Manual Therapy: Early Intervention for Shoulder and Cervicothoracic Dysfunction

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Objectives

• Summarize prevalence of chronic pain in the SCI population and discuss lack of research for treatment

• Identify common impairments relative to the shoulder, scapula, cervical spine, and thoracic spine noted in patients with SCI

• Define functional dry needling and it’s application in physical therapy treatment

• Explore techniques to treat shoulder and cervicothoracic pain and dysfunction using manual therapy and corrective exercise in the inpatient SCI rehabilitation setting

• Discuss two case studies incorporating manual therapy techniques, functional dry needling, and corrective exercise to address both pain and dysfunction in inpatient rehab plan of care
Pain in the Spinal Cord Injury Population

- Patients with SCI:
  - (Compared to US national norms)
  - Pain statistically and substantially greater
  - Overall pain not found to increase or decrease over time
  - EXCEPT shoulder pain found to INCREASE
- Cervicogenic pain often missed
  - Tetraplegia: 33%
  - Paraplegia: 13%

### Table 2: Frequency and intensity of pain

<table>
<thead>
<tr>
<th>Pain Site</th>
<th>Percent Reporting Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>43.6</td>
</tr>
<tr>
<td>Shoulder</td>
<td>60.7</td>
</tr>
<tr>
<td>Back</td>
<td>58.1</td>
</tr>
<tr>
<td>Arms/hands</td>
<td>29.9</td>
</tr>
<tr>
<td>Buttocks/hips</td>
<td>47.9</td>
</tr>
<tr>
<td>Abdomen</td>
<td>37.6</td>
</tr>
<tr>
<td>Legs/feet</td>
<td>48.7</td>
</tr>
<tr>
<td>Intensity of pain (mean ± SD)</td>
<td>5.08 ± 2.32</td>
</tr>
</tbody>
</table>
SCI and Shoulder Pain

- Shoulder pain prevalence in SCI
  - 36-71%
- Subjects with tetraplegia have a higher incidence of pain than those with paraplegia
- Pain develops quickly in SCI, indicating it is not just from overuse
- Early onset of shoulder pain during inpatient rehab → predictive of chronic pain
SCI and Shoulder Pain

- Early onset of shoulder pain: most important predictor of pain later
- Inpatient rehab →
  - Need to be careful to avoid increasing shoulder pain
  - Focus on balanced shoulder training

“Shoulder strength and physical activity predictors of shoulder pain in people with paraplegia from spinal injury: prospective cohort study” (Mulroy 2015)

- 223 subjects with SCI
- 39.8% developed shoulder pain
  - Found to have weaker shoulder muscles, specifically adductors
  - This accounted for only 7.5% of variability
- It’s not just a strength issue!
• Need to differentiate **site** versus **source** of pain
  • “Where does it hurt”
  • “Why does it hurt?”
    • Important to assess big picture

• Assessment: Both area of pain and joints above and below
  • Biomechanics
  • Strength and ROM
  • Pain pattern

→ Additional Assessment/Tx Considerations: Lumbar Spine, Sacroiliac joint, Hips
SHOULDER:
Common issues noted during inpatient rehabilitation

- Muscular imbalance
- Subluxation
- Subacromial impingement
- Forward, rounded posture/translated humeral head
- Posterior capsule tightness
- MTrPs
- Biceps Impingement, tendonitis
Trigger Point Referral Patterns: Shoulder

- Pectoralis Major
- Pectoralis Minor
- Latissimus Dorsi
- Deltoid
- Biceps Brachii
CERVICAL SPINE:
Common issues noted during inpatient rehabilitation

- Forward head
- ROM limitations
- Postural Asymmetries
- OA hyperextension
- Overuse of upper traps/scalenes
- Neural tension
- Immobility: fusion, collar
- Referral headaches
- Active MTrPs
Trigger Point Referral Patterns: Cervical Spine

- Sub occipitals
- Scalenes
- Splenius Capitus
- Splenius Cervicis
SCAPULA:
Common issues noted during inpatient rehabilitation

• Muscular imbalance
  • Tight pec minor, biceps short head
  • Weak (-) serratus anterior, lower/middle trapezius, rhomboids

• Postural Abnormalities
  • Scapular winging
  • Excessive scapular retraction
  • Scapular elevation

• Impaired scapular-humeral rhythm
  • Glenohumeral IR Deficit
  • Decreased scapular mobility
  • Posterior capsule tightness
  • Impaired proprioception
  • Acromioclavicular joint impairment

• Active MTrPs/Pain
THORACIC SPINE:
Common issues noted during inpatient rehabilitation

• Impaired mobility:
  • Rotation
  • Side bending
  • Extension

• Postural Asymmetries
  • Thoracic kyphosis
  • Upper Crossed Syndrome

• Impaired rib mobility

• Immobility
  • Spinal Fusion
  • Brace: TLSO, CTLSO, C-Collar

• Active MTrPs/Pain

• Referral Pain
Trigger Point Referral Patterns: Scapula & Thoracic Region

- Levator Scapulae
- Infraspinatus
- Upper Trapezius
- Teres Major/Minor
- Supraspinatus
Interventions

- Manual Therapy
  - Shoulder and Scapula
  - Cervical spine
  - Thoracic spine and Rib cage
  - **Functional dry needling**
- Corrective Techniques & Exercise
  - Postural taping
  - Strengthening
  - Neuromuscular Re-education
- Other Considerations:
  - Wheelchair seating and positioning
  - External postural supports
Shoulder Manual Therapy

- Glenohumeral joint mobilizations
  - Inferior
  - Lateral
  - Posterior
- 1st rib mobilizations
- Biceps Tendon Transverse Friction Massage
- Acromioclavicular A-P Glides
- Sternoclavicular A-P or S-I glides

Lateral Distraction (whole capsule)  ↑ all motions
Posterior Glide (posterior capsule)  ↑ flexion, IR, horizontal ADD
Caudal glide (inferior capsule)  ↑ abduction
Shoulder Manual Therapy
What’s the evidence say?

• Manual therapy vs strengthening exercises alone:
  • Both led to decrease in pain, increase in function
  • Manual therapy led to significantly more improvement

• Shoulder mobilizations and mobilization with movement compared to therapeutic exercise:
  • Both manual therapy groups had decreased pain and increased function vs exercise only
Cervical Spine Manual Therapy

- Segmental joint mobility
  - A-P joint mobilizations
  - Side glides
  - Rotational joint mobilizations
- Occipital Release
- Soft Tissue, Transverse Friction massage
  - Scalenes
  - Sternocleidomastoid
- Upper limb neural tension
  - Can address this when C-spine is immobilized

“Management of a patient with shoulder pain and disability: a manual physical therapy approach addressing impairments of the cervical spine and upper limb neural tissue”

- Initial Assessment:
  - SPADI score 83%
  - 50° S’ Flexion; 45° S’ Abduction; 25° S’ External Rotation
  - (+) ULTT
  - ↓ Segmental Mobility C5-6
- Treatment:
  - Segmental cervical mobilizations
- Results:
  - SPADI score 1.5%
  - S’ ROM WNL
Thoracic Spine Manual Therapy

• Joint mobilizations of thoracic spine/rib cage
  • Rotation; (+) Breath Work
  • A-P
• Regional interdependence
  • Check joints above and below:
    • Above: Cervical, Shoulder, Scapula
    • Below: Lumbar spine, hips, SI joint

“The immediate effects of thoracic spine and rib manipulation on subjects with primary complaints of shoulder pain”
• 21 subjects with shoulder pain.
• Treatment: thoracic spine/rib cage manipulation
• Test-retest: immediate decrease in pain (51% on VAS), increase in shoulder ROM (30-38 degrees)
Dry Needling is a skilled technique performed by a physical therapist using thin filiform needles to penetrate the skin and/or underlying tissues to affect change in body structures and functions for the evaluation and management of neuro-musculoskeletal conditions, pain, movement impairments, and disability.

(Federation of State Boards of Physical Therapy, May 2015)
Current Dry Needling Practice Models

- **Trigger Point Model**
  - Focus on tissue changes

- **Radiculopathic Model**
  - Focus on the spinal segment

- **Functional Model**
  - Focus on function; treating the *why* not just the *what*
### Physiological Effects of Functional Dry Needling

<table>
<thead>
<tr>
<th>LEVEL OF CHANGE</th>
<th>INCREASE</th>
<th>DECREASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle Tissue</td>
<td>• Blood Flow</td>
<td>• Muscle Banding</td>
</tr>
<tr>
<td></td>
<td>• Restore sarcomere length and length/tension relationship</td>
<td>• Spontaneous electrical activity</td>
</tr>
<tr>
<td>Biochemical</td>
<td>• B-Endorphin levels</td>
<td>• Nociceptive Sensitizing Agents: Substance P, CGRP</td>
</tr>
<tr>
<td></td>
<td>• Capillarity of Tissue</td>
<td></td>
</tr>
<tr>
<td>Central Nervous System</td>
<td>• Sensory stimulus drives gate control theory</td>
<td>• Changes in Neurotransmitters, cytokines, chemokines</td>
</tr>
<tr>
<td></td>
<td>• PAG and Limbic Activation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sympathetic Response</td>
<td></td>
</tr>
</tbody>
</table>

↑ ROM  ↓ PAIN  RESTORE FUNCTION

↑ ROM  ↓ PAIN  RESTORE FUNCTION
When is FDN *not* indicated for my patient?

<table>
<thead>
<tr>
<th>CONTRINDICATIONS</th>
<th>RELATIVE CONTRAINdications</th>
<th>PRECAUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consent denied</td>
<td>• Controlled Anticoagulants</td>
<td>• Significant Cognitive Impairment</td>
</tr>
<tr>
<td>• 1&lt;sup&gt;st&lt;/sup&gt; Trimester of pregnancy</td>
<td>• Post surgical but cleared by surgeon</td>
<td>• Communication Barrie</td>
</tr>
<tr>
<td>• Uncontrolled anticoagulant usage</td>
<td>• Autoimmune Disease</td>
<td>• Needle aversion or phobia</td>
</tr>
<tr>
<td>• Compromised immune system</td>
<td>• History of lymph node removal with clearance from</td>
<td>• Metal allergy</td>
</tr>
<tr>
<td>• Local infection or tumor</td>
<td>oncologist</td>
<td>• Severe hyperalgesia or allodynia</td>
</tr>
<tr>
<td>• History of lymph node removal</td>
<td>• Respiratory illness (acute, subacute)</td>
<td>• Abnormal bleeding disorders</td>
</tr>
<tr>
<td>• Occipital region of patients with Chiari Malformation</td>
<td></td>
<td>• Vascular disease</td>
</tr>
<tr>
<td>• Area over a cardiac pacemaker</td>
<td></td>
<td>• Area of breast implant of spinal stimulator</td>
</tr>
<tr>
<td>KinetaCore Post Surgical Protocol:</td>
<td></td>
<td>• Area of laminectomy</td>
</tr>
<tr>
<td>• Do not treat local area of surgery with FDN for 12 weeks following surgery</td>
<td></td>
<td>• Scoliosis</td>
</tr>
<tr>
<td>• Do not use FDN for any tissue that has shared a</td>
<td></td>
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<td></td>
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</table>
**PURPOSE** → Investigate DN to various non-trigger point-based anatomical locations coupled with strengthening exercises (SE) as a treatment strategies to decrease pain and increase function in patient with chronic RTC pathology.

**CASE DESCRIPTIONS** → Eight patients with rotator cuff tendinopathy were treated 1-2x per week for up to 8 weeks. Outcomes were tested at baseline upon completion of therapy. Long term outcome measure follow-up averaging 8.75 months also performed.

![Table 3. Demographic Characteristics of Patients with Chronic RTC Tendinopathy](image)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Time Since Onset (days)</th>
<th>Number of Treatment Sessions Attended Weeks 1-4</th>
<th>Number of Treatment Sessions Attended Weeks 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63</td>
<td>M</td>
<td>&gt; 90 days</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>59</td>
<td>F</td>
<td>&gt; 90 days</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>73</td>
<td>M</td>
<td>&gt; 90 days</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>M</td>
<td>&gt; 90 days</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>63</td>
<td>M</td>
<td>&gt; 90 days</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>78</td>
<td>F</td>
<td>&gt; 90 days</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>39</td>
<td>M</td>
<td>&gt; 90 days</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>41</td>
<td>M</td>
<td>&gt; 90 days</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Average</td>
<td>55.62</td>
<td></td>
<td>9.75</td>
<td>1.75</td>
<td></td>
</tr>
</tbody>
</table>
Case Series ➔ Intervention

Table 2. Strengthening Exercise Protocol

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention</th>
<th>Dosage</th>
<th>Illustration(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengthening Exercise Activities</td>
<td>1. Side-lying ER w/Towel Roll</td>
<td>3 sets x 15 reps for all interventions.</td>
<td>See Appendix A for images of all exercises utilized in the case series.</td>
</tr>
<tr>
<td></td>
<td>2. Supine Serratus Punch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Prone Horizontal Shoulder ABD at 100°FLEX &amp; 10° ER. (V's)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Standing Shoulder FLEX (I's)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Standing Shoulder ABD (I's) with 10° ER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Standing Full Can (V's) with 10° ER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Standing Machine Shoulder EXT 90-0.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Standing Machine Rowing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Machine IR at 20° ABD.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. Machine ER at 20° ABD.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11. Machine D1 FLEX &amp; EXT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12. Machine D2 FLEX &amp; EXT.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ER = external rotation; ABD = abduction; FLEX = flexion; IR = internal rotation; EXT = extension

Table

<table>
<thead>
<tr>
<th>Needle Number</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5 fingerbreadths medial to the medial acromial border angled inferior and slightly laterally.</td>
</tr>
<tr>
<td>2</td>
<td>Anterior &quot;eye&quot; dimple on the greater tuberosity (found by ABD the shoulder to 90 degrees).</td>
</tr>
<tr>
<td>3</td>
<td>Posterior &quot;eye&quot; dimple on the greater tuberosity (found by ABD the shoulder to 90 degrees).</td>
</tr>
<tr>
<td>4</td>
<td>1 fingerbreadth superior to the midpoint scapular spine angled inferior and posterior.</td>
</tr>
<tr>
<td>5</td>
<td>Deltoid tuberosity attachment on the Humerus.</td>
</tr>
</tbody>
</table>
8/8 patients improved shoulder ABD and ER MMT scores to 5/5
8/8 patients reported improvements in sleep
8/8 patients returned to independent exercise without limitation from shoulder pain

CONCLUSION
Clinically meaningful improvements in pain and disability were noted with the intervention protocol
### “Inclusion of trigger point dry-needling in a multimodal physical therapy program for postoperative shoulder pain; a randomized controlled trial” (Arias-Buria et. Al. 2014)

<table>
<thead>
<tr>
<th>Study &amp; Purpose</th>
<th>Participants &amp; Methods</th>
<th>Outcomes</th>
<th>Results</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective is to compare the effect of dry needling and multimodal PT vs. PT alone in individuals who have undergone rotator cuff repair or proximal fracture repair</td>
<td>20 Patients experiencing post-op pain, 5 sessions</td>
<td>Constant-Murley Score measured before each session and 1 week post final (5th) session</td>
<td>PT + DN Group experienced significantly greater improvements in strength (28%, p&lt;0.05) and ADLs (37.5%, p&lt;0.001)</td>
<td>Participants with post-op shoulder pain demonstrated significant improvements in strength, ROM, pain, and overall function following PT input, particularly if dry needling was included within the 1st 6 months of rehab</td>
</tr>
</tbody>
</table>

- **Control**: PT only; passive mobs, STM, strength and proprioceptive exercises
- **Experimental**: PT + DN
- DN applied in 1st /5 sessions to palpated trigger points

### “Effectiveness of dry needling for chronic nonspecific neck pain: a randomized, single-blinded, clinical trial” (Cerezo-Tellez et. Al. 2016)

<table>
<thead>
<tr>
<th>Aim of this study was to evaluate the effectiveness of DN on pain in people with chronic nonspecific neck pain attributed to MPS with active MTrPs in their cervical muscles, and to evaluate the effectiveness on DN on mechanical hyperalgesia, neck AROM, neck MMT, and perceived neck disability</th>
<th>128 participants total; 64 in each group; 4 sessions offered</th>
<th>Visual Analogue Scale</th>
<th>Significant and clinically relevant differences found in favor of DN in all measured outcomes at both short and long term follow-up</th>
<th>Deep dry needling and passive stretching are move effective than passive stretching alone in people with nonspecific neck pain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong>: Passive stretching to splenius cervicis, cervical multifidi, levator scapulae, trapezius</td>
<td>DN Group: DN to identified MTrPs in above muscles followed by passive stretching</td>
<td>Pain Pressure Threshold</td>
<td>Mean Tx Sessions: Control: 3.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neck AROM/MMT (flex, ext, rot, SB)</td>
<td>DN Group: 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neck Disability Index</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Additional Interventions: Taping

- **Purpose**
  - Subluxation
  - Anterior tilt of scapula
  - Anteriorly translated humeral head
  - Muscle inhibition or facilitation

- **Technique:**
  - **Stretch**
    - Increase proprioception
    - Provide positional stimulus through skin
    - Align fascial tissues
    - Decrease edema
  - **Non-stretch**
    - Protection
    - Joint support
    - Immediate pain relief
Additional Interventions: Taping

- Consider **WHEN** to apply
  - Postural Reinforcement
  - Pain free AROM with strengthening
  - Facilitation vs. Inhibition of muscles
- SCI Population
  - Possible proprioceptive effects
  - Compensation vs. Recovery

“The clinical efficacy of kinesiotape for shoulder pain: a randomized, double blinded clinical trial”

- Found to be immediately helpful (first 3 days of treatment) in increasing S’ ABD ROM and decreasing pain
- May be useful to incorporate in early treatment of shoulder pain
Exercise & Neuromuscular Re-education

- Strengthening
  - Rotator cuff
  - Serratus anterior
  - Middle trap
  - Lower trap
  - Deep Cervical Flexors

- Stretching
  - Posterior capsule
  - Upper trapezius
  - Levator scapulae
  - Latissimus Dorsi
  - Pectoralis Major
  - Pectoralis Minor

- Neuromuscular Re-education
  - PNF
  - Biofeedback
    - Laser
    - Vibration Plate
    - E-Stim
    - Visual
    - Tactile/Manual

CRAIG

Proprioceptive Training with Laser

Prone on Elbows
Additional Interventions to Consider

- External Supports
  - Corset
- Wheelchair Positioning
  - Add structural support
  - Assess at rest and during function
  - Modify postural habits
CASE STUDIES (2)

Integration of manual therapy techniques and conventional treatment to address shoulder and cervicothoracic pain and dysfunction during inpatient SCI rehabilitation program
Case Study: G.C.

Patient:
- 23 year old female
- MMA Fighter; Highly Active
- No previous medical history

Mechanism of Injury:
- Fall from handstand position while participating in acroyoga
- Patient reports (-) LOC; Medical records report (+) LOC for minimum of 10 seconds
- Immediately lost motor function and sensation in bilateral UE/Les
- Loss of bowel/bladder control

Diagnostic Imaging:
- Congenital absence of the C1 posterior arch
- Acute spinal cord injury at C1-2 with associated cord expansion and edema
- Small focus of hemorrhage within the cord at C2 and slight widening of the predental space measuring just under 4 mm
- Possible injury to the transverse ligament
- Mild discogenic degenerative changes C5-6
- CT angiogram: clear

ISNCSCI Exam = C1 AIS D
Case Study: G.C.

### Body System | Assessment
--- | ---
Bowel and Bladder | Independent
LE MMT | WNL
UE MMT | WFL
LE Sensation | Impaired
UE Sensation | Impaired
LE ROM | ↓ hip extension, internal rotation to neutral
Posture | Elevated right shoulder/scapula; ↑ thoracic kyphosis; ↓ lumbar lordosis; posterior pelvic tilt

### Functional Mobility | Level of Assist
--- | ---
Squat Pivot Transfer | Close supervision with use of hands
Sit to Stand Transfer | Contact Guard Assist
Ambulation | Contact Guard Assist – Min Assist
Balance | Fall Risk: FGA = 15/30
| Sitting Balance: Independent
| Standing Balance: Contact Guard Assist
## Treatment Session #1

<table>
<thead>
<tr>
<th>FDN</th>
<th>Manual techniques</th>
<th>Corrective Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R) Upper Trapezius with E-Stim</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Rib Jt. Mobs</td>
<td>Scapular PNF</td>
</tr>
<tr>
<td>(R) Deltoid</td>
<td>Posterior Capsule Stretching</td>
<td>- AAROM</td>
</tr>
<tr>
<td>(R) Latissimus Dorsi</td>
<td>Posterior and Inferior glenohumeral jt. mobs</td>
<td>- AROM</td>
</tr>
<tr>
<td>(R) Teres Major</td>
<td></td>
<td>- Resisted AROM</td>
</tr>
<tr>
<td>(R) Infraspinatus</td>
<td>Scapular depression jt. mobs</td>
<td>Shoulder push-ups in side sit</td>
</tr>
<tr>
<td>(R) Pectoralis Major</td>
<td></td>
<td>- AROM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Isometric holds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anterior &lt;&gt; Posterior pelvic tilts in sitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short sitting with BUEs supporting behind trunk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Scapular retraction and depression AROM</td>
</tr>
</tbody>
</table>
Treatment Session #1

Anterior View

Pre

Post

Posterior View

Pre

Post

Treatment Session #2:
- Repeat of FDN/Manual Techniques/Corrective Exercises
- 2 days in between session #1 and #2

*Pre photos taken 9am; Treatment session and after photos taken at 1pm
### Treatment Session #3

<table>
<thead>
<tr>
<th>FDN</th>
<th>Manual techniques</th>
<th>Corrective Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R) Upper Trapezius</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Rib Jt. Mobs</td>
<td>Scapular PNF: AAROM, AROM (sitting, standing on foam)</td>
</tr>
<tr>
<td>(+) E-Stim</td>
<td>Posterior Capsule Stretching</td>
<td>Anterior &lt;-&gt; Posterior pelvic tilts in sitting</td>
</tr>
<tr>
<td>(R) Deltoid</td>
<td></td>
<td>Short sitting with BUEs supporting behind trunk + Scapular retraction and depression AROM</td>
</tr>
<tr>
<td>(R) Latissimus Dorsi</td>
<td>Scapular depression jt. Mobs</td>
<td>AROM Trunk Rotation (+) Manual Resistance - Concentric/Eccentric</td>
</tr>
<tr>
<td>(R) Teres Major</td>
<td>L1-L5 A-P Jt. Mobs</td>
<td>Pelvic PNF: AAROM, AROM, (+) Resistance</td>
</tr>
<tr>
<td>(R) Infraspinatus</td>
<td>Anterior Hip Mobs</td>
<td>Tall Kneel: Eyes open/Eyes Closed Balance; Anterior &lt;-&gt; Posterior Pelvic Tilts; Trunk Rotation AROM</td>
</tr>
<tr>
<td>(R) Pectoralis Major</td>
<td>Thomas Test Stretch</td>
<td>Half kneel: Eyes Open/Eyes Closed Balance; Unilateral hip hiking; Trunk Rotation AROM</td>
</tr>
<tr>
<td>(L) Gluteus Med/Min</td>
<td>Thoracic rotation Jt. Mobs T1-10</td>
<td></td>
</tr>
<tr>
<td>(L) TFL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(B) L5, S1 Multifidus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(+) E-Stim Circuit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Treatment Session #3

*6 Days between treatment session #1 and #3
### Case Study: G.C.

<table>
<thead>
<tr>
<th>Functional Mobility</th>
<th>Postural/ROM Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional Gait Assessment</strong></td>
<td>Elevated 1(^{st}) Rib; no change</td>
</tr>
<tr>
<td>23/30</td>
<td>Improved symmetry between R/L shoulder and scapula height</td>
</tr>
<tr>
<td>Squat Pivot</td>
<td>Improved rotation throughout thoracic spine</td>
</tr>
<tr>
<td>Independent</td>
<td>Bilateral hip extension 4-6 degrees (ROM)</td>
</tr>
<tr>
<td>Sit to Stand</td>
<td>Decreased left trunk lean and shift</td>
</tr>
<tr>
<td>Independent</td>
<td>Improved symmetry with scapular humeral rhythm</td>
</tr>
<tr>
<td>Ambulation</td>
<td></td>
</tr>
<tr>
<td>Close stand by assist</td>
<td></td>
</tr>
<tr>
<td>Developmental Sequencing Positions</td>
<td></td>
</tr>
<tr>
<td>Sitting &gt; Supine: no assist for neck support needed</td>
<td></td>
</tr>
<tr>
<td>Sitting &gt; Side lying: no pain</td>
<td></td>
</tr>
<tr>
<td>Quadruped: can tolerate for 2-3 min without pain</td>
<td></td>
</tr>
<tr>
<td>Prone: Can achieve position with pain; fear of moving neck</td>
<td></td>
</tr>
</tbody>
</table>
Case Study: J.G.

**Patient:**
- 33 y/o male
- Firefighter; Highly Active
- Past Medical History: T7, T8 compression fractures; (L) rotator cuff partial tear (2015)

**Mechanism of Injury:**
- Fall on oryx horn that punctured (L) axilla resulting in immediate loss of sensation and motor function in his legs and trunk
- Suffered a left apical pneumothorax and left-sided pleural effusion due to the puncture
- Loss of bowel and bladder

**ISNCSCI Exam = T4 AIS A**

**Diagnostic Imaging:**
- MRI of his cervical, thoracic, and lumbar spine, showed a central cord infarction at the T2 and T3 levels with associated spinal cord edema
- CT of cervical, thoracic spine revealed chronic degenerative disc changes at C4-C7 with persistent kyphosis at C4-C5 and spondylosis at C6-C7
## Case Study: J.G.

<table>
<thead>
<tr>
<th>Test/Measure</th>
<th>Outcome</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>AROM</td>
<td>(L) Shoulder Elevation 104 degrees (L) Shoulder Abduction 110 degrees</td>
<td>(+) 2/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) “Clicking” &gt;90 degrees</td>
</tr>
<tr>
<td>PROM</td>
<td>(L) Shoulder Elevation 116 degrees (L) Shoulder Abduction 120 degrees</td>
<td>(-) pain</td>
</tr>
<tr>
<td></td>
<td>(R) Trunk Rotation Limited 25-50%</td>
<td>(+) “clicking” &gt;90 degrees</td>
</tr>
<tr>
<td>MMT</td>
<td>5/5 WNL all shoulder muscles</td>
<td>(+) Shoulder ER 2/10</td>
</tr>
<tr>
<td>Shoulder Special Tests</td>
<td>(+) Impingement (+) Hawkins Kennedy</td>
<td>(+) 4/10 pain rating</td>
</tr>
<tr>
<td>Posture (sitting)</td>
<td>Thoracic Kyphosis Rounded Shoulders Forward Head Scapular Abduction, L&gt;R</td>
<td>(+) Pain end of day at rest</td>
</tr>
<tr>
<td></td>
<td>(L) Shoulder Elevation Left Trunk Rotation</td>
<td>(+) Pain popping wheelie</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) AM muscle stiffness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) Pain with overhead reaching on the left with “clicking”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) Pain with floor transfers</td>
</tr>
</tbody>
</table>
Case Study: J.G.

• **Initial Treatment:**
  • FDN → (B) Upper Trapezius, (L) Latissimus, (L) Supraspinatus, (L) Infraspinatus, (L) Biceps, (L) Pectoralis Major
  • Manual Techniques → Shoulder PROM, Posterior capsule stretching, Inferior glides of shoulder joint
  • Corrective Exercise → Scapular PNF, Prone on elbows scapular and shoulder stabilization exercises, Rotator Cuff strengthening exercises

• **Outcome:**
  • No change in subjective pain report with unlevel pop over transfers, initiating wheelie in MWC, overhead reaching, end of day pain/clicking
Treatment Session #1: Upper Thoracic

<table>
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<td><strong>Corrective Exercise</strong></td>
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**Pre-Pain Scale:** 5/10 with shoulder elevation (+) “clicking” sensation 90-100 degrees

**Post-Pain Scale:** 1/10 end range shoulder elevation (+) “clicking” sensation 90-100 degrees
Treatment Session #2

Additional Muscles Needled: Bilateral Upper Trapezius, Levator Scapulae, Sub-occipitals; (L) Latissimus Dorsi, Supraspinatus, Teres Major/Minor
Case Study: J.G.

Baseline

Post Session 1

Post Session 2

Day 0

Day 7

Day 14
## Case Study: J.G.

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</tr>
<tr>
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<td></td>
<td>(-) Pain with overhead reaching on L; (+) “clicking”</td>
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Thank You

First Name Last Name
Email Address