



Risk Factors Associated With ACL Injuries in Females

Kiersten Young, Lindsey Eberman

Department of Applied Medicine and Rehabilitation ~ Indiana State University



Clinical Scenario

Approximately 100,000 ACL injuries occur in the United States each year¹. Sports that require quick changes in direction and jumping are where most of these ACL injuries are sustained¹. In about 70% of ACL injuries, the mechanism of injury is a noncontact injury¹. Anterior cruciate ligament injury rates are reported to be higher in females compared to males^{1,2,3,4}. The injury rates have been reported to be two to eight times higher in women than in men within the same sport⁴. There are many factors that are suspected to contribute to females being at a higher risk for an ACL injury. Risk factors that are suspected are notch width, ACL size, general joint laxity, higher than average BMI, and a female's menstrual cycle^{2,3,4}.

Clinical Question

Why are females at a greater risk for an ACL injury than males?

Search Strategy

Terms Used to Guide Search Study

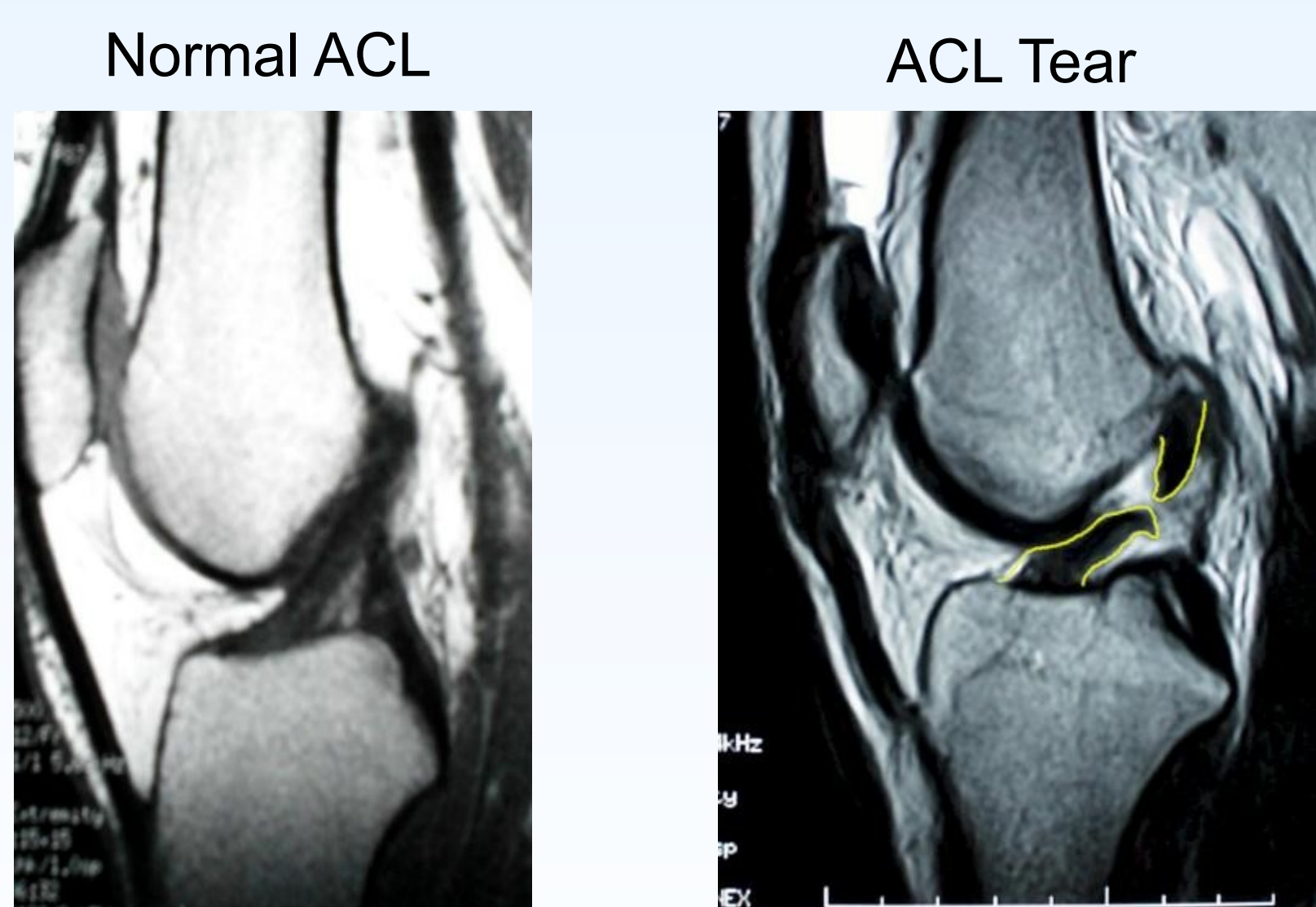
Patient/client group: any active population
Intervention: None
Comparison: men AND women
Outcomes: ACL injury

Sources of Evidence Searched

GoogleScholar
CINHAL

Clinical Bottom Line

Women sustain ACL injuries more often than men. There is sufficient evidence to support that a female's menstrual cycle, joint laxity, and a higher than average BMI do put females at a higher risk in sustaining an ACL injury^{1,2,3,4}.



Results

Table 1. Study Designs of Articles Reviewed

Level of Evidence	Study Design	Number Located	Author (Year)
1	Prospective Cohort Study	1	Uhorchak, J et all (2003)
2	Prospective Cohort Study	1	Myklebust, G et all (1998)
3	Local non-random survey	2	Wojtys, E et all (2002) Wojtys, E et all (1998)
3	Cohort Study	1	Leetun, D et all (2004)
3	Case control study	2	Myer, G et all (2008) Flynn, R et all (2005)
4	Nonrandom survey of injury data	1	Arendt, E et all (1999)
4	Nonrandom observational design	1	Heitz, N et all (1999)

Table 2. Characteristics of Studies

Author (Year)	Myer, G et all (2008)	Uhorchak, J et all (2003)	Myklebust, G et all (1998)	Wojtys, E et all (2002)
Study Design/Methodology	Case Control Study	Prospective Cohort Study	Prospective Cohort Study	Local nonrandom survey
Participates	95 female soccer and basketball players	34 healthy collegiate athletes who played basketball or soccer or both	23 women who sustained an ACL injury; 5 men who sustained an ACL injury	69 women who sustained an acute noncontact ACL injury; over a two year period within 24 hours of injury
Intervention	Injury	N/A	Gender differences	N/A
Control Group	Non-injured	N/A	N/A	N/A
Experimental Group	Injured	N/A	N/A	N/A
Outcome Measures	Positive Measure of knee hyperextension (95% confidence interval, 1.24-18.44)	Women have significantly greater knee joint laxity values	Women seem to be at a great risk for injury one week prior to menstrual cycle on one week after the completion.	Women had a significantly greater percentage of ACL injuries during phase II of their cycle and a less than expected % during the third phase of their cycle
Main Findings	For every 1.3-mm increase in side-to-side difference in anterior-posterior knee displacement, the odds of an ACL injury increases 4-fold (95% CI, 1.68-9.69)	Higher than average BMI and increased joint laxity increase a females risk for an ACL injury. More than one risk factor increases the chance of sustaining an ACL injury.	24 occurred during competition women risk ratio: 29.9; 28 ACL injuries, 23 among women (incidence: 0.31 ± 0.06 injuries per 1000 player hours) and 5 among men (0.06 ± 0.03 inj./1000 h; P < 0.001 vs women; risk ratio: 5.0)	Phase 1 expected rate=32, observed rate (non skiers)=12, (skiers)=30, Phase II expected rate=18, observed rate (nonskiers)=52, (skiers)=39, Phase III expected rate= 50, observed rate (nonskiers)=36, (skiers)=30
Level of Evidence	3	1	2	3
Conclusion	Increased knee-laxity measures can contribute to increased risk of anterior cruciate ligament injury. Increased knee-laxity increases the chances of a noncontact ACL injury.	Higher than average BMI and increased joint laxity put females at a higher risk for an ACL injury.	Incidence of ACL injuries was 5-fold higher in women than men. Women are at a higher risk of ACL injury during the week prior to or after menstrual period.	ACL tears may be related to hormonal fluctuations during a females menstrual cycle.

Implications for Practice

All of the studies reviewed in this CAT show that females are at a greater risk than males to have an anterior cruciate ligament injury. Uhorchak et all stated that increased knee-laxity and a higher than average BMI put females at a greater risk for injury¹. Myer et all also stated that an increase in knee-laxity can put females at a greater risk for a noncontact ACL injury². Wojtys' results showed that women had a significantly greater than expected percentage of ACL injuries during the ovulatory phase of the menstrual cycle⁴. These results give reasons for why females are at a greater risk, but more research needs to be done in these areas.

Females need to be educated on the risks associated with an ACL injury. Although the risks are mostly out of a female's control, it is important to educate them so they are aware of the risks. Educating women on the risk factor of a higher than average BMI is important. This is a risk factor that can be controlled.

There is research supporting the risk factors discussed in this CAT. Future research can still be done to help support females menstrual cycles effect on a females risk for an anterior cruciate ligament injury. Future research should have larger sample size than the ones reviewed in the CAT.

References

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