, SB and Rotation bilaterally
- Central PA’s and Left Unilateral PA’s are stiff (gr 11) @ T 5-8
- Springing ribs 6-8 on left reproduce some of her unilateral pain
- Position testing: FRS L T6,7 AND ERS L T5 (YIKES!)
- C-S is clear as are shoulder joints. PA’s to lumbar spine are negative

PT Interventions- Thoracic Spine and Ribcage Dysfunction

- Muscle energy techniques in sitting for FRS and ERS positional findings
- AAROM to T-S and ribcage in sitting
- Back extensor strengthening with theraband/tubing
- Ergonomic assessment of her work station and posture with recommendations for modifications prn

PT Interventions- Thoracic Spine and Ribcage Dysfunction, cont.

- General Trunk Strengthening — Core Stabilization
- HEP for T-S and ribcage mobility
- Considerations for sleep (foam mattress pad)
  (Boissonnault, 2011)

PT Recommendations for L&D- Thoracic Spine and Ribcage Dysfunction

- Most likely, no modifications needed
- Encourage partner to monitor her posture and to manage any c/o T-Spine pain with massage and heat

Body Mechanics Instruction for Post-partum Child Care
Thoracic Spine and Ribcage Dysfunction - Lab Practice

- FRS and ERS assessment in sitting
- FRS T-S correction in sitting
- ERS T-S correction in sitting
- AAROM for T-S/rib cage
  - Elongation in sitting
  - T-S Rotation
  - T-S extension over PT’s knee
- HEP for T-S SB, Rot, BB
- TRa strengthening & pelvic tilts on wall
- Posture re-education

ERS Correction in Sitting

Active Assisted Trunk SB

Elongation in Sitting to ↑ SB

Active Assisted Vertebral Extension
T-S Self-Mobilization into Extension

Active Assisted Trunk/Vertebral Rotation

Chair Twist to ↑Trunk Rotation

PA Unilateral Pressures in Supported Lean

Transverse Abdominis Ex in 4-Point

Transversus Abdominis Exercise While Sitting or When Driving
Posterior Pelvic Tilt on the Wall

Posture Work and Abdominal Strengthening to ↓ Excessive L-S Lordosis

Thoracic Spine and Ribcage Dysfunction References