When It’s Not Just the Labrum

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CSM 2014
Objectives

1. Understand the *influence of anatomical structures* on anterior groin/hip pain

2. Identify various *impairments* of the sacrum, ilium, lumbar spine and hip joint associated with hip/groin pain

3. Describe best *sequence of tx* eg. Pelvis or spine or hip first

4. Describe *soft tissue mobilization* techniques targeting lumbopelvic–hip joints

5. Understand *physical therapy intervention* that promotes protecting painful anterior/lateral hip structures while strengthening posterior/lateral muscles
Why Study this patient group?

- Patients referred with ongoing sx
  - (even after 1–4 previous PT episodes of care elsewhere)
  - Patients were not improving or returning to previous level of function/sport regardless of PT or Surgery

- No previous pelvic girdle evaluation during previous PT

- No previous tx of postural alignment influencing lumbar spine, pelvic girdle and hip

- Little to no deep soft tissue techniques and manual therapy

- Primary Focus of previous PT on anterior painful hip, stretching and strengthening

- PT/Teamed up with Surgeon who wanted better outcomes
Further rationale to study this patient population and interventions

- Scarce Literature regarding non-op PT for these patients

- National Institute for Health and Care Excellence (NICE) 2011
  - Recommendations for patients with hip labral tears was **surgical** intervention
  - secondary to FAI after failing to progress with conservative, temporizing measures that include:
    - activity modification,
    - rest
    - anti-inflammatory meds
  - **No mention of PT here**
    - which is classified as a conservative measure
    - May be largely due to studies recently appearing in the literature
Literature Review

- Prevalence of labral tears
- Non-operative conservative treatment (including PT)
- Post-operative rehabilitation
- Surgical outcomes
- Surgery vs. conservative
There is a prevalence of non-symptomatic hip labral tears in many persons

- Prevalence of Abnormal Hip Findings in Asymptomatic Participants

- 69% volunteers had a non-symptomatic labral tear on MRI
  - Forty-five volunteers with no history of hip pain, symptoms, injury, or surgery were recruited
  - Subjects over 30 years of age were 8.1 times more likely to have a labral tear
  - Subjects over 35 years of age were 13.7 more likely to have a cartilage defect
  - A strong correlation was seen between participant age and early markers of cartilage degeneration such as cartilage defects and subchondral cysts.
Prevalence in patient with mechanical symptoms

- 100 patients with mechanical symptoms of the hip such as pain, clicking, locking and giving way
- MR arthrography to assess for labral tear
- Labral Tears found in 66 subjects
- Cartilage thinning > 50% was found in 34 subjects
- Labral tears and cartilage loss are common in patient’s with mechanical symptoms of the hip
Literature Review: Non-operative Treatment

- Controversy over effectiveness of non-op PT tx
    - Greater evidence is required related to the post-operative management of patients following ALT repair.
    - Remains debate regarding the appropriateness of the physiotherapy management for the non-operative management of this patient group
Patients with labral tears can improve with PT alone

- Case series: Non-surgical treatment labral tears

- 4 patients, 6 month follow up
- Multi-phase PT (3 phases): strength, ROM, mobility
- All patients demonstrated improved strength
- All patients improved with pain and function at 6 months
Case Series: Conservative treatment for mild FAI
Emara, Samir, Motasem, Ghafar. Conservative treatment for mild FAI. *J Ortho Surg*, 2011

- 37 patients, 2 year follow up
- 27 male and 10 female athletic patients aged 23 to 47 years
- Improved hip outcome scores, but limited ADL and no improvement in hip ROM
- PT: intensive physio, stretching, ROM, and problematic ROM to avoid
Literature Review: Non-operative Treatment Continued

- Experimental data limited, but suggests that PT and activity modification might be of some benefit
  - Nonoperative Treatment for Femoroacetabular Impingement: A Systematic Review of the Literature, Wall et al. PM R. 2013
    - Concluded need more extensive and rigorous investigation to determine true clinical effectiveness

- Patient underwent labral debridement and chondroplasty
- 4 Phase rehabilitation program
- The player returned to training for football 16 weeks later and at the 4 month follow-up was pain free with no signs of FAI.

Post-op PT Tx Considerations

- Authors indicate that special attention must be paid to tissue healing and individual patient characteristics
Literature Review: Surgical Intervention

- Hip arthroscopy has limited benefit for ages 45+
    - 41 patients ≥ 45 YO (mean age 52.7) who underwent labral debridement
    - WOMAC, modified Harris hip score, SF–12 collected preoperatively/postoperatively
    - Reoperation rate 17% at 21.3 months
    - Only 32% had a good or excellent outcome as indicated by the postoperative mHHS
    - Authors conclude arthroscopic intervention in this patient population must be approached with caution as the overall clinical benefit was small.
Clinical Outcomes Analysis of Conservative and Surgical Treatment of Patients With Clinical Indications of Prearthritic, Intra–articular Hip Disorders—Hunt et al. PM R 2012

- 58 subjects (52 completed study) mean age 35 with pre–arthritic intra–articular hip disorders
- All subjects completed a directed course of conservative tx
- At 3 months patients with persistent symptoms had surgery
- 23 subjects (44%) reported satisfaction with conservative care
- 29 subjects (56%) chose to have surgery
- Authors concluded data suggest trial of conservative management should be considered
Factors contributing to the failure of conservative treatment for acetabular labrum tears, Kaya et al. Eur Orth Traum 2013

- Analyzed clinical and radiological factors contributing to failure of conservative treatment
- 75 patients with + physical symptoms and radiologic evidence of labral tears enrolled
- Surgical treatment if hip pain not completely resolved
- 37 patients responded to conservative tx
- 47 went to surgery (6 periarticular osteotomy, 11 partial debridement, and 28 labral refixation)
- Multivariate analysis indicated factor contributing to response to conservative tx was tear of ligamentum teres (p<0.01)
- Authors theorize that tear of ligamentum teres creates microinstability
Our Current Hip Studies

1. Retrospective Hip Study
   ◦ Non–Op PT Alone
   ◦ patients over 40 with hip labral tears

2. Randomized Controlled Trial:
   ◦ Surgery/PT versus PT alone
   ◦ patients over 40 with hip labral tears
Retrospective Non-operative Hip Labral Study

- **Pilot Data**
- **7 females**
  - Small sample size; many subjects had incomplete data due to No Discharge LEFS; once patients felt better, they stopped coming to formal PT (Cx or NS)
  - **Mean age** = 49 years (range 41–62)
  - **Positive Labral Tear** on confirmed on MRA (magnetic arthrogram)
  - **Positive Clinical Presentation** for Labral Tear
  - No severe OA
- **Intervention:** Non-operative PT Protocol
All subjects improved in:
- pain
- ROM
- LEFS
- muscle strength
- muscle length
- soft tissue palpation
- pelvic symmetry

Treatment ranged from
- 1–2/week to once every 2 weeks

Average Total Time in PT
- 2.7 months (range 1.1–5.5)

Treatment was prescribed protocols

No subject had surgery
- (at 5–13 month follow up)
Descriptive Results Retrospective Non–operative Hip Labral Study (cont)

**VAS (Pain)**

- Mean Scores **Pre Tx:**
  - VAS 8.8 (range 6–10/10)

- Mean Scores **Post Tx:**
  - VAS 0.85 (range 0–3/10)

- Mean **Change** in VAS
  - VAS 8/10 (range 5–10)

**Lower Extremity Functional Scale (LEFS)**

- Mean Scores **Pre–Tx**
  - LEFS 52.8 (range 45–59/80)

- Mean Scores **Post Tx**
  - LEFS 73.7 (range 59–80/80)

- Mean **Change** in LEFS
  - LEFS 16.4 (range 0–30/80)
    - > 9 is meaningful change
    - 5/7 subjects had were clinically meaningful results
Clinical Relevance of Retrospective Non–operative Hip Study

- Promising results in small sample
- Promising results for innovative treatment for non–operative physical therapy for patients with confirmed hip labral tears
- Identifies further need for future studies
- Precursor to current RCT
Current Hip RCT Study Team

Study Team
- Scott Martin, MD
- Kyle Alpaugh, MD
- Clare Safran-Norton, PT, PhD, OCS
- Dawn Rogers, DPT
- Marty Boehm, PT
- Jillian Vai, PT
- Kirsten Small, MD
- Harvard, PhD, School of Public Health

Role
- PI, Surgeon
- Co-Investigator, RA
- Co-Investigator, Primary PT
- Study PT
- Study PT
- Study PT
- Radiologist
- Statistician
Current RCT Surgery versus Non-operative PT (cont)

- To date,
  - Started in January 2014, 4 patients enrolled
    - 3 non-op, 1 operative
  - 3 Study PTs trained at 2 sites
  - Weekly Team Meetings
  - All patients improving in both arms
Anatomy and Hip Pain
Lower Quadrant Anatomy

- Regional interdependence of 3 systems
- Normal hip function relies on complex interaction of:
  - Lumbar spine
    - Hip movement during gait results in lumbar rotation
  - SI
    - Patients w/ SI dysfunction had asymmetrical limitations in hip joint ROM Cibulka 1998
  - Hip
    - flexion of hip results in posterior rotation, adduction, and external rotation of innominate Smidt
Lumbar Spine Anatomy

- 5 lumbar vertebrae
- Intervertebral discs
- Facet joints
- Ligaments—
  - interspinous,
  - supraspinous,
  - Anterior longitudinal
  - Posterior longitudinal
- Nerve roots
- Muscles
  - Stabilizers—multifidi
  - Global—erector spinae
  - Abdominals
  - QL

Sacroiliac Joint Anatomy

- SI joint – articulation between ilium and sacrum
- Ligaments –
  - Sacrotuberous
  - Iliolumbar
  - Interosseous sacroiliac
- Movement very small, induced by movement of other joints
Brief review

Bony anatomy:
  - 4 bones comprise the joint:
    - Acetabulum
      - Ilium
      - Ischium
      - Pubis
    - Femur
      - Femoral head
Hip Anatomy Continued

- Hip ligaments
  - Iliopectineal "Y" ligament
  - Pubofemoral ligament
  - Ischiofemoral ligament
  - Teres ligament
Hip Anatomy Continued

- Muscles
  - Gluteus maximus
  - Gluteus medius
  - Psoas
  - Iliacus
Deep muscles of the hip
  ◦ Rotator cuff of the hip (Retchford)
    • Piriformis
    • Superior gemellus
    • Obturator internus
    • Inferior gemellus
Palpation of Lower Quarter Anterior Muscles

- Iliacus: patient hooklying or seated, curl palpating fingers medially around anterior iliac crest
Palpation of Lower Quarter Anterior Muscles

- Psoas: patient hooklying, palpate abdomen below umbilicus just lateral to rectus abdominis
Palpation of Lower Quarter Anterior Muscles

- Tensor Fasciae Latae: patient sidelying, palpating hand just distal and slightly lateral to ASIS, patient actively moves into flexion and medial rotation, continue to palpate distally and slightly posteriorly along muscle belly until insertion on ITB
Proximal Rectus Femoris:
Patient in supine position (can passively flex the thigh) and palpate for tendon at AllS, follow muscle belly
Palpation of Lower Quarter Posterior Muscles

- Piriformis: patient prone, knee flexed to 90, palpating fingers just lateral to sacrum halfway between PSIS and apex of sacrum, feel for contraction as patient externally rotates
Palpation of Lower Quarter Posterior Muscles

- Gluteus medius:
  Patient prone, place palpating hand between iliac crest and greater trochanter
Gluteus maximus: patient prone palpating hand from lateral sacrum to attachment on ITB (actively extend and lat rotate thigh)
Palpation of Lower Quarter Posterior Muscles

- Quadratus lumborum:
  Patient prone, palpate just inferior border of 12\textsuperscript{th} rib and follow to iliac crest

http://www.youtube.com/watch?v=PwKm9KpE5Wc
Hip Articular Surfaces

- Femoral head 2/3 hyaline cartilage (center lacks cartilage)
- Acetabulum
- Labrum
  - Outer margin of acetabulum
  - Serves to enlarge the articular surfaces
  - Attachment for joint capsule
  - Assist in maintaining fluid pressurization
  - Provide proprioceptive sensory info re: hip position and movement
Sensorimotor System of Hip

- Anterior coxafemoral joint:
  - Innervated by sensory branches from femoral and obturator nerves

- Posterior coxafemoral joint:
  - Innervated by branches from sacral plexus
Potential sources of pain:
- Soft tissue
- Intra–articular
- Referred pain from lumbar region
  - Disc, facet, nerve root
- Iliopectineal bursa
- Impingment
  - CAM
  - Pincer
  - Mixed
Hip Impingment

- CAM
- Pincer
- Mixed
Lateral Hip pain

- Potential sources of pain:
  - Gluteus medius/minimus tendinopathy/tear
  - Trochanteric bursitis
  - Labral Tear or joint pathology
    - C sign
  - Iliotibial band syndrome
Differential Diagnosis

- Influence of Lumbar Spine, Sacrum, Ilium and Hip Joint:
- 4 joints and associated tissue structures
  - ROM
  - Joint Mobility: PIVM/PAVM
  - Muscle Length
  - Muscle Performance
  - Posture:
    - Overall Alignment
    - Pelvic Girdle Asymmetries
    - Leg Length Discrepancies
    - Biomechanical Foot Alignment
Differential Diagnosis

- Lumbar spine pathology
  - Disc, facet, nerve root
- SI joint/pelvic girdle dysfunction
- Intra-articular hip pathology
  - Labrum
  - Cartilage/bone—early OA, FAI (cam/pincer lesions), stress fracture
- Soft tissue sources of pain
  - Trigger points
  - Tendonitis
Differential Diagnosis (Cont)

- Hernia
- Athletic pubalgia
- Also consider:
  - Gynecologic referred pain
  - Pelvic floor dysfunction
  - Visceral pain sources
  - Neoplasm, abscess, septic arthritis
Evaluation: Lumbar Spine

- Muscle Performance
- Range of Motion
- Special Tests:
  - Slump test, SLR, prone instability test
- Joint Mobility: PAIVMS/PIVMS
- Posture
- Sensory Integrity
- Reflex Integrity
- Gait, Locomotion, and Balance
Evaluation: Pelvic Girdle

- Palpation:
  - Alignment of sacrum: torsion/sidebent
  - Innominate rotation
  - Tenderness to palpation

- Joint Mobility: SI joint

- Special Tests:
  - Gaenslen’s, FABER / Patrick’s test Thigh thrust / femoral shear test ASIS distraction (supine) Sacral compression (sidelying)

- Muscle Performance:
  - Strength of rectus abdominis, IO/EO, TrA
Evaluation: Hip

- **Muscle Performance:**
  - manual muscle testing of hip musculature

- **Range of Motion**
  - Coxafemoral joint
  - Muscle length assessment: ITB, HS, hip flexor, QL, adductors group, piriformis

- **Joint Mobility of hip:**
  - long axis distraction, posterior glide, anterior glide, lateral distraction

- **Special tests**
  - Scour test, log rolling, FABER, FADIR, Trendelenberg, Anterior/posterior labral test

- **Soft tissue assessment:**
  - palpation of iliopsoas, iliacus, quadriceps, adductor group, glutes, piriformis, gemelli

- **Posture:**
  - Leg length assessment, landmarks, biomechanical foot alignment

- **Gait, locomotion, and balance**
  - gait, stairs, sit to stand, unilateral step up, quality of movement and movement patterns
Common Examination Findings

- Impaired joint mobility– lumbar spine, SI joint, hip
- Impaired muscle performance– abdominals, gluteals, paraspinals, multifidi and deep hip stabilizers
- Impaired neuromuscular control
- Impaired muscle length– hamstring, quads, ITB, QL, piriformis
- Soft tissue restrictions– hip, lumbar spine
- Impaired posture
PT Intervention to RCT Protocols

- Basis of this approach lead to Retrospective Study and RCT Study
  - Non-operative PT versus Surgery/PT

- Model of Trial is modeled after MeTeOR Trial (*NEJM*, 2013) non-op PT versus surgery but unique with this patient population and surgical repair
Our PT Protocols

- Non–Op and Surgical PT Protocols
  - Phase I–Acute
  - Phase II–Subacute
  - Phase III–Advanced

  - Each Phase:
    - Goals
    - Precautions/Guidelines
    - Treatment Strategies
    - Criteria for Advancement
Clinical Judgment always prevails
Can progress through phases quickly or slowly
Can overlap phases
Weeks are suggested and typical not definitive
Protocols are intended to be guidelines
Exercises are a sampling within phases and not exhaustive

Criteria for progression
- 2 out of 3 for Phase I to Phase II
- 4 out of 5 criteria for Phase II to Phase III
Phase I

- Acute
- 0–2 weeks

**Goals:**
- Provide an understanding of etiology of sx
- Activity Modification
- Normalize Gait
- Restore Joint Play/ROM
- Initial strengthening
- Minimize Pain
- Restore Pelvic Alignment
Non-operative PT Protocol

Criteria to Progress to Phase II ($\geq 2$ out of 3)
- Control of Pain
- Symmetrical Pelvic Alignment
- Normal Gait with or without device
Non-operative PT Protocol (cont)

- Phase II
  - Subacute
  - 2–12 weeks
  - Goals:
    - Painfree Normal Gait without device
    - Painfree ADL
    - Ascend/Descend Stairs with good pelvic and trunk control
    - ROM within functional limits
    - Progressive HEP
Criteria for Progression

- ROM–functional
- Ascend/Descend Stairs with good postural and pelvic stability
- Good postural and pelvic control with single leg stance
- Normal painfree gait without device
- No active hip flexion until pain subsides
Non-operative PT Protocol (cont)

- Phase III
  - Advanced
  - 12–24 weeks
  - Painfree HEP
  - Normal/Optimal ROM
  - 5/5 LE MMT/4/5 Trunk strength
  - Good dynamic balance
  - Painfree ADL
  - Painfree Hip Flexion
Innovative PT Approach

Principles:

◦ Protect Anterior Painful Structures
◦ Strengthen Posterior and Lateral Structures
◦ Balance Muscle Length and Muscle Strength
◦ Align Pelvic Girdle
◦ Restore ROM
◦ Restore Core and Extremity Strength
◦ Restore Function and Recreation
Protect Anterior Painful Structures

- **Patient Report**
  - Painful SLR, Painful Hip Flexion/IR
  - Painful Driving, Transfers, Sleeping, Activity/Sport

- **Typical Anatomical Structures**
  - that have become painful
  - (Lewis and Sarhmann, J Biomech, 2007)

- **Examples of Protecting Structures**
  - Listen to your pain
  - Strengthen posterior structures
  - Deep STM to relax and lengthen anterior structures
  - Level Pelvis
Pain Control Modalities

- Ice/Cold Pack/Heat
- E-Stim
  - Interferential Current
- Kinesiotaping
- Self Soft Tissue Mobilization
Kinesiotaping

- Lumbar Paraspinals
- SIJ
- Piriformis
- Hamstring
- Gluteus Medius
- TFL
- ITB
- Groin
- Iliacus
- Adductors
- Rectus Femoris
Strengthen Posterior and Lateral Structures

- Progressive Strengthening Pain-free
- High Reps, Low Resistance
- Incorporate Core Stabilizers
- Open Chain, Closed Chain, Con/Ecc/Resistance
Balance Muscle Length and Muscle Strength

- Sarhmann Exercises
- Stretch Trunk, Hip, Knee and Lower Leg painfree
- Strengthen Trunk, Hip, Knee and Lower Leg painfree
- Core Strengthening with Extremity Strength painfree
Align Pelvic Girdle

- Joint Mob Sacrum/Ilium
- MET Sacrum/Ilium

- Secondary Joints affecting Pelvis such as lumbar spine and hip

- Core TrA Training
- Core Stabilization, all planes
- SIJ belt (not often)

- Body Mechanic Education/Activity Modification
Restore ROM, Core and Extremity Strength, Function, and Recreation

- Key is *Painfree*

- Anterior structures protected first

- Core TrA introduced early

- Level pelvis early

- Restore ROM, Core and Extremity Strength and Function and Recreation *Painfree*
Deep Soft Tissue Palpation
Deep Soft Tissue Techniques
Superficial MFR Techniques
Self STM
Self Stretching
Taping, Kinesiotape
Strengthening
Soft Tissue Techniques (cont.)

Psoas
Soft Tissue Techniques (cont)
Psoas
Soft Tissue Techniques (cont)  Iliacus
Soft Tissue Techniques (cont)
TFL
Soft Tissue Techniques (cont)
Gluteus Medius
Soft Tissue Techniques (cont)
Piriformis
Lumbar Spine
  ◦ Joint Mob/Manip (as long as painfree on hip)

Sacrum
  ◦ Joint Mob/MET

Hip
  ◦ Joint Mob/Mulligan MWMs

Ilium
  ◦ Joint Mob/MET/Manip (painfree)
Restore Ms Strength

- TrA early on
- Core Stabilization
  - Painfree, (modified planke, center/lateral)
  - Plyoballs in UE with Stabilization ther ex
  - Balls/Bozu/Stable surface to unstable surface
- Posterior/Lateral Hip Muscle Strengthening painfree
- Open Chain/Closed Chain
  - Painfree
  - Posterior lateral LE ms first, anterior hip last
- Balance/Proprioception/Return to Sport/Fxn
Examples of Stab Ther Ex

- TrA
- Progress from Supine/Sitting/Standing/Fxn
- Progress to other abdominal ther ex
Stabilization Continued
Stabilization with Ultrasound

TrA with Real Time Ultrasound with and without function
Examples of Stab Ther Ex

- Multifidus/Quadratus Lumborum
Examples of Hip Ther Ex

- Painfree
- Bridging Progression
- Sarhman Stab with LE
Examples of Hip Ther Ex

- Glut Max quadriped/prone painfree
- Glut Med sidelying in neutral
  - Philippon MJ et al, AJSM, 2011
- Glut Med standing to sidelying to resisted
  - Boren, JOSPT 2011, Glut Max & Med
Examples of Closed Chain Ther Ex

- Bosu
- Theraband
- Weight Training
Examples of Aerobic Conditioning

- Painfree
- Treadmill
  - start backwards
  - balance backward/forward
  - Add incline, add sideways
- Elliptical
  - start backwards
  - balance backward/forward
Examples of Return to Sport/Fxn

- Skiing
- Soccer
- Walking/Running
- Jumping, Cutting
Physical Therapy

- Protocols are similar in each arm
- Patients enrolled in PT treatment both arms
- Monthly PT Re-Assessments
  - Baseline Eval–impairments, Fxn, LEFS
  - Monthly Re–Eval w above
  - Dischargere–Eval w above
PT Post-Operative Protocol

- **Phase I**
  - Acute

- **Phase II**
  - Subacute
    - Phase IIa, 2–6 weeks
    - Phase IIb, 6–12 weeks

- **Phase III**
  - Advanced
    - Phase IIIa, 12–16 weeks
    - Phase IIIb, 16–24 weeks
PT Considerations for Post-op Surgical Approach

- Bilateral **Hip Joint Distraction**,
  - surgical side slightly more than non-surgical side
PT Considerations for Post-op Surgical Approach (cont)

- Mostly an anterior approach
- Mostly **anterior anchors** with repair
- Need to protect bony anchors per surgeon
Most surgery preserves the joint capsule
Gluteus medius is punctured with scope but not peeled nor cut nor re-attached
Post-op PT Protocol
Phase I – Acute

- 0–2 weeks
- We chose no formal PT
- WBAT w crutches
- Functional ROM, self limiting w pain
- No extreme combined ROM
  - eg (flex/IR, flex/ER)
- Limit beyond 90 degrees of flexion
- Pain management
- Activity modification
Post-op PT Protocol
Phase Ila–Subacute

2–6 weeks

Goals of Phase
- Minimize pain, protect sutures
- Begin to Restore ROM
- Restore pelvic symmetry
- Begin to Restore gait
  - Step to gait pattern
  - WBAT with crutches
  - No trendelenburg
  - No hip extension
- Begin Core Stabilization
- Begin to restore *ms* strength
- All painfree
Post-op PT Protocol
Phase IIb–Subacute

6–12 weeks

Goals of Phase
- Normal Joint Play
- Normal ROM
- Normal Pelvic Alignment
- Normal Tissue Resting Length and Palpation
- Restore Muscle Length
Post-op PT Protocol
Phase IIb–Subacute (cont)

- Restore Muscle Strength,
  4/5 MMT LE

- Restore Core Strength,
  3–4/5 MMT Abdominals

- Restore Painfree ADL/Function

- Begin Backward Closed Chain Training Painfree

- Begin Light Resistance Training Painfree
12–16 weeks

Goals of Phase

- Strengthening and Return to Pre–Sport Function/Activities
- Forward and Backward Training
- 5/5 LE ms strength
- 4/5 core ms strength
- Closed chain and open chain strengthening
- Balance, Single Leg Activities
- Basic Plyometrics
Post-op PT Protocol
Phase IIIb–Advanced

16–24 weeks

Goals of Phase
- Advanced Activities/Return to Sport
- I/safe HEP at home and at gym
- Plyometrics as indicated
- Closed and Open Chain Resistance Ther ex
- Continue with Backward and Forward Training
- Sport Specificity of Training
Questions and Answers
References


