

Presented by:
Mary Lloyd Ireland
Professor
Dept. of Orthopaedic Surgery and Sports Medicine
University of Kentucky
Lexington KY
www.marylloydireland.com

0:00 Introduction

1:03 I HAVE NOTHING TO DISCLOSE

1:07 Sex and Sports: Caring for the Female Athlete ACL Injuries

1:35 Sex Based Considerations in Caring for Common Sports Injuries

2:23 30 Years After Appreciating Non-contact ACL higher rates in basketball, what progress have we made?

2:51 Sex Based Considerations in caring for common sports injuries
ACL Injuries and Management

- Epidemiology highest Female:Male rate differences1
- Basketball and Team Handball

3:15 ACL Injury Rates NCAA 1989-2004

Basketball

Women:Men

3.38

Soccer

Women:Men

2.75

4:18 Mechanisms of Injury

- No Sex Difference in noncontact Mechanisms
- Weight bearing Pivot Shift

4:48 Basketball ACL Tear Video

5:28 Basketball: non-contact, unexpected, not thinking

5:58 How do we teach athletes to land in a safe position?

7:20 Multiple Factors Resulting in ACL Injuries

- NOT modifiable:
 - Anatomic/Structural
 - Hormonal
- Modifiable:
 - Neuromuscular/biomechanical
 - Expert think tanks agree that modifiable factors are most important

- Emphasize modifiable factors for return-to-play and prevention programs

7:44 Anatomic Differences in the Knee, No Sex Differences

- Notch size and shape
- Tibial slope on sagittal measurements
- Normal: 10° posterior slope
- Greater Posterior Slope is a risk factor for ACL injury
- Size of ligament
- Femoral condyle size and shape

8:38 Notch Size and Shape

- No Sex Differences
- Smaller Notch and Ratios = Greater ACL Tear Rate

9:49 BONY MORPHOLOGY Shape and Size of Femoral Condyles

Female Knee – Less wide and significant difference medial more than lateral femoral condyle (Gibson G, Hashemi J, Mansouri H, Slauterbeck J, Beynon V. On the Horizon from ORS. Journal of the American Academy of Orthopaedic Surgeons. 2010 OCT 18(10):638–641)

10:13 Tibial Plateau Geometry

- No Sex Differences
- Tibial Plateau Risk Model:
- Medial and Lateral Slope
- Medial Tibial Depth

Odds Ratios

Female

Male

1mm MTP Depth

And

3.58

4.18

1° Posterior Slope

11:09 Intrinsic (Sutton K, Bullock J. Anterior Cruciate Ligament Rupture: Differences Between Males and Females. The Journal of the American Academy of Orthopaedic Surgeons 01/2013; 21(1):41–50)

- Hormonal / Joint Laxity
- Data are insufficient to make any conclusive statement regarding menstrual cycle of knee laxity and on the rate of ACL injury in females

11:50 The COL5A1 Gene Is Associated With Increased Risk of ACL Tears in Females (Posthumus M, September A, O’Cuinneagain D, Merwe W, Schweltnus M, Collins M. The COL5A1 Gene Is Associated With Increased Risk of Anterior Cruciate Ligament Ruptures in Female Participants. Am J Sports Med NOV;37(11) 2234–40)

- Gene that encodes alpha1 chain
- Type 1 collagen ACL tears
- Type 5 collagen Achilles tendon injuries

12:35 Male vs Female Comparison

13:38 Hypermobility (excessive joint laxity) associated with increased incidence of musculoskeletal injury (Wolf JM, Cameron KL, Owens BD. Impact of joint laxity and hypermobility on the musculoskeletal system. J Am Acad Orthop Surg. 2011 Aug;19(8):463-71)

13:50 Extrinsic (Hewett TE, Myer GD, Ford KR, et al: Biomechanical measures of neuromuscular control and valgus loading of the knee predict Anterior Cruciate Ligament injury risk in female athletes: A prospective study. AM J Sports Med 2005;33(4):492-501)

- Kinematics
- Valgus Collapse and increased knee abduction moment
- 205 female athletes, 9 ACL tears
- Greater abduction moment predicted ACL injury $p < .001$

14:58 A Comparison of Knee Kinetics between Male and Female Recreational Athletes in Stop-Jump Tasks.

Women had greater knee extension valgus moment ACL stress greatest backward stop jump

15:37 Is Decision Making Different for ACL Management Based on SEX? NO

- Treatment by Health Care Professionals
- Decision to Reconstruct ACL and Graft Choice
- Desire to Compete and Win

16:15 PE Video

16:28 Special Considerations in Females

- Shorter femoral condyle
- Adjust fixation accordingly
- Absorbable/HA interference screw or endobutton

16:59 16 YO Female Soccer Athlete

- Autograft B-PT-B graft
- Height 5' 2", weight 106 lbs.

17:12 Surgical Management

- Graft Choice
- No Sex Difference
- Do not change based on cosmetic concerns
- Pearls
- Smaller Shorter Patient
- Adjust Femoral Fixation
- Use Suspension or Bioabsorbable Devices
- Avoid Iatrogenic ITB Syndrome

18:01 16 YO Female Soccer Athlete

- Xrays: 2 weeks after hardware removal

18:11 Orthopaedic Surgeons Can Stabilize the Knee,
but not restore it to pre injury state.
Rethink Biologic Healing and Timing of Return to Play...
Variable due to Multiple Factors...

18:53 Development of Osteoarthritis (Lohmander LS, Ostenberg A,
Englund M, Roos H. High prevalence of knee osteoarthritis, pain, and
functional limitations in female soccer players twelve years after
anterior cruciate ligament injury. Arthritis Rheum 2004;50:3145-3152)
Swedish ACL Registry

- 84 female soccer players ACL injuries
- 12 year follow up.
- 42% Symptomatic Knee OA
- 75% Symptoms affected QOL
- No difference if underwent ACLR compared to those who had not

20:10 Development of Osteoarthritis (O'Connor M. Sex Differences in
Osteoarthritis of the Hip and Knee. Journal of the American Academy of
Orthopaedic Surgeons. 2007 15:22-25)
Longer term Registry follow up needed

21:00 Knee "pack-years" as in smoking:
Additive effects of years of participation in basketball. . .
•Pack-years of smoking on lungs
•Pack-years of activity on knees
? Too many pack years of basketball ?

21:24 We Tried an outcome study 2000, not able to get adequate follow
up

•KSM	51
•UK	13
•Lex. Clinic	15
Total	79

Planned Follow-up at 1,2 and 5 years
Study discontinued

21:45 We should work together on projects. ASK QUESTIONS.. DIG DEEPER!

22:46 2 years after ACLR
Young active athletes returning to high level sports
•Less likely for second ACL injury
•More likely regain knee joint biological health and function
•? Delay development of OA

23:32 7 Months Right ACLR Full Soccer Video
•Forward Trunk & Pelvic Tilt ,Trendelenberg

24:41 Brian Noehren PT, Ph.D., FACSM b.noehren@uky.edu

LOWER EXTREMITY RESEARCH PROJECTS: If Interested Contact Us

25:08 Gait Analysis, Balance, and Strength

What do we compare?

Normal vs Post ACLR vs Uninjured Leg

What are the objective measurements of?

Hip, Trunk, Balance, Gait

What do the functional tests we do really tell us?

Tell the Patient if they are ready or not.

What are the Best Tests to Do?

26:22 There remains a paucity of objective criteria and consensus guidelines to facilitate the decision of RTP after ACLR

of •More emphasis on Psychological State, Kinesiophobia or Fear of Reinjury

subjective •Need reliable consensus guidelines with objective and criteria prior to RTP

27:07 "The Uneven Playing Field"

•By Michael Sokolov

New York Times, May 11, 2008

•Janelle Pierson

•High school soccer player

•Multiple ACL injuries, both knees

•Mindset: after surgeries, multiple knee injuries

•Rehab hard

•Get back on the field

•Compete fiercely

•Hope not to be injured

28:09 There are Sex Differences. Children are not Little Adults. Girls and Boys are not alike. Good Thing! (Katy Kay BBC & Coauthor The Confidence Code)

30:35 The End