Rehabilitation of Hip Labral Tears and Femoroacetabular Impingement

Michael Newsome PT, OCS, SCS, CSCS
Hip injuries account for 3.1% of all injuries in the NFL from 1997-2006 (Feeley 2008)

- 59% strains
- 33% contusions
- 5% intra-articular (no labral tears dx before 2004)
Intra-articular injuries account for 10.6% of all hip/groin injuries in NHL from 2006-2010 (Epstein 2012)

- 69% labral tears
- 5% FAI
Prevalence of intra-articular hip pathology in asymptomatic athletes

- 72% male/50% female elite soccer players had radiographic FAI (Gerhardt 2012)
Prevalence of intra-articular hip pathology in asymptomatic athletes

• 64% collegiate and pro hockey players had MRI findings of hip pathology
  – 56% labral tears
  – 39% FAI

• 90% pro hockey players that were followed from previous study were able to play at 4 year follow up (Gallo 2014)
NON-OPERATIVE REHAB

• Is there a case for non-operative treatment?
  – Not all athletes dx with FAI/labral tears have surgery and are able to return to sports
  – What functional and biomechanical deficits in FAI/labral tear patients that can be addressed with non-operative rehab?
  – Will non-operative rehab help with post-operative recovery?
NON-OPERATIVE REHAB

• Pelvic and hip muscle retraining with functional activities
• Flexibility
• Joint mobility
• Strength
• Activity modification and education
PELVIC/ HIP BIOMECHANICS

• Normal pelvic rhythm (Murray 2002)
  – Pelvic rotation accounts for 18% of ROM with hip flexion in standing
  – Pelvic rotation occurs throughout the movement
PELVIC/HIP BIOMECHANICS

• Patients with CAM FAI have altered hip/pelvic biomechanics during gait (Kennedy 2009)
  – ↓ pelvic ROM in the frontal plane
  – ↓ total frontal/sagittal plane hip ROM
PELVIC/ HIP BIOMECHANICS

• Squat kinematics in patients with CAM FAI (Lamontagne 2009)
  – ↓ sagittal pelvic ROM
  – ↓ squat depth
  – No difference in hip motion
PELVIC/HIP BIOMECHANICS

- Effect of changes in pelvic tilt on hip ROM in FAI patients (Ross 2014)

<table>
<thead>
<tr>
<th>10° ↑ ant. pelvic tilt</th>
<th>10° ↑ post. pelvic tilt</th>
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<tbody>
<tr>
<td>- 6° ↓ IR</td>
<td>- 5° ↑ IR</td>
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<tr>
<td>- 10° ↓ hip flexion</td>
<td>- 10° ↑ hip flexion</td>
</tr>
<tr>
<td>- 8.5° ↓ FADIR</td>
<td>- 7° ↑ FADIR</td>
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PELVIC/HIP BIOMECHANICS

• Improve dynamic control of the pelvis that would change pelvic tilt in FAI patients
NON-OPERATIVE REHAB

• Double Cross Syndrome
  – Tight hip flexors/lumbar extensors
  – Weak gluteals/abdominals
NON-OPERATIVE REHAB

- Flexibility
  - Patients with post. hip pain will have decreased piriformis and gluteal flexibility
  - Tight hip flexors are common problem before and after hip arthroscopic surgery
NON-OPERATIVE REHAB

• Joint mobility
  – A number of FAI/labral tear patients will have joint restrictions
  – Hip ROM restrictions improve with manual therapy in hip OA patients (Hoeksma 2004)
NON-OPERATIVE REHAB

- Dynamic knee valgus with landing mechanics
  - Hip adduction/IR with dynamic knee valgus
  - Excessive hip adduction and IR during functional activities may contribute to FAI (Austin 2008)
  - S.E.R.F. strap ↓ adduction/IR at the hip with drop jumps, running and step down (Austin 2008)
NON-OPERATIVE REHAB

• Dynamic knee valgus with landing mechanics
  – ↓ hip abduction/ER strength correlates with landing kinematics and kinetics (Jacobs 2007, Lawerence 2008)
  – Female soccer players who completed in-season PEP program had ↓ IR and ↑ abduction at the hip with drop landing (Pollard 2006)
NON-OPERATIVE REHAB

• Hip Strength
  – Arthrogenic inhibition of gluteus maximus with intra-articular fluid injection (Freeman 2012)
  – Patients 18 - 40 years old with chronic hip joint pain had hip ER/IR/Abd weakness of 16-28% and the uninvolved hip had 18% ↓ ER and 16% ↓ Abd strength (Harris-Hayes 2014)
  – Symptomatic FAI patients had ↓ strength with hip adduction (28%), flexion (26%), ER (18%) and abduction (11%) (Casartelli 2011)
NON-OPERATIVE REHAB

• Activity modification and education
  – Avoid pivoting and cutting activities
  – Avoid combined flexion/add/IR positions
  – Bike for CV training
  – Focus on proper LE alignment with exercise
NON-OPERATIVE REHABILITATION OUTCOME STUDIES

• Case series of non-surgical treatment of hip labral tears (Yazbek 2011)
  – Phase 1 - pain control, trunk stabilization, correction of abnormal movements
  – Phase 2 - muscle strengthening, restore ROM, balance training
  – Phase 3 - advanced strengthening/balance training, sports specific functional progression

*Focus on proper L.E. alignment and stabilization at all phases
NON-OPERATIVE REHABILITATION

OUTCOME STUDIES

- Conservative care for 52 patients (avg. age 35) with prearthritic, intra-articular hip disorders (Hunt 2012)
  - Phase 1 treatment included patient education, activity, modification and physical therapy (muscle retraining, strengthening and stretching). 27% of the patients improved and did not need any further treatment.
  - Phase 2 was an intra-articular injection and 17% improved and did not choose surgery.
  - Phase 3 surgical intervention was chosen by 56% of the patients. Subjects with higher baseline activity scores were likely to choose surgery.
BIOMECHANICS OF THE ACETABULAR LABRUM

- Acetabular labrum provides hip stability by increasing articular surface area and volume (Tan 2001)
- The labrum seals the synovial fluid under pressure to produce a fluid film which protects the underlying cartilage (Ferguson 2000)
- The sealing effect enhances joint stability by providing resistance to distraction of the femoral head from the acetabular socket (Crawford 2007)
BIOMECHANICS OF THE ACETABULAR LABRUM

• The anterior superior region of the labrum has lower compressive and tensile elastic modulus than other quadrants of the labrum (Smith 2009)
• ER/Abd ↑ tensile strain in the anterior part of the acetabular labrum (Dy 2008)
BIOMECHANICS OF THE ACETABULAR LABRUM

- Hip extension with combined ER or abduction force results in large strains in the anterior labrum (Crawford 2007)
- Hip motion is limited by tension in the capsule with abduction and ER which causes the center of rotation of the joint to shift posterior which puts additional strain on the anterior capsule and labrum (Crawford 2007)
- Anterior and anterior lateral labral strains are high with hip flexion and IR (Safam 2011)
EMG ANALYSIS OF HIP EXERCISES

• WB and NWB exercises
• Exercises that isolate a muscle
• Highest ranking EMG exercise can be difficult to perform or cause pain
• Functional exercises
• Exercises that recruit multiple muscles
EMG ANALYSIS OF HIP EXERCISES

- Hip rehabilitation exercises (Bolgla 2006)
  - G.Med: 1) Pelvic drop – 57% MVC
  2) WB Abd – 42%
  3) Sidelying Abd – 42%
  4) NWB Abd – 33%
EMG ANALYSIS OF HIP EXERCISES

• Unilateral WB exercises (Ayotte 2007)
  – G.Med: 1) Wall squat – 86%
   2) Front step up – 74%
  – G.Max: 1) Wall squat – 52%
   2) Front step up – 44%
EMG ANALYSIS OF HIP EXERCISES

- Core trunk, hip and thigh muscles during rehab exercises (Ekstrom 2007)
  - G.Med: 1) Side-bridge – 74%
    2) Unilateral bridge – 47%
  - G.Max: 1) Quad arm/leg raise – 56%
    2) Unilateral bridge – 40%

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EMG ANALYSIS OF HIP EXERCISES

• Gluteal muscles activation during therapeutic exercises (Distefano 2009)
  – G.Med: 1) Sidelying hip abd – 81%
    2) Single limb squat – 64%
    3) Lat band walk – 61%
  – G.Max: 1) Single limb squat – 59%
    2) Single leg dead lift – 59%
    3) Transverse lunge – 49%
EMG ANALYSIS OF HIP EXERCISES

- Top exercises for gluteus med. and max. (Boran 2011)

<table>
<thead>
<tr>
<th>Exercise</th>
<th>G. Med.</th>
<th>G. Max</th>
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<tbody>
<tr>
<td>Front plank with hip ext.</td>
<td>75%</td>
<td>106%</td>
</tr>
<tr>
<td>Side plank abd up</td>
<td>88%</td>
<td>72%</td>
</tr>
<tr>
<td>Side plank abd down</td>
<td>103%</td>
<td>70%</td>
</tr>
<tr>
<td>Single leg squat</td>
<td>82%</td>
<td>70%</td>
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EMG ANALYSIS OF HIP EXERCISES
EMG ANALYSIS OF HIP EXERCISES

• Rehab exercises for G. Med. with consideration for iliopsoas tendinitis (Philippon 2011)
  1) Single leg bridge
  2) Sidelying hip abd with IR
EMG ANALYSIS OF HIP EXERCISES

- Exercises that target the gluteal muscles while minimizing TFL activation (Selkowitz 2013)
  1) Clam in sidelying with tubing
  2) Sidestep with tubing
  3) Unilateral bridge
REHABILITATION AFTER ARTHROSCOPIC HIP SURGERY

• Phase I – Protection (0–4 weeks)
• Phase II – Strength/Mobility (4–8 weeks)
• Phase III – Functional Training (8–12 weeks)
• Phase IV – Return to Sport (12–26 weeks)
PROTECTION PHASE (0 - 4 WEEKS)

- Brace: 0-90° to protect labrum and anterior capsule
- CPM: 4 hrs/day
- Wt. Bearing: 25% flat foot wt. bearing with brace for 2 weeks then WBAT. NWB=PWB compression forces (Givens–Heis 1992). Hip flexor irritation with NWB.
PROTECTION PHASE (0 - 4 WEEKS)

• ROM:
  - Limit extension 0°/ER 20°
  - Avoid flexion/add/IR
  - Quadriped position to increase hip flexion ROM
  - IR ROM in prone position
  - Upright bike with high seat and minimal resistance

• Flexibility: Prone lying for hip flexors and modified supine hip flexion stretch.
PROTECTION PHASE (0 - 4 WEEKS)

• Strength:
  – Lumbopelvic stabilization (post. pelvic tilts/bridging)
  – Quadriceps and submaximal hip isometrics except hip flexion
  – Progress to hip isotonics after 2 weeks

• Education and activity modification
  – Limit time sitting especially in low chairs
  – Need to assist operative LE with transfers
  – Avoid pivoting or rotating during wt. bearing
  – Avoid active long lever hip flexion (SLR)
  – Anterior hip pain is a common complaint
STRENGTH/ MOBILITY PHASE (4-8 WEEKS)

• D/C brace and CPM
• Gait training: restore stride length and correct frontal plane compensation
• Aquatic therapy: gait training and CKC exercises
• ROM: progress to full ROM, can use mobilization belt with ROM, ST mobilization as needed
STRENGTH/MOBILITY PHASE (4-8 WEEKS)

• Flexibility:
  – Static, dynamic, and PNF stretching to all muscle groups
  – Wt bearing hip flexion stretch

• Strength:
  – Advance lumbopelvic stabilization (single leg bridge and side planks)
  – Multi-hip machine
  – CKC exercises
  – Hip hiking and lateral band walks for glut med
STRENGTH/ MOBILITY PHASE (4-8 WEEKS)

- Balance training: progress to single leg
- CV training: bike/elliptical/stairmaster
- Education: focus on proper LE alignment with exercises and ambulation
FUNCTIONAL TRAINING PHASE (8 - 12 WEEKS)

- ROM: add joint mobilization if ROM is still limited
- Strength: single leg CKC exercises and low impact multi-plane functional exercises
- Balance training: add perturbation training
RETURN TO SPORT PHASE (12 - 26 WEEKS)

• Running on flat surface
• Plyometric and agility training
• Sport specific training
RETURN TO SPORT PHASE (12 - 26 WEEKS)

- Return to sport 3.9 months (Philippon 2010) – 9.4 months (Nho 2011)
- Return to sport for professional athletes 4.2 months and recreational athletes 6.8 months (Malviya 2013)