Femoracetabular Impingement Evaluation and Treatment

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Health and Injury Management & Prevention Coordinator
Kinetic Edge Physical Therapy
Outcomes

- Identify and perform current evaluation techniques for the hip
- Understand differential diagnosis of the hip
- Understand the natural history and progression of FAI
- Consider surgical and non-surgical options of the hip
- Identify evidence-based rehabilitation practices
- Describe and demonstrate the various types of mobilizations used to address extra and intra-articular hip pathologies
- Demonstrate hip stretching techniques to restore normal mobility about the hip
- Demonstrate strengthening exercises utilized to improve hip mechanics and functional movement
- Review modifications to strengthening and stretching in the presence of intra-articular hip pathology
Clinical Exam
Clinical Exam

- **Common Observations:**
  - Gait – antalgic gait may be present
  - Weight shift away from painful side
  - ROM limitations at hip or lumbar spine
  - Fear avoidance of painful movements

- **Common Symptoms:**
  - “Deep” anterior groin pain – (87 to 96%) reported
    - May indicate intra-articular pathology
  - “Pain” in anterior thigh or lateral/posterior hip
  - “Buckling/catching” or “sharp painful clicking”
  - “Pain” with transitions (sit to stand)
Clinical Exam

- Objective Exam:
  - Functional Tests–aggravation with the following:
    - Forced adduction with rotation
    - Transitional movements– sit to stand
    - Torsional movements
  - ROM:
    - Joint–Limited by pain or stiffness
    - Muscle length–may be decreased
  - Neuromuscular:
    - Weakness of hip/gluteal musculature 2°to pain
    - Muscle imbalances with static or functional testing
    - May not have pain with static strength test
Differential Diagnosis

Anterior Hip Pain

Lateral Hip Pain

Posterior Hip Pain

Hip Differential Diagnosis
Differential Diagnosis

Involved Structure

Inert Tissue

Contractile Tissue
Anterior Hip Pain
Patient Profile

- **Mechanism of Injury**
  - **Contractile:** Sudden or overuse injury
  - **Inert:** Sudden, overuse, or degenerative

- **1°C/O:** “Groin Pain”
  - May include “popping” or “clicking” or “catching”
  - May include a feeling of crepitation or “grinding”

  - **Aggravating Movements:**
    - Pain with closed chained movements (e.g. squats, lunges)
    - Pain with rotatory movements (e.g. cutting movements)

  - **Relieving Movements:**
    - Positions that de-weight the hip
Anterior Hip Pain

- Hip Labral Tears
- Femoral Acetabular Impingement
- Hip DJD
- Muscle Lesion
- Internal Snapping Hip Syndrome
- Sports Hernia
Involved Structure

**Inert Tissue**
- Actetabular Labral Tears
- Femoral Acetabular Impingement
- Hip DJD

**Contractile Tissue**
- Internal Snapping Hip Syndrome
- Sports Hernia
- Muscle Lesion
Inert Clinical Exam

- Acetabular Labral tears
- Femoral Acetabular Impingement
- Hip DJD
Impingement Tests

Hip Labrum/FAI
Test #1 Anterior Labrum

FADIR Test
Test #2—Anterior Labrum

- Phase I) Acute flexion/Ext. Rot./Full Abduction
- Phase II) Extension/Adduction/Internal Rot.

Adapted from Magee. Orthopedic Physical Assessment. 4th ed. 2002
Provocation Tests

General Testing
FABER Tests

Negative

Positive
Log Roll Test

Action:
- Internal Rotation of Femur
- External Rotation of Femur

Provocation:
- Excessive ER is (+) for Illiofemoral ligament insufficiency
- Click with IR is (+) for a labral tear

Clinical Significance:
- Does not stress myotendinous structures or nerves
- Only moves femoral head & capsule in relation to the acetabulum
Resistive SLR

- **Action**
  - Raise leg 30° with knee in full ext
  - Patient resists downward force

- **Provocation:**
  - Hip/groin pain
  - Clicking or locking

- **Benefits:**
  - Quick test to stress the whole joint
Contractile Clinical Exam

- Sports Hernia
- Internal Snapping Hip
- Muscle Lesion
The Sports Hernia

Athletic Pubalgia
Sports Hernia

- Common Tissues Violated
  - Torn external oblique aponeurosis
  - Torn conjoined tendon (Rectus + TrA)
  - Conjoined tendon torn from pubic tubercle
  - Dehiscence between conjoined tendon and inguinal ligament

**The pubic tubercle, is the main site of muscle/tendon disruption**
The lower extremity muscles are more developed than the core muscles

- The conjoined tendon pulls up and rotates the trunk, and the adductor longus pulls down and rotates the upper leg.
- When the forces are excessive and imbalanced, a sports hernia can occur.
- With a sports hernia, these opposing forces cause disruption of the muscles at their insertion site on the pubis.
C/O deep groin/lower abdominal pain

Pain with resisted abdominal curl

Pain increases with activity (relieved by rest)

Pain with resisted hip Adduction (0°, 45°, &/or 90°)

Palpable tenderness over the pubic ramus (RA & Conjoined Tendon)
<table>
<thead>
<tr>
<th>Sit Up Test</th>
<th>Sit-Up &amp; Twist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Adduction (straight)</td>
<td>Hip Adduction (knee bent)</td>
</tr>
<tr>
<td>Combined Sit-Up &amp; Adduction</td>
<td>Palpation</td>
</tr>
</tbody>
</table>
Snapping Hip Syndrome

Internal
Internal Pathology

- Illiopsoas Tendon
  - Over femoral head/hip joint capsule
  - Over illiopectineal eminence or lesser trochantar
- Illiofemoral Ligaments/Long Head of Biceps Femoris
Internal Pathology

Snapping Hip Maneuver
Muscle Lesion
# Resisted Isometric Testing

<table>
<thead>
<tr>
<th>Test Findings</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong &amp; Painfree</td>
<td>Normal Tissue</td>
</tr>
<tr>
<td>Strong &amp; Painful</td>
<td>Local Lesion (muscle or tendon)</td>
</tr>
<tr>
<td>Weak &amp; Painful</td>
<td>Severe Lesion</td>
</tr>
<tr>
<td>Weak &amp; Painfree</td>
<td>Complete Rupture</td>
</tr>
</tbody>
</table>
Hip Flexion  

Hip Internal Rotation  

Hip External Rotation  

Knee Extension
Lateral Hip Pain
Lateral Hip Pain

- Trochanteric Bursitis
- Meralgia Parasthetica
- Hip Differential Diagnosis
- Lateral Snapping Hip Syndrome
- Muscle Lesion
Involved Structure

- Inert Tissue
  - Meralgia Parasthetica

- Contractile Tissue
  - External Snapping Hip Syndrome
  - Trochanteric Bursitis
  - Muscle Lesion
Patient Profile

- **Mechanism of Injury**
  - Contractile: Sudden or overuse injury
  - Inert: Sudden, overuse, or degenerative

- **1°C/O: “Lateral Hip Pain”**
  - May include “clicking” or “catching”

- **Aggravating Movements:**
  - Pain with closed chained movements (e.g. squats, lunges)
  - Pain with rotatory movements (e.g. cutting movements)

- **Relieving Movements:**
  - Positions that de-weight the hip
  - Avoiding aggravating movements
Contractile Clinical Exam

External Snapping Hip Syndrome  Trochanteric Bursitis  Muscle Lesion
Snapping Hip Syndrome

External
Subluxation of ITB over trochantar

- Causes:
  - Posterior ITB*
  - Anterior Gluteus Maximus*
  - Coxa Var a (decreased angulation of femoral neck)
  - Fibrotic tissue after Total Hip Replacements (THR)
  - Surgery for anterolateral knee instability
External Pathology

Tests
- Ober’s
- Nobles Compression
- Palpation
- Other Tests
  - Provocating movements
  - Muscle Length– (e.g., piriformis length)
Trochanteric Bursitis
Figure 2. The doctor examines the greater trochanter with the patient lying on his/her side.
Resisted Isometric Testing

Hip Abduction

Hip Adduction
Posterior Hip Pain
Posterior Hip Pain

- Hip Labral Tears
- Hip Differential Diagnosis
- Femoral Acetabular Impingement
- Muscle Lesion
- Hip DJD
Involved Structure

Inert Tissue
- Actetabular Labral Tears
- Femoral Acetabular Impingement
- Hip DJD

Contractile Tissue
- Muscle Lesion
Mechanism of Injury
- **Contractile:** Sudden or overuse injury
- **Inert:** Sudden, overuse, or degenerative

1°C/O: “Posterior Hip Pain”
- May include “popping” or “clicking” or “catching”
- May include a feeling of crepitation or “grinding”

**Aggravating Movements:**
- Pain with closed chained movements (e.g. squats, lunges)
- Pain with rotatory movements (e.g. cutting movements)
- Pain with transition or forceful movements

**Relieving Movements:**
- Positions that de-weight the hip
- Avoiding aggravating movements
Inert Clinical Exam

- Acetabular Labral tears
- Femoral Acetabular Impingement
- Hip DJD
Impingement Tests

Hip Labrum/FAI
Test #1 – Posterior Labrum

Hyperextension/Abduction/Ext Rotation
Test #2–Posterior Labrum

- Phase I) Flexed/Adduction/Internal Rot
- Phase II) Extension/Abduction/Ext. Rot.

Adapted from Magee. Orthopedic Physical Assessment. 4th ed. 2002
FABER Tests

Negative

Positive
Contractile Clinical Exam
Muscle Lesion
Resisted Isometric Testing

Hip Extension (knee straight)

Hip Extension (knee bent)
Upper Lumbar Spine Referral

- Upper Lumbar Facet Pathology
  - L1–L3 facets or nerve Root can refer into the anterior hip and groin
Lumbar Spine Exam

- Reflex Testing
- Quadrant Testing
- Sensory Testing
- Motor Testing
## Neuromotor Testing

<table>
<thead>
<tr>
<th>Level</th>
<th>Motor</th>
<th>Reflex</th>
<th>Sensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1-L2</td>
<td>Hip Flexion</td>
<td>NA</td>
<td>Dermatome</td>
</tr>
<tr>
<td>L3-L4</td>
<td>Knee Extension</td>
<td>Patellar (L2-L3)</td>
<td>Dermatome</td>
</tr>
<tr>
<td>L4-L5</td>
<td>Ankle Dorsiflexion</td>
<td>NA</td>
<td>Dermatome</td>
</tr>
<tr>
<td>L5</td>
<td>Great Toe Extension</td>
<td>NA</td>
<td>Dermatome</td>
</tr>
<tr>
<td>L5-S1</td>
<td>Unilateral Standing</td>
<td>Achilles</td>
<td>Dermatome</td>
</tr>
<tr>
<td>S1</td>
<td>Walk on toes</td>
<td>Ext. Digi Brevis (L5-S1)</td>
<td>Dermatome</td>
</tr>
</tbody>
</table>
SI Joint Dysfunction can refer into the posterior Pelvis, Hip, and Leg.
## SI-Joint Exam

<table>
<thead>
<tr>
<th>Compression Test</th>
<th>Gapping Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Compression Test" /></td>
<td><img src="image2" alt="Gapping Test" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sacral Thrust Test</th>
<th>Patrick’s Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Sacral Thrust Test" /></td>
<td><img src="image4" alt="Patrick’s Test" /></td>
</tr>
</tbody>
</table>
Differential Diagnosis

- Loose Bodies
- Labral Tears
- Chondral Damage
- Ligamentum Teres
- Hip Instability
- Athletic Pubalgia
- Snapping Hip Syndrome
- Piriformis Syndrome
- Slipped Capital Femoral Epiphysis
- Tumors

- Femoroacetabular Impingement (FAI)
Hip Labrum Tears

- Most common cause of mechanical hip symptoms
Hip Labrum Tears

[Diagram of hip with labeled Acetubular Labral tear]
Prevalence

Location

- Anterior Quadrant Tears
  - Trauma or pivoting injuries in athletics
  - 92–98% (1246 cases)
- Posterior Quadrant Tears
  - Isolated & occur with posterior dislocation or hip dysplasia
- Lateral Quadrant Tears
  - Infrequent & linked with additional labral and acetabular lesions
Common Mechanism of Injury
- Sudden twist/pivot of lower leg
- Forced adduction with a rotatory component of the leg
- Traumatic event—slip & fall
- Other—osteoarthritis, hip dysplasia

Data on mechanisms of injury from European Football (Soccer)\(^6\)

<table>
<thead>
<tr>
<th>Player</th>
<th>Position</th>
<th>Action at Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Midfield</td>
<td>Jogging</td>
</tr>
<tr>
<td>2</td>
<td>Defense</td>
<td>Ext Rotation/Hip Extension</td>
</tr>
<tr>
<td>3</td>
<td>Defense</td>
<td>Direct Blow/Hip Extension</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>Hip Extension/ Ext Rotation</td>
</tr>
<tr>
<td>5</td>
<td>Midfield</td>
<td>Hip Extension/ Ext. Rotation</td>
</tr>
<tr>
<td>6</td>
<td>Forward</td>
<td>Hyper Extension</td>
</tr>
</tbody>
</table>
Etiologies

- **Femoral Acetabular Impingement**
  - Next section

- **Traumatic Injuries:**
  - Shear forces from twisting, pivoting, or falling

- **Dysplasia—shallow acetabular socket**
  - Decreased coverage of the femoral head anteriorly and laterally
  - Problem: Increased stress to anterior capsule and labrum
  - Linked to hypermobility and labral tears

- **Chondral Lesions**
  - Labral tears have been associated to acetabular articular degeneration
    - 73% with labral tears have chondral damage
  - Absence of a labrum results in increased contact pressure and cartilage consolidation
  - Anterosuperior chondral damage has been associated with:
    - Cam FAI
    - Anterior capsular laxity
    - Dysplasia
Capsular Laxity

- **Traumatic**
  - Cause: Hip subluxation or dislocation

- **Atraumatic**
  - Global laxity: Individuals with connective tissue disorders
    - E.g. Downs, Marfan’s

- **Focal Rotational Laxity**
  - Forceful ER: Focal laxity 2° to forceful ER
    - Leads to illiofemoral ligament insufficiency
  - Forceful IR: Focal laxity 2° to forceful IR
    - Leads to ishiofemoral ligament insufficiency
  - Sports: Golf, ballet, gymnastics, martial arts, & hockey
## Labral Tear Classification

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th><strong>Classification</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Detachment of labrum from articular surface. Perpendicular to articular surface and may extend into subchondral bone</td>
</tr>
<tr>
<td>Type II</td>
<td>One of more cleavage planes or different depths within the labrum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Stage</strong></th>
<th><strong>Classification</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0</td>
<td>Contusion with synovitis</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Labral margin tear with intact articular cartilage</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Labral tear with focal articular damage to head of femur</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Labral tear with/without articular chondromalacia</td>
</tr>
<tr>
<td>Stage 3A</td>
<td>Labral tear with &lt;1cm of acetabular articular cartilage</td>
</tr>
<tr>
<td>Stage 3B</td>
<td>Labral tear with &gt;1cm of acetabular</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Extensive labral tear with diffuse arthritic articular cartilage</td>
</tr>
</tbody>
</table>
Diagnostics

- Magnetic Resonance Arthrography (MRa)
  - Sensitivity (66 to 95%), Accuracy (71 to 91%)
- Magnetic Resonance Imaging (MRI)
  - Sensitivity (30 to 67%), Accuracy (36 to 75%)
- Hip Arthroscopy
  - Accuracy 55%
- Radiographs
  - Not reliable
**Chondral Damage**

- Common mechanism due to direct lateral impact
- Higher incidence in males due to contact sports
- High bone density transfers energy to cartilage surfaces
- Fractures likely if poor bone density
Lesion may occur as the result of trauma or in association with degenerative arthritis.

This is being increasingly recognized as the cause of painful hip symptoms especially in athletes.

Often caused by twisting injury in the absence of subluxation or dislocation.
Athletic Pubalgia

- Multifactorial
- Acute macrotrauma or repetitive microtrauma
- Hyperextension mechanism often with rotation
- Change of direction movements
- Co-contraction forces in opposite directions produce shear forces
- Occurs at pubis (rectus abdominus insertion and hip flexor origin), medial to inguinal canal
- Bilateral involvement common in ice hockey and soccer
- Present as groin pain
Sports Hernia

- Nomenclature
  - Sports Hernia
  - Athletic Pubalgia
  - Gilmore’s Groin

- Common Tissues Violated
  - Torn external oblique aponeurosis
  - Torn conjoined tendon (Rectus + TrA)
  - Conjoined tendon torn from pubic tubercle
  - Dehiscence between conjoined tendon and inguinal ligament

**The pubic tubercle, is the main site of muscle/tendon disruption**
The Sports Hernia

Torn external oblique aponeurosis
- Torn conjoined tendon
- Conjoined tendon torn from pubic tubercle
- Dehiscence between conjoined tendon and inguinal ligament
Patient Profile

- **Patient:** All ages
  - **1° C/O:** “Deep” groin or lower abdominal pain with exertion
    - Groin pain at the insertion of the conjoined tendon at the pubic tubercle
    - Pain at the insertion of the adductor longus as well.
    - Radiating groin pain along the inguinal canal and even down into the perineum or rectal area.

- **Mechanism:**
  - Insidious onset
  - May be linked to prior incident

- **Location:**
  - Tenderness along the superior–lateral pubis
    - May be unilateral or bilateral
    - Radiating pain down adductors

- **Provocation Tests:**
  - See cluster of symptoms

- **Imaging:** Used to rule out other medical conditions
Algorithm for the Management of Athletic Pubalgia

Kachingwe, Grech 2008
Athlete presents with cluster of 5 signs and symptoms consistent with a sports hernia

- Athlete recalls hearing or feeling acute lower abdominal “rip”
  - Category 1
    - Athlete who is not scheduled to return to sport for at least 4 mo
      - Undergo surgical exploration and repair
        - If <80% improvement
          - Undergo surgical exploration and repair
        - If >80% improvement, continue with rehabilitation additional 2-3 wk
          - Undergo surgical exploration and repair
  - Category 2
    - Athlete who is scheduled to return to sport within 4 mo
      - 3- to 4-wk trial rehabilitation
        - If <80% improvement
          - Undergo surgical exploration and repair
        - If >80% improvement, continue with rehabilitation additional 2-3 wk
          - Undergo surgical exploration and repair
  - Category 3
    - 6-wk trial rehabilitation
      - If <80% improvement
        - Undergo surgical exploration and repair
      - If >80% improvement, continue with rehabilitation additional 2-3 wk
        - Undergo surgical exploration and repair
      - If 100% improvement, return to sport
  - Category 4
    - Patient is not a high-performance athlete
      - Rehabilitation
      - If 100% improvement, return to sport
Diagnoses

- **Magnetic Resonance Imaging (MRI)**
  - Limited ability to diagnose and is good to rule out other pathology

- **Radiographs**
  - Used to exclude underlying pathology

- **Bone Scan/CT Scan**
  - Used to exclude underlying pathology

- **Ultrasound**
  - Currently being used, but is still being studied.
Evaluation

- **History**
  - Pain, groin, will demonstrate with a “C” sign
  - Locking, popping, clicking, catching

- **Observation**
  - Limited hip ROM, specifically IR, increase pelvic and lumbosacral motion to compensate,

- **Palpation**

- **Special Tests**
  - FADIR will be +, log roll test (highly specific articular pathology vs extra articular, low sensitivity)
Pathological condition in which there is an abnormal relationship between the acetabulum and the proximal femur

- 2 types
  - Cam
  - Pincer
Important: Decreased joint clearance of femur & acetabulum

- FAI is a condition of too much friction in the hip joint.  
  - Basically, the ball (femoral head) and socket (acetabulum) rub abnormally creating damage to the hip joint.  
  - The damage can occur to the articular cartilage or the labral cartilage
- FAI is associated with cartilage damage, labral tears, early hip arthritis, hyperlaxity, sports hernias, and low back pain.
- FAI is common in high level athletes, but also occurs in active individuals.
Cam Type Lesion

- Thickened area around the femoral head and neck junction
- During flexion and IR the femoral head jams into the acetabular rim and labrum
- Often referred to as a pistol grip deformity due to its resemblance to a hand gun stock
Cam Impingement – excess bone on the head/neck junction of the femur, restricting motion.
Pincer Type Lesion

- Bony overgrowth of acetabular rim
- Can cause ossification of labrum which can appear as a fracture in plain radiographs
Pincer Impingement – excess bone on the Acetabulum creates an abnormally deep socket which restricts movement of the femur and causes pinching of the labrum.
Patient Profile

Patient:
- Cam Impingement – Young male athletes (20–40 years)
- Pincer Impingement – Middle age females

1°C/O: “Groin Pain”

- Mechanism: Abnormal contact between femur and acetabulum
  - Pain with combined Flex, ADD, IR
  - Pain with rotatory movements

Risk Factors:
- Cam Impingement:
  - Linked to anterosuperior labral tears and chondral lesions
- Pincer Impingement:
  - Abutment of the femoral head and acetabulum leading to a “contra-coupe” posterior-inferior chondral lesion
Single Subject Case Study (Female Subject)

- Looked at hip motions in a patient with FAI
- Movements:
  - Single leg step down, running, drop jump maneuver
- Results:
  - Excessive adduction/internal rotation reproduced symptoms
  - External hip strapping device—decreased symptoms
- Conclusion:
  - Excessive frontal and transverse plane motion may contribute to FAI impingement. Rehab interventions aimed at controlling poor hip movements may give the best outcomes.
Diagnostics

- Magnetic Resonance Arthrography (MRa)
  - Sensitivity (66 to 95%), Accuracy (71 to 91%)
- Magnetic Resonance Imaging (MRI)
  - Sensitivity (30 to 67%), Accuracy (36 to 75%)
- Hip Arthroscopy
  - Accuracy ~55%
- Radiographs
  - Not reliable
Surgical vs. Non Surgical

- Keys to successful surgical intervention
  - Patient selection
  - Patient education
  - Appropriate precautions
  - Patient specific progressive rehab
Patient Selection

- Physical evidence of hip joint pathology
- Radiological evidence and/or results of intra-articular injection
- Trauma
- Previous surgical intervention
- Absence of significant soft tissue pain/tenderness and/or restriction
- Presence of adequate hip strength
- Realistic expectations
- History of compliance
Patient Education

- Pre-operatively: expected precautions and rehabilitation timelines/expectations
- Post-operatively: WB restrictions, ROM restrictions, ADL modifications, sleeping positions, dosing activity, HEP Instructions
  - Caregiver education: dosing activity, LAD with circumduction, safety/home modifications
- Long term rehab considerations
  - Necessary activity modifications
Non Operative Treatment

- Decrease pain and effusion
- Normalize joint mobility and ROM
- Normalize hip and core strength
- Avoid deep squatting or loaded hip flexion > 45°
  - Includes deep lunge and deep leg press
- Avoid loaded rotational movements
  - Plant and twist/pivoting
- No active SLR
- Low impact CV activities
3 R’s of Treatment

- Reset
  - Does the joint move? No, joint mobs to restore. Yes, STM and stretching
  - Mobility before stability
  - The body finds a way to move, so if mobility restrictions are present they will continue to drive the stability dysfunctions
  - Mobility resets
    - Mobilization progression: Long axis distraction with circumduction, log roll technique, caudal glides with varying HF angles, Lateral glides, SL hip extension with PA glides
    - Suggested soft tissue areas of restriction: iliopsoas/rectus femoris, adductors, TFL/Glut med, hamstrings
  - Soft tissue techniques: ART, IASTM, dry needling, DTM, myofascial release
3 R’s of Treatment

- Reinforce
  - Reintroduce normal movement
  - Patient education–Corrective Exercise–External Reinforcements
  - Examples of external reinforcements
    - Postural shirts/garments/devices
    - Kinesiotape
    - Bracing/Taping
    - Biofeedback
3 R’s of Treatment

Reload Functional Patterns

4 Positions
- NWB
- Quadruped
- Kneeling
- Standing

4 Types of Resistance
- No resistance, movement assistance
- No resistance
- Resistance, movement assistance
- Resistance
Development Progression

- Supine/Prone as a baby
- Quadruped (crawling)
- Kneeling/half kneeling
- Standing

As we begin our exercise progression we should not advance to the next stage if pain or incorrect movement is encountered in the previous stage.
Rolling Progression

- Can the patient perform fundamental rolling?
  - Yes continue with 4x4 matrix
  - No begin rolling progression
- Prone to Supine (lower body and upper body)
Rolling Progression

- Supine to Prone (lower body and upper body)
Rolling Corrections

- Start Supine
- Move to SL
- Use bolster or foam roll to keep them SL
- Work on upper body assist first
<table>
<thead>
<tr>
<th>NWB</th>
<th>Quadruped</th>
<th>Kneeling</th>
<th>Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolling</td>
<td>Bird Dog</td>
<td>Tall Kneeling alternating flex/ext</td>
<td>Varying stance chops and lifts</td>
</tr>
<tr>
<td>Supine Chops and Lifts</td>
<td>Planks</td>
<td>Tall kneeling chops and lifts</td>
<td>SL Balance progressions</td>
</tr>
<tr>
<td>Modified Crunches</td>
<td>Side Planks</td>
<td>Tall kneeling med ball lifts</td>
<td>Cup walking</td>
</tr>
<tr>
<td>Superman</td>
<td>Plank with Leg Raise</td>
<td>Tall kneel med ball slams</td>
<td>SL RDL</td>
</tr>
<tr>
<td>Glute Isometrics</td>
<td>Hip Extensions</td>
<td>½ kneel narrow base of support</td>
<td>4 way hip</td>
</tr>
<tr>
<td>Clamshells</td>
<td>Fire Hydrants</td>
<td>Nordic Hamstrings</td>
<td>Squats</td>
</tr>
<tr>
<td>Bridges</td>
<td>Mule Kicks</td>
<td>Kneeling Hip IR/ER</td>
<td>Lunges</td>
</tr>
<tr>
<td>Prone Hip Ext</td>
<td>Bird Dogs</td>
<td>Kneeling Pelvic Tilts</td>
<td>Lateral/Monster walks</td>
</tr>
<tr>
<td>SL Hip Abd</td>
<td>Side plank w/Abd</td>
<td>Tall to half kneel transitions</td>
<td>Deadlifts</td>
</tr>
</tbody>
</table>
Post Op Treatment Considerations
Biological Healing Considerations

- **Structural Repair or Bony Contouring?**
  - Yes
    - Acetabuloplasty
      - Minimal Restrictions
    - Femoroplasty
      - Moderate Restrictions
    - Labral Repair/Fixation
      - Moderate Restrictions
    - Microfracture
      - Significant Restrictions
  - No
    - Restrictions based on symptoms/normalized gait
## Biological Healing Considerations

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Weightbearing</th>
<th>Crutches</th>
<th>ROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine Arthroscopy (loose body removal, labral debridement, chondroplasty, etc.)</td>
<td>WBAT</td>
<td>5–7 days as gait is normalized</td>
<td>No limits</td>
</tr>
<tr>
<td>Femoroplasty</td>
<td>WBAT; avoid loaded torsional forces</td>
<td>1 month</td>
<td>No limits</td>
</tr>
<tr>
<td>Acetabuloplasty</td>
<td>WBAT</td>
<td>2 weeks or until gait is normalized</td>
<td>No limits</td>
</tr>
<tr>
<td>Labral Repair or Fixation</td>
<td>50% body weight</td>
<td>1 month</td>
<td>90° of hip flexion, no ER for 4 weeks, progress gradually to 6 weeks</td>
</tr>
</tbody>
</table>
## Biological Healing Considerations

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Weightbearing</th>
<th>Crutches</th>
<th>ROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capsular Closure</td>
<td>Dictated by concomitant procedures</td>
<td>Dictated by concomitant procedures</td>
<td>No hip extension beyond what is present in normal gait for 4 weeks</td>
</tr>
<tr>
<td>Microfracture</td>
<td>30# PWB</td>
<td>2 months</td>
<td>No limits (emphasize ROM)</td>
</tr>
<tr>
<td>Tendon Release</td>
<td>WBAT</td>
<td>2 weeks or until gait is normalized</td>
<td>No limits on PROM, limit AROM to allow healing process. Encourage PROM hip extension.</td>
</tr>
</tbody>
</table>

Remember: with multiple procedures the most restrictive precautions will be followed.
1 – Mobility and Initial Exercise
2 – Intermediate Exercise and Stabilization
3 – Advanced Exercise and Neuromuscular Control
4 – Sport Specific/Function Training and Return to Sport/Work
Protocols vs. Guidelines

- Hip injuries and arthroscopic hip procedures are relatively novel to most practitioners due to the lower incidence of these diagnoses and surgeries as compared to other joints.
- Often patients are travelling long distances from home to undergo these procedures and so the practitioners have little to no contact with the surgeon and rely heavily on protocols.
I. Initial Phase
Goals: Regain range of motion within tolerance, decrease swelling and pain, retard muscle atrophy
A. Day of surgery
1. Begin isometric glut sets and ankle pumps.
B. Postoperative days 1–7
1. Remove bulky dressing.
2. Weight bearing to tolerance, crutch ambulation on flat and stairs.
3. Immediate postoperative exercises.
   a. Isometric quad, glut, hamstring, adductor, and abductor sets
   b. Active assisted range of motion in all planes
   c. Hip mobilization if beneficial in decreasing pain and increasing range of motion with straight-plane distraction, inferior glide, and posterior glide
   d. Closed chain bridging, weight shifts, balancing drills
   e. Open chain standing abduction, adduction, flexion, extension without resistance

II. Intermediate Phase
Goals: Regain and improve muscular strength and normalize joint arthrokinematics
A. Postoperative weeks 2–3
1. Progress off crutches and normalize gait.
2. Continue to progress range of motion with gradual end-range stretch within tolerance.
3. Begin progressive resistive exercises as tolerated.
   a. Closed chain single leg bridging
   b. Open chain above knee resistive Theraband or pulley exercise in flexion, extension, adduction, abduction, hamstring curl as tolerated
   c. Bike if tolerated
   d. Pool exercises

III. Advanced Phase
Goals: Improve functional strength and endurance
A. Postoperative weeks 4–6
1. Continue flexibility exercises.
2. Continue to progress resistive strengthening and functional strengthening exercises.
   a. Closed chain exercises as tolerated: multihip strengthening, hamstring curls, knee extensions
B. Gradual progression to full functional activities
Common Post-Operative Complaints

- Hip/Thigh swelling and/or knee pain and popping
- Stiffness/tightness
- Pain with quick movements
- Clicking/Popping
- Difficulty with ADL’s
- Intolerance to prolonged activities or positions

Basic solutions
- Education
- Vasopneumatic device
- Elevation
- Crutch use
Phase I: Mobility and Initial Exercise

- Day 1 Post Op
  - Isometrics
  - AAROM
  - Long Axis distraction with circumduction
  - Log rolling (IR only)
  - Bridges
  - Seated knee extension/Prone hamstring curl
  - Standing 4 way SLR
  - Crutch training
  - JOBST or other similar vasopneumatic compression device
Phase I: Mobility and Initial Exercise

2–3 weeks
- Goals: 90° of HF and IR as tolerated, diminish pain and inflammation, and prevent muscle inhibition
- Increase resistance of activities
- 4 way hip beginning with SL activities progressing to standing
- Core exercises (supermans, crunches)
- Biking w/o resistance
- Soft tissue mobilization (with healed incision)
- Caudal glides or joint mobs
- Pool therapy
Phase II: Intermediate Exercise and Stabilization

Week 4
- Criteria to advance: no pain with Phase I exercises, no ROM concerns, following WB restrictions
- Goals: Restore pain free ROM, progressively increase muscular strength and endurance
- Increased joint mobilizations
  - Caudal glides in varying positions of flexion, ER log roll, sidelying extension PA
- PROM with 8 weeks as goal of full ROM
- Bridges
- Planks
- Clamshells
Basic Techniques
- A/P Glide
- P/A Glide
- Lateral Distraction
- Long Axis Distraction

Advanced Techniques
- Manual TX belts
Rationale: Used to loosen the presence of a hip capsular restriction (general stretch)
Technique: Patient is supine with both knees straight. Examiner grasps affected leg and applies:
✓  Mild/moderate distraction force
(+)Response: Treatment is successful if improved hip mobility is achieved. Patient will have less symptoms during movement
Rationale: Used to loosen the presence of a hip capsular restriction (general stretch)

Technique: Patient is supine with both knees bent. Examiner is standing at the patients side and grasps affected leg:
✓ Part I: put belt around patients thigh over a towel
✓ Part II: puts belt around examiner hips
✓ Part III: positions patient’s leg in 90/90 position
✓ Part IV: examiner leans backward applying a mild/moderate lateral distraction force

(+)Response: Treatment is successful if improved hip mobility is achieved. Patient will have less symptoms during movement
**Rationale:** Used to loosen the presence of a hip capsular restriction (general stretch)

**Technique:** Patient is supine with both knees bent. Examiner is positioned under the patient's bent knee and grasps the affected leg:
- Part I: put belt around patient's thigh over a towel
- Part II: put belt around examiner hips
- Part III: positions patient's leg in 90/90 position
- Part IV: examiner leans backward applying a mild/moderate inferior distraction force

**(+)Response:** Treatment is successful if improved hip mobility is achieved. Patient will have less symptoms during movement
**Rationale:** Used to loosen the presence of a hip capsular restriction (general stretch)

**Technique:** Patient is prone with both knees straight. Examiner is standing at the patients side with belt over shoulder and grasps affected leg:
- ✓ Part I: put belt around patients thigh over a towel
- ✓ Part II: position belt around shoulder of cranial hand
- ✓ Part III: position patient’s leg in hip ext. and 90° knee flexion
- ✓ Part IV: examiner’s cranial hand is positioned at level of greater trochanter and caudal hand cradles and supports knee above patella.
- ✓ Part VI: examiner applies a mild/moderate **downward** force at the hip with cranial hand.
- ✓ Part VI: *Contract/Relax* can also be done

**(+)**Response: Treatment is successful if improved hip mobility is achieved. Patient will have less symptoms during movement
Rationale: Used to loosen the presence of a hip capsular restriction (general stretch)

Technique: Patient is supine with both knees bent. Examiner is standing at the patient’s side and grasps affected leg:
✓ Part I: put belt around patient’s thigh over a towel
✓ Part II: put belt around examiner hips
✓ Part III: positions patient’s leg in 90/90 position
✓ Part IV: examiner leans backward applying a mild/moderate lateral distraction force
✓ Part VI: patient then actively internally and externally rotates hip

Response: Treatment is successful if improved hip mobility is achieved. Patient will have less symptoms during movement.
Phase III: Advanced Exercise and Neuromuscular Control

- **Week 8**
  - Criteria to advance: No pain with phase II exercises, ROM at or nearing normal, normal muscle recruitment
  - Goals: restoration of muscular strength and endurance, optimize proprioceptive function
  - Progression off of crutches with normalized gait
  - Initiate advanced exercises
    - Ball bridging, step downs, complex gait (cones), lunges (band assist, multiplane external resistance), BOSU ball, proprioceptive/balance activities, resisted band activities, squat progression
  - WB exercises
  - Continue soft tissue mobilization
    - IASTM, Foam Roll, Stick work, prone PA with hip in ER (frog leg, AP mobilizations if necessary
  - Restore cardiovascular endurance activities
  - May need to “pull in the reigns” at this point
Phase IV: Sport Specific Training and Return to Sport/Work

- Week 12
  - Criteria to advance: SL mini squat, step down with level pelvis, restoration of CV endurance, and good mechanics with basic agility drills/movements
  - Sport/activity specific drills, cones, plyos, advanced core, traditional strengthening (squat, clean, snatch, deadlift)
Functional Movement/Performance Testing and Outcome Measures
When is Movement/Performance Assessment Appropriate

- Based on healing times and restoration of ROM
- SFMA allows the establishment of dysfunctions in mobility and stability
- Can perform as early as 8 weeks
Common findings

- Limited hip mobility
- Limited thoracic mobility
- Poor neuromuscular control
  - Hips (Bridging with leg extension)
  - Core (rolling assessment)
- Other findings: cervical, ankle, knee
Traditionally post op rehab is fairly isolated or targeted on the involved joint

- Addressing movement dysfunction as early as possible assists in eliminating poor movement patterns as the patient returns to high level activity
Depending on the patient may be performed as early as week 12, but typically weeks 14 and beyond.

Consider required mechanics/demands of the patients sport or work.

Consider FMS and/or Y balance for functional movement assessment.
  - Not truly performance testing but movement testing.
Fundamental Testing Examples

- Lateral Movements
- Squatting
- Hopping
  - SL Hop for distance, Crossover Triple jump, Timed 6 Meter jump
- Speed Work
- Agility Ladders
- Balance Testing (BESS)
Balance Test

- Helps determine deficits in proprioception and balance
- Single leg stance (hold position for time)
  - Can incorporate different surfaces, and eye condition
  - May also incorporate sports skills into test

Subjective Evaluations

- Incorporation of subjective questionnaires or numeric scales to assess function
## Lower-Quarter Functional Progression and Testing Template

<table>
<thead>
<tr>
<th>Levels</th>
<th>Support</th>
<th>Stability</th>
<th>Plane</th>
<th>Response</th>
<th>Direction</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bilateral</td>
<td>Stable</td>
<td>Single</td>
<td>Single</td>
<td>Vertical</td>
<td>Leg press, Shuttle, Minsquat</td>
</tr>
<tr>
<td>2</td>
<td>Bilateral</td>
<td>Unstable</td>
<td>Single</td>
<td>Single</td>
<td>Vertical</td>
<td>DynaDisc, Foam roller, Biodeck stability</td>
</tr>
<tr>
<td>3</td>
<td>Unilateral</td>
<td>Stable</td>
<td>Single</td>
<td>Single</td>
<td>Vertical</td>
<td>Leg press, Shuttle, Minsquat, Step-up</td>
</tr>
<tr>
<td>4</td>
<td>Unilateral</td>
<td>Unstable</td>
<td>Single</td>
<td>Single</td>
<td>Vertical</td>
<td>Leg press, Shuttle, Minsquat, Step-up</td>
</tr>
<tr>
<td>5</td>
<td>Bilateral nonsupport</td>
<td>Stable</td>
<td>Single, multiple</td>
<td>Single, multiple</td>
<td>Vertical, horizontal</td>
<td>Jumping “5-Dot drill”, Spin hops</td>
</tr>
<tr>
<td>6</td>
<td>Unilateral nonsupport</td>
<td>Stable</td>
<td>Single, multiple</td>
<td>Single, multiple</td>
<td>Vertical, horizontal</td>
<td>Jumping “5-Dot drill”, Spin hops</td>
</tr>
<tr>
<td>7</td>
<td>Acceleration, deceleration</td>
<td>Stable</td>
<td></td>
<td></td>
<td></td>
<td>“Shuttle Run”, “T-drill”, Cocontraction, Lateral power hop</td>
</tr>
</tbody>
</table>

---

**Notes:**
- Levels 1-4: Focus on bilateral exercises.
- Levels 5-7: Focus on unilateral and non-support exercises.
- Exercises are designed to progress in complexity and challenge.
Harris Hip Score

- 100 is a perfect score
- In a hip center with over 1000 patients, patients HHS improved 35 points after surgery
- Most improvement occurred in the first month with maximal improvement at 3 months and maintained at 5 years f/u
Common issues in Post–Op Rehab

- Pain with supine SLR (should avoid supine SLR)
- No manual therapy being performed
- Prescribing too many compressive exercises and not enough “opening” up movements
- No stretching performed (active or passive)
- Discharging prior to functional goals being met
- Getting back to ADL’s or Sport Specific activities too quickly
- Not modifying therapy program and ADL’s during and after a flare up
How to treat flare ups

- Ice/use of vasopneumatic compressive device
- Anti-inflammatory
- Assess outside activities
- Hold on activity or rehab for 2–3 days
- Maintain ROM
- Continue Isometrics
- Pool therapy
- Contact referring source if needed
Sources

- Chahal J et al. The minimal clinical important difference (MCID) and patient acceptable symptomatic state (PASS) for the modified Harris hip score and hip outcome score among patients undergoing surgical treatment for femoroacetabular impingement. Orth J of Sports Med. 2014; 2 (sup).
Sources