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Slide 7

Graded Motor Imagery

- Excellent research in Pain Science, Moveley, Butler
- SACI Institute http://www.grademotorimagery.com
- Story of the Bike (Moveley)
- Karen Lilly, Heather, Healthy, Skinny, Smart

Slide 8

Injection Therapy

- Higher Reimbursement
- Higher Frequency
- What is the effectiveness?
  - Epidural
  - Epidural
  - Prolotherapy

- From 1997 to 2000 there was a
  - Comparison of epidural injections
    - Marchant et al., 2001

Slide 9

From the United Healthcare Medical Policy – Nov 2013

- Epidural Steroid injection: Epidural steroid injection is proven for the symptomatic relief and to support medical of sciatica with or without low back pain caused by spinal stenosis, disc herniation or degenerative changes in the spine. Epidural steroid injections have been clinically evaluated role in theshort-term management of low back pain when the following two criteria are met:
  - The pain is associated with symptoms of nerve root irritation and/or low back pain due to disc herniation and/or
  - Moderate herniation and/or
  - Moderate symptoms

- The pain is uncompensated for conservative treatment, including but not limited to pharmacotherapy, exercise or

- Epidural Steroid injection is approved for all other indications of the lumbar spine

- #type!!
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Slide 10

Early Intervention is Pivotal!

• Of 12,000 patients seen (Medicare) only 7% were referred by their primary care MD to PT.
• Decreased cost per incident
  - Less chance of inappropriate MRI, injections, medications, etc.

- Reliability of a treatment-based classification system for
  Sep;45(9):850-4.

Slide 11

The Ideal Human?

• Is the current human body design flawed or are we using it wrong?

Slide 12

We are how we move
Slide 13: How Should We Sit?

Slide 14: Survival of the Fittest
- Energy Efficient
- More specifically energy efficient through striding

Slide 15: Features of Human Striding – Erl Pettman
- A habitual weight-bearing tolerance
- A hip joint which can flex off beyond the vertical, coronal plane of the spine
- The 12 degree of the lordosis helps to minimize rotational displacement
- A knee joint with flattened femoral condyle which leads to two phases of gait

The Hip Bone is Connected to the Foot Bone...

The optimum spine.

Gracovetsky S, Farfan H

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Slide 16

Review of the “Optimum Spine”
- Lower limbs may not be necessary for human locomotion.
- Legs give us extra leverage, is an energy-saving device.

Slide 17

Energy Stored
- Ligaments and Capsules of the lumbopelvic region.
- Coiled Spring

Slide 18

Effects of Gravity
- Friction
  - How we launch our efforts.
- Consistency
  - Falling, broken, fracture, bend.

Interactive Hip © 2009 Primal Pictures Ltd.
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Slide 19

First Law of Thermodynamics

- “Energy cannot be created or destroyed, only altered in form.”

Slide 20

Kinetic Energy with Motion

- Can only be transferred in one of three ways:
  - ground reaction, or absorption of force
  - muscular contraction of directly affects
  - friction/heat
- Stored as potential energy within the tissue and the body

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Where is the Energy Stored?

- Three dimensional body
- We store energy in all three planes.
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Pendulum
- Example of transferring potential to kinetic energy.
- Resonates in the field of gravity.
- Only resistance is friction.
- Substantial movement with minimal energy cost.

Slide 23

Locomotion
- Displacement of the body mass with minimal energy cost.
- Advantage to have the body use a pendulous motion in the field of gravity.
- Job of the entire musculoskeletal system.

Slide 24

Wolff’s Law Revisited
- “As a consequence of primary stress variations and continuous loading, or even due to loading alone, bone changes its inner architecture according to mathematical rules and, as a secondary effect and governed by the same mathematical rules, also changes its shape.”
- A. von Wolff (1809) "De ossium Structura et Varietate"

[Additional content may follow, but is not shown in the image.]
Slide 25

Collagen Formation and Repair

- 15 Chemically distinct collagen variants.
- Forces through a ligament will determine how it will heal.
- http://bjsm.bmj.com/site/podcast

Slide 26

Joints Have to Move Through Their Full ROM

- Articular Cartilage Nutrition
- Clinical Observations and in vivo aging studies have shown that joint nutrition can induce a wide range of metabolic deficiencies.
- Long-term functional impairment of joint nutrition can cause degradation, decrease in repair synthesis, and result in softening of the tissue.
- ACSIS Instructional Course Lectures, Volume 12, Issue 12, American College of Surgeons Inc., Rockville, Maryland and Alan

Slide 27

Clinically Predicting Gravity

- The laws of motion do not lie.
Personality Types – Myers Briggs
- Cherish – Optimistic, energetic
- Recorder – Accurate and Practical
- Golden Retriever
- Lion – Take charge, problem solver.

Where do you Practice? How do you Treat
- Model of Treatment
- Meet the patient where they are not where you are.

Functionally Applied and Collaborative
- New generation of patients
- Want to move and are not happy about it
- They will want more when they feel better
- Exercise and interventions have to be more comprehensive
- Therapists need to test and treat
- Where else do you use this information?
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Slide 31

Routine Motion Assessment
- Hands On
- Modified Schober's Test (L.Ives 1988)
- Integration
- Accuracy
- Efficiency
- Consistency

Slide 32

Integration and Collaboration
- Inside or outside the lumbar spine?
- How does the patient respond to the movements?
- How do you talk to your patients?

Slide 33

Accuracy
- Reproduction of what the patient came in to see you for:
  - Articular
  - Extra-articular motion and forces
  - Neurological
  - Venous
  - Thoracic movement assessment
Slide 34

Slide 35

**Efficiency**
- A lot of information in very little time
- Identifying patterns.

Slide 36

**Consistency**
- Routine assessment when first learning, covers all systems and assists with pattern recognition.
- Checklist Manifesto (Gawande, 2009)
Recent research states there needs to be refinement in the stabilization and mobilization category, but agreement is improving (2003 vs. 2013).

Mobilization
- Factors Favoring
  - Symmetry of movement (look at brace)
  - Upright stance (disappearance)
  - Lower PAMO scores (3rd)
- Factors Against
  - Lumbosacral mobility (low lumbar)
  - Incomplete nerve root relief
  - No pain with straight leg raising

Stabilization
- Factors Favoring
  - Symmetry with springing
  - Absent motions present
  - Increasing episode frequency
  - Younger age (45+)
  - History of prior episodes
  - Not 90 degrees (flexed)

MCS

McGill (2002)
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Slide 40

Multifidus Lift Test

- The evaluation of lumbar multifidus muscle function via palpation: reliability and validity of a new clinical test. 
- Hebert JJ, Koppenhaver SL, Teyhen DS, Walker BF, Fritz JM. Increased reliability and validity of the MLT to assess lumbar multifidus function at the L4-L5 level.
- 33 Subjects
- Compared ultrasound to palpation with the left test

Slide 41

Multifidus Lift Test

Slide 42

Multifidus Lift Test – Shoulder??
Slide 43

**Specific Exercise**

- Factors favoring
  - Performance of one pattern
  - Centralization with motion testing
  - Peripherally opposite to centralization

- Factors against
  - LP only (no other symptoms)
  - Status quo with all movements

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Slide 44

"Once you have back pain, you will ALWAYS have back pain."

- Low Back Tug of War

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Slide 45

**Roller Coaster of Professional Life**

- David Butler – "At times it is the patient and therapist interaction that is the main variable in outcome."
- Pat Wall – "In the end, if the majority of the outcomes are based on placebo, do not fear, but work out what it was in the placebo which gave the outcome."
- Butler, NSI Jan December 13, 2003
Case #1 – Traction Category

- Radiculopathy
- Central stenosis vs. Disc or combined
- Radicular Signs Present and patient may not be able to centralize

Do not mistake pain in the leg for a radiculopathy!

- Tests from the Scan
- Active motion testing increases pain in one direction and centralizes in the other direction.
- Key Muscle (Musclar) Weakness (L5/S1)
- Diminished Reflexes
- Diminished sensation, light touch (presented as numbness)
- Positive Neural Tension (Typically SLR) (30–45 degrees)

Tale of 2 Palsies
Slide 49

It was the best of times ...

- 55 y/o right hand dominant female has been seen for hip pain and extending therapy 8 weeks and her hip pain is resolving.
- Scheduled this DC visit to stratify her self-management program and reassess
- Patient a hiker and was able to return for horseback riding with minimal complaints of pain in her hip.

Slide 50

It was the worst of times ...

- She enters the clinic complaining of right hip pain, back pain, complaint with lifting ligament of left knee and hip flexion.
- She reported that 2 days prior she had been riding her horse and also a few days back to back and woke up with a sharp pain in her hip and went to the ER.
- Observed: Noticible shift to the left and difficulty doing her right foot with walking. Resists an expression of significant discomfort.

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The Story continues

- 1) SLR on Right positive at 55 degrees.
- 2) Key muscle weakness fatiguing with dorsiflexion (L4) on the right (agressive 3 seconds, delayed 4" to 5 seconds and then could not sustain contraction.
- 3) Sensation (light touch and filament 10 gm) intact.
- 4) Reflexes are intact, i.e. Quadriceps, Achilles and tibialis anterior on the right and left.
- 5) Stand forward bend limited 25% and reproduces pain right posterior leg pain.
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What mechanism is most likely causing the patient's symptoms?
- The patient is seen through annular tears of the annulus.

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**Treatment**
- Mobilizations (sustained) into right side bending and extension at L1, L4, L5/S1
- Taping into extension (McKenzie, Beller's Taping)
- Shelf correction
- McKenzie Protocol
- Patient was advised to see her physician, but return for PT.
  - 14% chance that the risks outweigh benefits
  - Invasive (surgical)
  - Knee pain
  - Exhibit a maneuver she could choose to go next

Slide 54

**Follow Up visit after**
- Patient felt a lot less pain, more comfortable at the end of the day. Had an MRI which demonstrated spondylolisthesis and an L5/S1 PDD.
- Patient DID NOT want to see the neurologist and was just finishing up with physical therapy.
- Continued with prior treatment and functional integration of McKenzie protocol.
  - 1) SICK on right anterolateral to 40 degrees
  - 2) Key muscle weakness tilting with donaffusion (L4) on the right (improving)
  - 3) Sensation and reflexes appear intact.
  - 4) Stand forward bend limited 50% and reproduces pain. (Improving)
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MRI
- Up to a 50% false positive rate in the Lumbar Spine
- (Borden, 1990)
- (Jervik, 2003)

Slide 56

After 8 Visits and 6 weeks
- Patient did not follow up with her MD and could tolerate all mobility.
- Patient DID NOT need to see a neurosurgeon.
- Patient DID NOT require any injections.
  1. Sink one digit negative and increased to 85 degrees, back pain with dorsiflexion, mild positive.
  2. Key muscle weakness not failing with dorsiflexion (LA) on the right.
  3. Sensation and reflexes intact.
  4. Stand forward bend limited 90° and there is an absence of shifting and pain.

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One month follow up
- Patient took a trip to the Grand Canyon (above) and did not have any reproduction of pain.
- Continued with her exercises, plus added in stability exercises as well.
- Returned to horseback riding without complaints.
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Take away thoughts ...

• Even if a palsy is presents surgery is not always required.
• Monitoring of the condition is important and telling the patient what the finding will be will provide the patient with confidence.
• Patient was informed that MRI results would probably show a “disk protrusion” and afterwards the patient stated they would ask their therapist if they needed further management.

Slide 59

Illness Script – “Typical Posterior Lateral Disk”

• Patient has a history of prolonged lumbar flexion sitting.
• Narrow band of pain with leg pain > back pain.
• Positive SLR.
• Loss of lumbar spine extension and ipsilateral side bending greater than flexion.
• Myotome/Key Muscle Weakness (fatiguing).
• May or may not have altered reflexes and sensation.
• May or may not have a noticeable shift in standing.

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Case #2 - Immobilization

• Frequent previous episodes
• Positive response to prior manipulation or bracing
• Instability catch
• Lumbar hypermobility
• Typically a number of different therapies attempted
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CPR for Response to a Stabilization Program
- Positive prone test
- Abnormal movement/instability
- Average SLJ > 31 degrees
- Average age over 60 yrs
- Success increased 15-20%


Slide 62
Prone Instability Test

Slide 63
Anterior Shear Test
Other Tests in the Scan

- Motion testing
- Palpate while you do it T1 junction and 5s
- Multifidus Lift Test
- Instable motions with extension
- Pattern of tightness
  - Peak, hamstring etc.
  - Janda: Isolated Pattern
- May be sensitive to PTA pressure or torsion test.

Static Patterns

Find The Driver (Dynamic Patterns)

- These patients use extension for stability you will pick this up on mobility testing.
- Usually are impacted from the high T1 junction and do overcome facilitated places.
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Case Example #3
- Veteran with PTSD multiple occurrences of LBP
- McKenzie Approach
- Cryoisoine injections
- Spinal Manipulation
- What was not assessed:
  - SI joint (Positive, Load bearing, indirect)
  - Hip Extension and IR (Manipulation)
  - Individual Movements
  - RLJ, stance

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Case #3 Mobilization – SI Pattern
- Unilateral symptoms
- No signs of nerve root compression
- Positive finding for SI joint dysfunction:
  - Positive Frenkel Test
  - Positive Lasegue Test
  - Pudendal Test
  - Positive Hult vs. NAMO Kinetic Tests

Slide 69

Long Dorsal Ligament
- Sensitivity was 75%
  - Sensitivity in a group of 143 women of the study group that showed
  - positive or both active straight leg raise and posterior pelvic
  - pain production tests was 75%.
  - When only one pelvic pain test was used, patients with pelvic:
    - sensitivity increased to 98%
Slide 70

The Portland – Load Transfer Test

- Clift Fowler
- Artifact online
- Displacing center of gravity.
- Finds for the patient a functional imbalance
- Quick way to educate and motivate the patient.
- Appropriate for all categories.

Slide 71

Mobilization – Lumbar Pattern

- Unilateral symptoms
- No signs of nerve root compression
- Asymmetrical restrictions
- Lumbar Segmental Hypomobility
  - hip hypomobility
  - TL junction hypomobility

Slide 72

Case Example - Runner

- Case History
  - Restrictions in hip IR and Laterozation
  - Hypomobility at the TL junction with combined rotation
  - Leg in Multifidus
Slide 73

What did we do

- Ch. Running
- Inversion/eversion and rotation
- Seated or leg raise, otherwise
- Retaining of core timing and gluteal control
- S1 Sliders

Slide 74

Most Cases are Mixed

- I have provided a case example for each category, but most areas are mixed and you will jump between categories.
- The categories are being refined and techniques are being validated.
- It is important to vary, question, stay functional and do not box yourself into one category.
- Stay consistent with your assessment.

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Neuromuscular Re-Ed of Combined Motions
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