EXAMINATION/EVALUATION AND TREATMENT OF LUMBO-PELVIC INJURIES

Kelby R. Church, PT, DPT, OCS, COMT, FAAOMPT, DAC, ATC

LEARNING OBJECTIVES

By attending this lecture, attendees will:

1. Define the difference between the Biomedical Model and Regional Interdependence Model.
2. Examine the importance of making an accurate Movement Impairment Diagnosis in relation to associated Pathoanatomic Diagnoses when treating the lumbopelvic region.
3. Understand what leads to dysfunctional movement patterning and how maladaptive postures and movement can result in lumbopelvic pathology.
4. Understand the concept of the Clinical Decision-Making Model and how it relates to an associated Rehabilitation level Management Progression for the lumbopelvic region.
5. List associated treatment considerations for the lumbopelvic region combining both manual approaches and corrective progressions to optimize function.

APPROACH TO EXAMINATION/ EVALUATION AND TREATMENT

Professional vs Technician

- Professional
  - Individuals who use a clinical decision-making process to exam patients relying on pattern recognition skills to make an associated diagnosis/prognosis and formulate a POC with related outcome goals
- Technician
  - Individuals who provide basic service without interpretation following specific instructions

APPROACH TO EXAMINATION/ EVALUATION AND TREATMENT

Movement Approach vs Medical Approach

- Medical approach- Considers a biomedical model of disease mandating a diagnostic label be identified in order to proceed with treatment
  - Example Pathoanatomic diagnosis- Lumbar strain/sprain, Trochanteric bursitis, etc.
- Movement Approach- Considers a regional interdependence model to examine fundamental movement patterns in respect to the neurodevelopmental sequence to determine associated substitution patterning in order to proceed with treatment
  - Example Global/local Movement impairment diagnosis- Multi-segmental flexion hypomobility syndrome, Multi-segmental extension hypomobility syndrome
  - Sahrmann S. The Human Movement System: Our Professional Identity. PHYS THER. 2014; 94: 1034-1042

APPROACH TO EXAMINATION/ EVALUATION AND TREATMENT

- As a professional and an expert looking at movement and focusing on fundamental movement patterning, we need to focus on strategies not tactics
- We need to lay out the strategy first then utilize the appropriate tactics
    - Strategy/system
        - A plan of action or policy designed to achieve a major or overall aim
        - A set of principles or procedures according to which something is done; an organized framework or method
    - Tactic
        - An action carefully planned to achieve a specific end

HUMAN MOVEMENT

The Neurodevelopmental sequence (NDS)

- Hetzler, B. (2014). Movement Restoration: Movement Restoration, LLC.
  - Is the universal and predictable pattern of motor development that occurs from birth until around the age of 2

HUMAN MOVEMENT

Fundamental movement patterns

- Human movement is a behavior/subconscious
- Many ways of describing but for our purpose we will use the following….
  - Multi-seg flexion
  - Multi-seg extension
  - Triple flex with reach (upward or downward)
- Can be also described in relation to lateral motion, weight transfer, forward motion, up and down motion, and coordinating upper and lower body movements or Pull, Push, Squat, Lunge, Hinge, Rotation and Gait, etc.

INFLUENCES TO HUMAN MOVEMENT

- The NDS allows for efficient movement patterning but adaptive behavior can lead to dysfunctional movement creating inflammation leading to a degenerative process creating the eventual possibility of pathology. Causes of dysfunctional movement can include trauma, broken development, adaptive behavior (sustained postures/repeated movements/biased behavior), etc.
- Over time man's interaction and perception of his environment has changes secondary to many factors including lifestyle leading to increased stressors.
    - Information/Perception Revolutions
        - 84,000 generations ago we were hunter/gathers
        - 350 generations ago the Agricultural revolution occurred
        - 7 generations ago the Industrial revolution occurred
        - 2 generations ago the Digital revolution occurred

THEORETICAL CONSTRUCTS OF ADAPTIVE MOVEMENT

- The Trigger Point Model (Energy Crisis Theory and Motor End-Plate Hypothesis)
  - Examines local tissue (biomechanical changes to local tissue)
    - Energy Crisis Theory
    - Motor End Plate Hypothesis
- Radiculopathic Model (Cannon's Law- super-sensitivity)
  - Examines associated spinal segment (loss of regulatory abilities impacting motor firing patterning)
    - Gunn C. Radiculopathic Pain: Diagnosis and Treatment of Segmental Irritation or Sensitization. Journal of Musculoskeletal Pain. 1997; 5: 201-216

ADAPTIVE MOVEMENT PATTERNS

Adaptive movement Patterns

- R or L side biased behavior
- Extension bias behavior
- Flexion bias behavior

IMPACT OF TRAUMA/ADAPTIVE BEHAVIOR

- Symptoms
  - Perception of pain, increased perception of tone/tightness, reported numbness/ paresthesia, trigger point, etc.
- Signs
  - Stability motor control dysfunction, mobility dysfunction, tissue changes, inhibition, etc.

KRAUS–WEBER TEST

- Phillips M, Bookwalter C, Denman C, McAuley, Sherwin H, Summers D, Yeakel H. Analysis of Results from the Kraus-Weber Test of Minimum Muscular Fitness in Children, Research Quarterly. American Association for Health, Physical Education, and Research. 1955; 26: 314-323

KEY CONCEPT

Regional Interdependence (RI)

- Wainner R, Whitman J, Cleland J, Flynn T. Regional Interdependence: A Musculoskeletal Examination Model Whose Time Has Come. Journal of Orthopaedic and Sports Physical Therapy. 2007; 37: 658-660
  - Concept that seemingly unrelated impairments in remote anatomical regions may contribute to, or be associated with, the patient's primary complaint

KEY CONCEPT

Three holistic networks: A summary

- Myers, T. (2014). Anatomy Trains: Churchhill Livingstone.
  - All three convey information
    - Neural net carries encoded info, usually in binary form (on/off), works on frequency modulation
    - Circulatory net carries chemical information throughout the body by a fluid medium
    - Fascial system coveys mechanical information by the interplay of tension and compression by the fascial net

KEY CONCEPT

Double bag theory

- Myers, T. (2014). Anatomy Trains: Churchhill Livingstone.
  - The double-bag theory
    - Double bagging or two-layer sacs cover each cell, the heart, lungs, abdomen, brain, and musculoskeletal system
  - Double-bagging in the musculoskeletal system
    - Inner bag surrounds the bones and cartilage, called the periosteum
    - Outer bag surrounds the muscles, called the deep investing fascia

KEY CONCEPT

Tensegrity structure

- Myers, T. (2014). Anatomy Trains: Churchhill Livingstone.
  - Tensegrity is coined as tension integrity, describing a structural relationship in which structural shape is guaranteed by the finitely closed continuous tensional behaviors of the system and not by discontinuous local compressional behaviors
  - Tensegrity structures are characterized by continuous tension around localized compression
  - In the tensegrity model forces are distributed not localized
  - The compression members push outward against the tension members that pull inward, if both forces are balanced than the structure is stable

LOCAL ANATOMY

Components of the Functional Pelvis

- Inner bag (compressive component)
  - Lumbar spine
    - Lumbar vertebrae
      - Intervertebral joints
      - Facet joints
  - Pelvis
    - Innominates
    - Sacrum
    - Coccyx
      - Sacroiliac joints
      - Symphysis pubis
      - Sacrococcygeal joint
  - Hip
    - Innominates
    - Femur
      - Coxofemoral joints

LOCAL ANATOMY

Components of the Functional Pelvis

- Outer bag (tensioning component)
    - Superficial back line (SBL)
    - Superficial front line (SFL)
    - Lateral line (LL)
    - Spiral line (SPL)
    - Deep back arm line (DBAL)
    - Back functional line
    - Front functional line
    - Ipsilateral functional line
    - Deep front line (DFL)

CLINICAL DECISION-MAKING MODEL

- First order healthcare provider
- Rehabilitation level Assessment
  - 1st order decision making: rule out **(SCREEN)**
  - 2nd order decision making: rule in **(BREAKOUTS/BIOMECHANICAL ASSESSMENT)**
  - 3rd order decision making: prioritize regional interdependence **(PATTERN RECOGNITION)**

REHABILITATION LEVEL MANAGEMENT PROGRESSION

- Alrwaily M, Timko M, Schneider M, Stevens J, Bise C, Hariharan K, Delitto A. Treatment-Based Classification System for Low Back Pain: Revision and Update. Phys Ther. 2016; 96: 1057-1066
  - Symptom Modulation
  - Movement Control Approach (Integrated Decision-Making Tool)
    - Local Mobility components (Reset/manual)
    - Global Stability components (Reinforce/neuro re-ed)
    - Functional optimization (Reload/ther-ex)

PUTTING IT ALL TOGETHER

- Utilize test re-test method
- Consider RI factors and all tissues
- Introduce novel/non-threatening input to the CNS to desensitize and create an opportunity to restore symptoms free functional motor programs that can be implemented in daily routine
- Focus on feedback loops to build integrity

EXAMPLES OF A MOVEMENT IMPAIRMENT DIAGNOSIS FOLLOWING THE CLINICAL DECISION MAKING MODEL

Example of patient unable to touch toes

- 1st order decision making: rule out **(SCREEN findings)**
  - DN multi-seg flexion top tier
- 2nd order decision making: rule in **(BREAKOUTS/BIOMECHANICAL ASSESSMENT findings)**

  Contributed to by….
  - Pelvic component positional fault
  - Lumbar upglide JMD
  - CFJ flexion/internal rotation JMD
  - TED of the SBL and short external rotators
  - Altered neurodynamics of the sciatic nerve
  - Trunk/hip SMCD
- 3rd order decision making: prioritizing RI and determining Movement Impairment Diagnosis **(Pattern Recognition)**

  Characterized as…
  - Multi-seg flex hypomobility syndrome

EXAMPLES OF A MOVEMENT IMPAIRMENT DIAGNOSIS FOLLOWING THE CLINICAL DECISION MAKING MODEL

Example of patient unable to bend backwards

- 1st order decision making: rule out **(SCREEN findings)**
  - DN multi-seg extension top tier
- 2nd order decision making: rule in **(BREAKOUTS/BIOMECHANICAL ASSESSMENT findings)**

  Contributed to by….
  - Sacral component positional fault
  - Lumbar downglide JMD
  - CFJ extension/external rotation JMD
  - TED of the DFL/LL
  - Altered neurodynamics of the femoral nerve
  - Trunk/hip SMCD
- 3rd order decision making: prioritizing RI and determining Movement Impairment Diagnosis **(Pattern Recognition)**

  Characterized as….
  - Multi-seg ext hypomobility syndrome

EXAMPLE OF REHABILITATION LEVEL MANAGEMENT PROGRESSION

Example of patient unable to touch toes

- Symptom Modulation
  - Rest, passive modalities, meds, etc.
- Movement Control Approach (Integrated Decision-Making Tool)
  - Local Mobility components (Reset/manual)
    - Pelvic component positional fault
      - Lumbopelvic roll
    - Lumbar upglide JMD
      - Lumbar upglide tech
    - CFJ flexion/internal rotation JMD
      - CFJ inferior/post glide
    - TED of the SBL and short external rotators
      - Myofascial release to SBL and short external rotators
    - Altered neurodynamics of the sciatic nerve
      - Sciatic nerve neurodynamic tech

CONT…

Global Stability components (Reinforce/neuro re-ed)

- Activation
  - Diaphragmatic breathing
  - Pelvic clock
- Acquisition
  - Follow 4x4 matrix with flexion movement patterning with emphasis from supported to stacked postures with continued emphasis on breathe control offering minimal non-verbal feedback with goal of error detection
  - Examples (excluding activity to promote specific trunk/hip stability)
    - Supine, feedback mechanism if required, anterior functional line progression
    - Supine, feedback mechanism if required, multi-seg flex to long sitting
    - Suspended, feedback mechanism if required, flex patterning with post rocking
    - Suspended, feedback mechanism if required, multi-seg flex with ankle pumping
    - Tall kneeling, feedback mechanism if required, high hip/low hips
    - Half kneeling, feedback mechanism if required, multi-seg flex with triple flex
- Assimilation
  - Std flexion-based movement patterning with continued emphasis on breathe control offering non-verbal feedback with goal of error detection
  - Examples
    - Std, feedback mechanism if required, multi-seg flex
    - Std, feedback mechanism if required, goblet squat

CONT…

Functional optimization (Reload/ther-ex)

- Functional activity without feedback but added load or dynamic variable
  - Examples:
    - Std, error detection with possible addition of load or dynamic movement, multi-seg flex
    - Std, error detection with possible addition of load or dynamic movement, squat
    - Std, error detection with possible addition of load or dynamic movement, pull or lunge tech
    - Std, error detection with possible addition of load or dynamic movement, stepping pattern

EXAMPLE OF REHABILITATION LEVEL MANAGEMENT PROGRESSION

Example of patient unable to bend backward

- Symptom Modulation
  - Rest, passive modalities, meds, etc.
- Movement Control Approach (Integrated Decision-Making Tool)
  - Local Mobility components (Reset/manual)
    - Sacral component positional fault
      - Prone pelvic correction
    - Lumbar downglide JMD
      - Lumbar downglide tech
    - CFJ extension/external rotation JMD
      - CFJ anterior/superior glide
    - TED of the SBL and short external rotators
      - Myofascial release to DFL, SFL. and LL
    - Altered neurodynamics of the sciatic nerve
      - Femoral nerve neurodynamic tech

CONT…

Global Stability components (Reinforce/neuro re-ed)

- Activation
  - Diaphragmatic breathing
  - Pelvic clock
- Acquisition
  - Follow 4x4 matrix with extension movement patterning with emphasis from supported to stacked postures with continued emphasis on breathe control offering minimal non-verbal feedback with goal of error detection
  - Examples (excluding activity to promote specific trunk/hip stability)
    - prone, feedback mechanism if required, post functional line progression
    - Supine, feedback mechanism if required, prone press up progression
    - Suspended, feedback mechanism if required, extension patterning with ant rocking
    - Suspended, feedback mechanism if required, mule kicking/bird dog progression
    - Tall kneeling, feedback mechanism if required, high hip/low hips
    - Half kneeling, feedback mechanism if required, multi-seg extension with triple flex
- Assimilation
  - Std flexion-based movement patterning with continued emphasis on breathe control offering non-verbal feedback with goal of error detection
  - Examples
    - Std, feedback mechanism if required, multi-seg ext
    - Std, feedback mechanism if required, hip hinge

CONT…

Functional optimization (Reload/ther-ex)

- Examples:
  - Std, error detection with possible addition of load or dynamic movement, multi-seg ext
  - Std, error detection with possible addition of load or dynamic movement, hip hinge
  - Std, error detection with possible addition of load or dynamic movement, swing or press tech
  - Std, error detection with possible addition of load or dynamic movement, stepping pattern

EXAMINATION CONSIDERATIONS FOR 2ND ORDER CLINICAL DECISION MAKING UTILIZING THE CLINICAL DECISION- MAKING MODEL

Cibulka M and Koldehoff R. Clinical Usefulness of a Cluster of Sacroiliac Joint Tests in patients with and Without Low Back Pain. Journal of Orthopaedic and Sports Physical Therapy. 1999; 29:83-92.

- Pelvic component Cluster Criteria
  - 3 of 4 criteria (+) produced a cluster sensitivity score of 0.82 and specificity score of 0.88
  - Consider Fortin's sign pain
    - Std flexion test
    - Seated landmark asymmetry
    - Long sit test
    - Prone knee flex test

EXAMINATION CONSIDERATIONS FOR 2ND ORDER CLINICAL DECISION MAKING UTILIZING THE CLINICAL DECISION- MAKING MODEL

Laslett M. Evidence-Based Diagnosis and Treatment of the Painful Sacroiliac Joint. The Journal of Manual and Manipulative Therapy. 2008;16:142-152

- Sacral component Cluster Criteria
  - Distraction test and Thigh Thrust test (+) with Fortin's sign or 3 of 6 criteria (+) produce a sensitivity score of 0.91 and specificity score of 0.78
    - Distraction test
    - Thigh Thrust test
    - Gaenslen's test
    - Compression test
    - Sacral thrust test
    - Drop test

EXAMINATION CONSIDERATIONS FOR 2ND ORDER CLINICAL DECISION MAKING UTILIZING THE CLINICAL DECISION- MAKING MODEL

Delitto A, Erhard RE, Bowling, RW. A Treatment-Based Classification Approach to Low Back Syndrome: Identifying and Staging Patients for Conservative Treatment. Phys Ther. 1995; 75 (6): 470-485

- Active Movement Testing Classification
  - Mobilization/Manipulation
    - Non-Capsular
      - Specific Opening Procedure
        - Asymmetrical side bending (involved side will be painful but demonstrate greater motion)
        - Pelvic translocation does not improve symptoms
        - Status Quo with movement testing
        - Flexion is limited
      - Specific Closing Procedure
        - Asymmetrical side bending (involved side will be painful and demonstrate less motion)
        - Pelvic translocation does not improve symptoms
        - Status Quo with movement testing
        - Extension is limited

EXAMINATION CONSIDERATIONS FOR 2ND ORDER CLINICAL DECISION MAKING UTILIZING THE CLINICAL DECISION- MAKING MODEL

Cook, E. (2010). Movement. Aptos California: On Target Publishing.

- Multi-Segmental Flexion
  - Multi-Segmental Flexion Breakout
    - DN: Less than 120 degrees of hip flexion (active/passive), no pain
  - Multi-Segmental Rotation Breakout
    - DN: Less than 30 degrees of hip internal rotation (active/passive), no pain
  - Arms Down Deep Squat Breakout
    - DN: Less than 120 degrees of hip flexion (active/passive), no pain
    - DN: Less than 30 degrees of hip internal rotation (active/passive), no pain
- Multi-Segmental Extension
  - Multi-Segmental Extension Breakout
    - DN: Less than 10 degrees of hip extension (active/passive), no pain
  - Multi-Segmental Rotation Breakout
    - DN: Less than 40 degrees of hip external rotation (active/passive), no pain

TREATMENT CONSIDERATIONS FOR LOCAL MOBILITY UTILIZING THE MOVEMENT CONTROL APPROACH

Pelvic Component

- Lumbopelvic roll
  - Non-specific tech at lumbopelvic region
  - Table at mid-thigh level (low)
  - Patient in supine with fingers interlocked behind neck, Provider stands on uninvolved side and side bends patient away (head then legs), Provider weaves arm at elbow and presses at ASIS, Provider feels barrier and applies pressure at ASIS
  - **You need close contact**

TREATMENT CONSIDERATIONS FOR LOCAL MOBILITY UTILIZING THE MOVEMENT CONTROL APPROACH

Sacral Component

- Prone pelvic correction
  - Sacral correction
  - Patient in prone, Provider stands on uninvolved side and slides hips towards to SB, Provider has patient perform press up on involved side with UE to extend while Provider places hypothenar region of hand involved SI joint along base, Provider feels barrier and applies pressure
  - **You need close contact**

TREATMENT CONSIDERATIONS FOR LOCAL MOBILITY UTILIZING THE MOVEMENT CONTROL APPROACH

Lumbar

- Side lying opening restriction correction
  - Patient in SL and slight flexion of hip/knee with waist at break in table and involved side up with table at ASIS height, patient bottom leg flexed while PT palpates level of involvement, PT pulls bottom arm down or parallel to floor while palpating the level of involvement, patient is side bent at break in table to open on restricted side, PT palpates at involved spinous process and pulls up to create pure side bending, weight through forearms
  - **You need close contact**

TREATMENT CONSIDERATIONS FOR LOCAL MOBILITY UTILIZING THE MOVEMENT CONTROL APPROACH

Lumbar

- Side lying closing restriction correction (specific more for L4/5 and L5/S1)
  - Patient in SL and slight ext of hip/knee with waist at break in table and involved side up with table at ASIS height, patient top leg flexed while PT palpates level of involvement, PT pulls bottom arm up to ceiling (ext/rot) while palpating the level of involvement, patient is side bent at break in table to close on restricted side, PT rolls patient toward self while palpating at involved spinous process to create gapping force with weight through forearms
  - **You need close contact**

TREATMENT CONSIDERATIONS FOR LOCAL MOBILITY UTILIZING THE MOVEMENT CONTROL APPROACH

Coxofemoral Joint

- Inferior glide of the coxofemoral joint (flexion)
  - Patient supine on edge of table with hip/knee flexed, patient stabilized, Provider standing on ipsilateral side of table and will flex hip to end-range or at least 90 degrees flexion, Provider will place hands around proximal thigh with the LE will be draped over the outer shoulder of the provider, an inferior glide of the coxofemoral joint will be provided
- Posterior lateral glide of the coxofemoral joint (Internal rotation)
  - Patient supine on edge of table with hip flexed to 90 degrees with slight hip adduction, Provider standing on contralateral side of table and will place patient's knee in axillary region to drive femur in posterolateral direction, Provider can hold onto table to help grade force of mobilization

TREATMENT CONSIDERATIONS FOR LOCAL MOBILITY UTILIZING THE MOVEMENT CONTROL APPROACH

Coxofemoral Joint

- Anterior glide of the coxofemoral joint (extension)
  - Patient prone on edge of table with mobilization strap under distal thigh, Provider standing on ipsilateral side of the table and will place anterior force through posterior proximal thigh while using strap to ext and support LE
- Anterior/superior glide of the coxofemoral joint (External rotation)
  - Patient prone on table with involved hip in flexion, abduction, and external rotation, Provider standing on ipsilateral side of table and applies anterior force through posterior proximal thigh

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