The Dancer’s Hip--
FAI and Dysplasia,
Physical Exam Pearls
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Objectives of Lecture
1. Learn about the technique and hypermobility of the dancer’s hip
2. Explore the unique hip injuries of performing art in dancers
3. Learn how to distinguish FAI vs hip flexor strain and about hip dysplasia
4. Obtain physical exam pearls for hip dysfunction and important imaging techniques
5. Learn about preventive yoga and stretching techniques to teach dancers
6. Implement preventive care to these athletes in order to prevent recurrent or debilitating injury

Dance Medicine
- Dance medicine: Science and art of all different genres of dance used to prevent and treat injury and illness of the discipline.
- “The feet are the end goal of a dancer but the art starts with the turn out of the hip.”
- The conditions governing these patients’ lives include early exposure to high expectations of excellence, incessant demands for perfection, long periods of intense practicing, and fierce competition.
- Types of coverage for physicians: dance companies, performing arts centers, symphonies, and theatres.
The Hip

- The dancer’s hip is unique due to its hypermobility and trained and strained external rotation (turned out position).
- Impingement can occur despite normal hip anatomy
- Labral tear in atypical location
- Tear without skeletal abnormalities of FAI
- Generalized ligamentous laxity
- Dance, Figure skating, Gymnastics

Dance-The hip

- Ideal turnout demonstrates 180 deg of external rotation starting at the hips and results in the feet being easily placed in 180 deg of floor.
- Many students are unable to attain the perfect turnout because of limitations of the hip → undertucking of the hip
- This posture is done in order to force turnout.
- Limits ROM of hips and actively engages external rotator muscles of the hip
- Places strain on hip flexor muscles and hip labral complex.
- Also causes pain in medial knees and can lead to pronation of midfoot.
- Goal: Tailbone down and core lifted with belly button to spine

Dance-Hip Injury

- [Image of a dancer]
FAI: hip impingement caused by abutment of acetabular rim and the proximal femur.

Mechanical causes: static overload, dynamic motion or both.

Static overload of cartilage and labrum occur in the setting of dysplasia and with valgus femoral neck-shaft angles.

Dynamic motion: causes intra-articular damage due to impingement or from motion induced instability.

Two mechanical types of impingement: cam and pincer

**CAM Impingement**
- Inclusion type injury
- Typically ant lat femur
- Aspherical portion of femoral head
- Bony deformity at fem-head-neck junction occurs in joint when hip flexes
- Leads to shearing forces on ant and sup labrum and articular cartilage
- Young athletic male

**Pincer Impingement**
- Impaction type injury
- Global or focal acetabular coverage or acetabular rim to impact fem head, metaphysis or neck when hip flexes
- Another cause: prominent AIIS impinges on fem neck in hip flex
- Leads to tears, degeneration, or ossification of ant/sup labrum
- Contra-coup damage to post/inf articular cartilage
- MC in Females
FAI: Static Overload

- Factors: dysplasia (DDH, SCFE) with ant and lateral acetabular undercoverage, femoral anteversion, and coxa valga
- Due to: asymmetrical loads across hip joint between femoral head and acetabulum in positions (yielding)
- Femoral Anteversion: shifts normal arc of hip motion twd int rot with assoc loss ext rot- important to dancers. Places stress on psoas tendon (ant stabilizer).
- COXA VALGA: assoc with femoral anteversion and acetabular dysplasia
- Abductor overload and overload to ant stabilizing muscles of the hip, asymmetric wear of the cartilage
- Do not require motion to cause symptoms

Dynamic Motion

- Increased stress in abduction→ compensatory strain to lumbar spine, pubic symphysis, and SIJ due to lack of hip motion.
- Further affect to periacetabular musculature (adductors, prox hamstrings, abductors, iliacus) this also leads to strain on glut med.
- Soft tissue Injury with groin strain compensating for inadequate rotation.
- Sports Hip Triad: labral tear, adductor strain, rectus abd strain

FAI Causes: Intra-Articular Factors

- Osteoarthritis or inflammatory arthritis
- Labral tear
- Osteonecrosis
- Traumatic injury to cartilage or labrum
- Fracture or stress fracture
- Loose body
- Transient osteoporosis of the hip
FAI Causes: Extra-articular Sources

- Trochanteric bursitis
- Muscle strain or tendinitis
- Adductor, abductor, flexor, hamstrings
- Snapping hip (coxa saltans)
- Iliopsoas, iliotibial band
- Abductor tears
- Psoas muscle abscess
- Atlanto-pubalgia, a.k.a. sports hernia
- Patellaris syndrome
- Iliopsoas impingement
- Sacral iliac joint pathology
- Osteitis pubis, lumbar spine disorder
- Endometriosis
- Ovarian Cyst

FAI Causes: Extra-Articular Dynamic Impingement Factors

- Trochanteric-pelvic impingement (coxa vara or Legg-Calve-Perthes-type deformity)
- Legg-Calve Perthes: hip D/O with deep bl supply to fem. head → osteonecrosis. MC boys age 4-8y/o.
- Ischiofemoral impingement: btw lesser trochanter and ischium

FAI Pathoanatomy

- Results: limitation of terminal hip motion → labral and chondral disease → muscular and neural dysfunction
- Less stable joint and at risk for subluxation
- Formation of subchondral cysts → OA
The Hip Exam

- **HIPROT, History**
  - Inspection: look for swelling, assess iliac crest, anterolateral, leg circumference, leg length.
  - Fugl-Meyer Assessment: useful for gait disorders or hypomobility of knees, and for leg strength.

- Palpation: iliac crest, ASIS, AIIS, post iliac crest, greater trochanter, ITB from hip to gerdy’s tubercle, deep superficial tendons.

- ROM: Flex hip to 90 deg is not enough for assessment as hips hypermobile and incr flexibility, go past 90 deg. Ext rot, Int rot.

- OTHER TESTS:
  - Ant Impingement Sign: pt supine with hip flexed to 90 deg and Int rot. If <10-15 deg Int rot and hip=+.
  - Post Impingement sign: pt supine at end of table with knee unaffected flexed into chest as doc ext leg and pt has pain post hip=+.
  - Post capsule disruption sign: set-up as ant impingement except doc places post compressive oblique pressure at knee and pt has pain post hip=+. 

- SLR test testing hip flexor both in parallel and ext rot positions.
- Ab/adduction against resistance.
- Functional ballet tests: first position, demi and grande plie, developpe al seconde, splits with affected leg in front.

- Always compare bilateral sides of the hip PE.

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Ballet Positions ➔ FAI ➔ early OA
Imaging

- True AP pelvis, frog leg lateral
- Dunn Lateral views
- Pt standing and xray taken with pt affected hip in 45-90 deg of flex and ext rot or abducted 20 deg to look for impingement
- Have RAD obtain measurement for Tonnis angle (acetabular index) to determine dysplasia. Abnormal ≥10 deg

Imaging Hip

- Frog leg lateral
- 45 deg abduction

Imaging Hip

- Dunn Lateral 45 deg
Imaging Hip

- Dunn Lateral 90 deg

Imaging

- 3D CT reconstruction of hip: eval for morphology of prox part of femur and acetabulum in patients with symptomatic FAI and femoral versions.
- MRI hip: eval for acetabular labrum, articular cartilage, joint capsule, periarticular soft tissue (bursa, tendon, muscle)
- MRA hip: eval for above structures but recent study indicates it is sup to eval for acetabular chondrolabral complex than MRI

Diagnostic Injections

- Proven to be valuable for diag and therapeutic tool for hip pain
- Under fluro or US with corticosteroid inj and local anesthetic
- Should alleviate s/s attributable to labral tears, synovitis, mechanical impingement, and OA
- Response to intra-articular inj of hip proven to be 90% reliable as intra-articular abn.
- A failed injection response should alert physician to occult or extra-articular sources of s/s
**Treatment FAI**

- **NON-OP**
  - Limited evidence
  - Prevent deep hip flex and int rot
  - Diag INJ
  - NSAID's
  - PT: stretching focusing on hip/pelvis muscles-stability
  - Core strengthening
  - Sport-specific functional progression

- **OPERATIVE**
  - Open and arthroscopic sx
  - No studies to show one is better
  - Address underlying impingement or dysplasia before labral repair for better outcomes post sx
  - Unk if sx can prevent hip arthrosis-no studies long term

**Treatment hip dysplasia**

- **NON-OP**
  - NSAID
  - PT
  - Steroid INJ
  - Close obsv

- **OPERATIVE**
  - Peri acetabular osteotomy- must have reached skeletal maturity
  - Femoral osteotomy
  - Hip arthroscopy to repair labrum
  - Total hip replacement
  - Hip Preservation

**Dance Injury Prevention**

- Proper warm up and cool down especially in conditions of cold temperatures. Education in multi-plane stretching of hip, inner and outer thigh, hamstring, quad, gluteals, ITB.
- Quality Technique
- A well constructed and quality dance floor
- Careful fitting of the shoes to support feet and prevent deformities.
- Treating injuries early and distinguish btw muscle strain and true hip dysplasia or FAI.
- Physician to inquire what performances or competitions are coming up and what role the dancer plays in the show.
Dance Prevention

- Every angle and motion of the dancer must be precise and perfect.
- Any deviation from this will be evident to the dancer, the instructor, and audience but not necessarily the physician.
- For this reason, collaboration with instructors, therapists, and treating physicians is vital.

Hip and the Concept of Torque

- Torque: a measure of how much a force acting on an object causes that object to rotate.
- What is a stable position for the hip joint affecting knees and feet? (Screw down feet method)
- By slightly adducting feet, the knees and spreading toes it tightens the ACL and PCL, making the knees stable.
- By the above posture, it forces the femur to rotate in the acetabulum, thereby tightening the hip ligaments and sacral ligaments.
- This posture helps the athlete to be in the most stable position by tightening the joint capsule to avoid injury. When the ligaments and surrounding structures become lax due to incorrect rotation at joints, it leads to injury or tearing of structures.

Intro into Multi-Plane Hip Stretching

- Muscles are not linear. We receive fibers from multiple angles to make up a muscle.
- Important to teach dancers to stretch multi-plane and not just in turn-out or adduction.
- Stretching with proper warm-up and cool down helps to decrease injuries.
- Dancers move through many angles with dance so it is vital to target all angles of the muscles during a stretch.
- Dynamic vs static stretching
+ Demo of Yoga Exercises: Deep Iliopsoas

[Images of yoga poses]

+ Demo of Yoga Exercises: Piriformis

- Use chair

[Images of yoga poses]

+ Demo of Yoga Exercises: Hamstring and ITB

[Images of yoga poses]
Many possible causes, must distinguish intraarticular problems from extraarticular
- Anterior pain, C-signs
- Mechanical symptoms
- "chronic groin strain"
- Most traumatic labral tears assoc w/ FAI
- Thorough X-Ray series to define bony anatomy
- No signs of FAI, labral tear less likely
- Initial treatment is rest & physical therapy
- Ballet dancing implies a new sup/postsup FAI (accord to motion capture study)

Thank you
References