Preoperative Foot Parameters and the Risk of Noncontact Secondary Injury After ACL Reconstruction in Teenage Athletes

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COI Disclosure Information

Presenter: Yuko Takeuchi

I have no financial relationships to disclose.

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Background

- Flatfoot has been previously associated with primary ACL injury risk.

Allen MK. Journal of athletic Training. 2000.

- Teenage athletes are at high risk for secondary ACL injury following reconstruction.

AJ Wiggins. Am J Sports Med. 2016.

Purpose

- To investigate whether preoperative flatfoot-related parameters are associated with the risk of noncontact secondary injury after ACL reconstruction (ACLR) in teenage athletes.

Methods Retrospective study

Primary anatomical double-bundle ACLR
in teenage patients aged 15 to 19 years between 2016 and 2022 (n = 272)

- 91 patients excluded with incomplete 24-month follow-up data
- 13 patients excluded with prior limb operation
  ; Contralateral ACLR (n = 11), MM suture (n = 1), Exostosis (n = 1)
- 1 patient excluded with BMI >40
- 6 patients excluded with preoperative tegner score <7
- 3 patients excluded without well-positioned foot radiograph
- 2 patients excluded with tarsal coalition
- 4 patients excluded with contact ACL secondary injury

152 patients who met the inclusion criteria

Methods

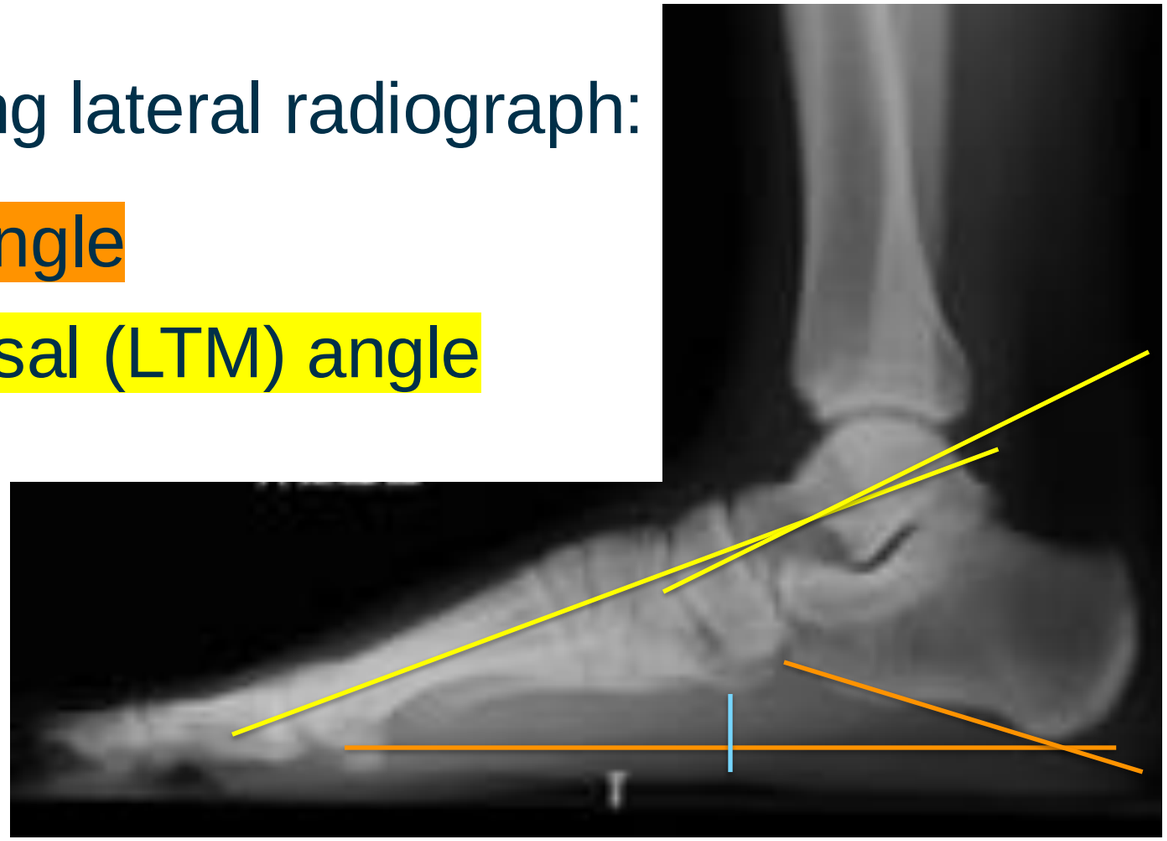
Foot Parameters

measured on weight-bearing lateral radiograph:

① Calcaneal pitch (CP) angle

② Lateral talo-1st metatarsal (LTM) angle

③ Cuboid height (CH)



Gamble FO. Williams & Wilkins, Baltimore. 1966.

Meary R. Rev Chir Orthop. 1967.

Younger AS. Foot Ankle Int. 2005.

Methods

✓Patients were grouped by **whether each parameter was below or above the median.**

	Group F	Group C
① CP angle	**Lower**	Higher
② LTM angle	**Higher**	Lower
③ CH	**Lower**	Higher

Results

Patients Characteristics			
Age: median (IQR)		**16**	(16-17)
Sex: n (%)	Male	**52**	(34.2)
	Female	**100**	(65.8)
BMI: median (IQR)		**21.5**	(20.3-23.2)
Tegnar score: n (%)	7	**39**	(25.7)
	8	**17**	(11.2)
	9	**96**	(63.2)
Secondary Injury: n (%)		**24**	(15.8)
	Ipsilateral	**16**	(10.5)
	Contralateral	**8**	(5.3)

Results

Preoperative foot parameters

Injured-side foot	All patients		Secondary injury patients	
① CP angle: median (IQR)	**18.5**	(16.5-21.5)	**18.7**	(16.9-21.5)
② LTM angle: median (IQR)	**5.5**	(3.1-8.5)	**5.4**	(2.4-7.6)
③ CH: median (IQR)	**16.4**	(13.9-18.9)	**16.5**	(14.6-20.1)

Uninjured-side foot	All patients		Secondary injury patients	
① CP angle: median (IQR)	**19.1**	(16.9-22.2)	**17.5**	(16.1-21.7)
② LTM angle: median (IQR)	**5.4**	(3.1-8.6)	**5.7**	(2.6-8.1)
③ CH: median (IQR)	**16.8**	(14.0-19.1)	**16.5**	(14.0-19.4)

Results

	Group F	Group C	p
	Secondary Injury: n (%)		
Injured-side foot			
① CP angle	12 (16.0)	12 (15.6)	**1.00**
② LTM angle	13 (16.8)	11 (14.7)	**0.82**
③ CH	11 (14.5)	13 (17.1)	**0.82**
Uninjured-side foot			
① **CP angle**	**17 (22.7)**	**7 (9.0)**	**0.03***
② LTM angle	15 (20.0)	9 (11.7)	**0.19**
③ CH	13 (18.1)	11 (13.8)	**0.51**

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Fisher's exact test, *** p-value < 0.05**

Discussion

In this study

There was a **difference** in median foot parameters between the **injured and uninjured side**.

- **Percentage weight-bearing** affect to foot parameters in foot radiograph.

Shelton TJ. Foot & Ankle Specialist. 2018.

- In radiography before primary ACLR, **the way to weight-bearing** may have influenced by injury.

Uninjured-side radiograph may have been more useful for evaluation after ACL injury

Discussion

In this study

Lower CP angle on the uninjured-side showed significant higher risk of noncontact ACL secondary injury.

- **Flatfoot landing** pattern may associate with a non-contact ACL injury mechanism.

BP. Boden. Am J Sports Med. 2009.

- **Flatfoot** may could also be a factor in noncontact **secondary injury** after primary ACLR.

Flatfoot measured by weight-bearing radiograph on the uninjured-side may be a prediction of noncontact ACL secondary injury.

Conclusion

- A lower preoperative calcaneal pitch angle on the uninjured side was significantly associated with the risk of noncontact secondary ACL injury in teenage athletes.
- Weight-bearing foot radiograph may be useful in preoperative risk assessment.