ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Tunnel Enlargement After Isolated Posterior Cruciate Ligament Reconstruction Is Correlated With Tunnel Angle And Functional Outcomes

Kun-Han Lee, Kun-Hui Chen, En-Rung Chiang*

Taipei Veterans General Hospital, Taipei, Taiwan

Faculty Disclosure Information

- Nothing to disclosure

Phenomenon of TE after ACLR is widely explored

TE rate: 0% to 74.26%

Several etiologies explaining TE have been proposed

TE may jeopardize **knee function and stability** after revision ACLR

Yue L et al. ***JBJS Rev***. 2020 Apr;8(4):e0120.

Aim and Goal

- Evaluation of **femoral and tibial TE** after single-bundle aPCLR
- Patient demography and possible **risk factors**
- Correction of TE with **placement of tunnel angle and functional outcomes**

Patient selection

- Retrospective study
- Single-bundle aPCLR with autologous hamstring tendons
- Between 2008/10 and 2020/9
- Taipei Veterans General Hospital
- Dr. E-R Chiang

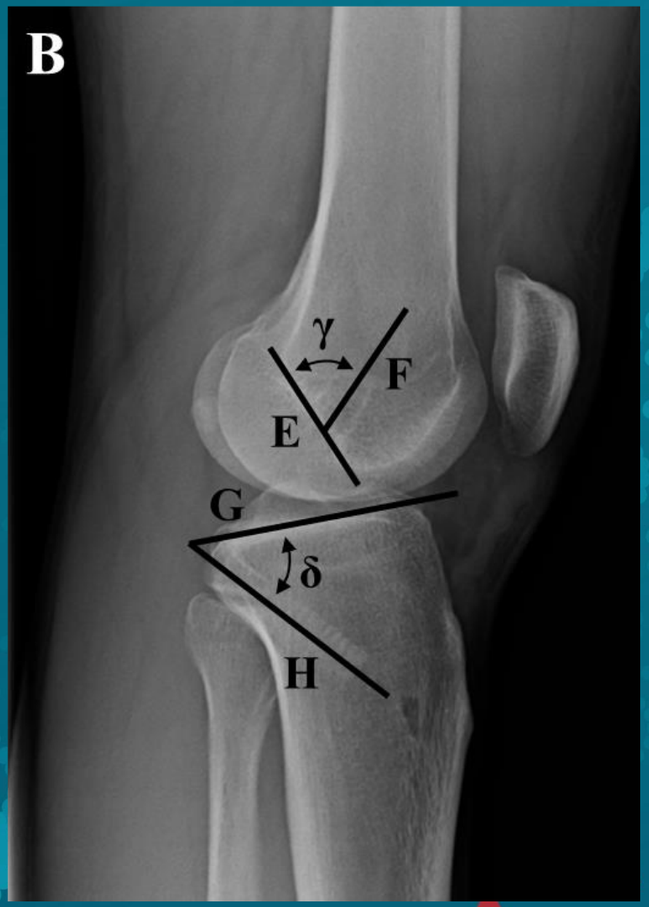
Imaging evaluation: TE

- **Tunnel size**: the width of the bone tunnel perpendicular to long axis of the tunnel, 1cm above the femoral entrance/ below the tibial plateau
- **TE rate** = (Tunnel sizes – Drilled sizes) / Drilled sizes × 100%
- **TE group**: TE rate > 25%

Imaging evaluation: Tunnel angle

- AP view
- A: axis of femur; B: femoral tunnel axis
- C: tibia plateau; D: tibial tunnel axis
- α: Femoral angle, AP
- β: Tibial angle, AP

- Lateral view
- E: Blumensaat’s line; F: femoral tunnel axis
- G: tibial plateau; H: tibial tunnel axis
- γ: Femoral angle, LT
- δ: Tibial angle, LT



Functional Outcomes & Statistical Analysis

- **IKDC score** & **Lysholm score**
- **TE group** v.s. **no TE group**
- Chi square test or Fisher exact test for categorical variables
- Independent t test for continuous variables
- Statistical significance if $P < 0.05$

Results

No significance of demography between TE and non-TE groups

Table 2 Comparisons of patients with and without tunnel enlargement

	TE Group ($n=23$)	Non-TE Group ($n=31$)	*P* value
Age, [years]	29.8 ± 8.9	28.3 ± 11.1	0.587
Male (%)	14 (60.9%)	23 (74.2%)	0.279
Body mass index (kg/m2)	25.2 ± 4.4	25.1 ± 4.9	0.948
Time from injury to PCLR, [months]	4.8 ± 8.2	5.7 ± 7.5	0.688
Injury mechanism	4 (17.4%)	9 (29.0%)	0.493
Sports	8 (34.8%)	9 (29.0%)	0.666
Traffic accidents	7 (30.4%)	11 (35.5%)	
Knee hyperextension	4 (17.4%)	2 (6.5%)	
N/A	11 (47.8%)	13 (41.9%)	
Preoperative PDT	12 (52.2%)	18 (58.1%)	
Grade II			
Grade III			
Right knee (%)	11 (47.8%)	15 (48.4%)	0.967
Meniscus repair	1 (4.3%)	2 (6.5%)	0.739
Meniscectomy	3 (13.0%)	6 (19.4%)	0.717
Femur drill size,* [mm]	8 (1)	8 (1)	0.591
Tibia drill size,* [mm]	9 (0)	9 (2)	0.773
Graft failure (%)	2 (8.7%)	3 (9.7%)	0.902
Follow-up time, [years]	6.3 ± 4.0	6.8 ± 2.7	0.616

Imaging evaluation

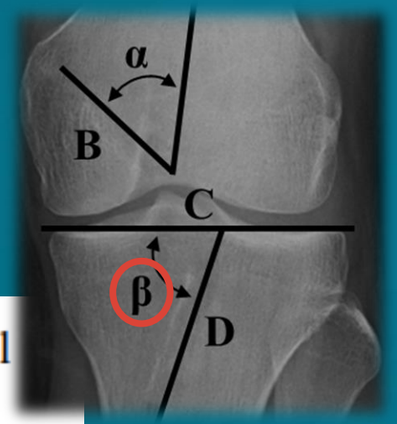


Table 3. Radiological Features of the Femur and Tibia for Patients with or without Femoral/Tibial Tunnel Enlargement

	Femoral Tunnel			Tibial Tunnel		
	Enlarged (n = 18)	Not Enlarged (n = 42)	*P* value	Enlarged (n = 15)	Not Enlarged (n = 45)	*P* value
Femoral angle, AP*	65.0 ± 14.2	65.2 ± 12.4	0.970	65.7 ± 10.6	64.9 ± 13.6	0.841
Femoral angle, LT†	87.7 ± 11.3	92.3 ± 12.9	0.202	94.8 ± 9.6	89.6 ± 13.2	0.170
Tibial angle, AP*	78.4 ± 6.0	75.7 ± 6.0	0.122	79.6 ± 6.0	75.5 ± 5.8	**0.022**
Tibial angle, LT†	52.6 ± 6.4	51.2 ± 7.4	0.476	52.2 ± 6.6	51.4 ± 7.4	0.670

NOTE. Data is expressed as mean ± standard deviation.

*Femoral/Tibial angle in the anteroposterior view of plain radiographs

†Femoral/Tibial angle in the lateral view of plain radiographs

AP, anteroposterior; LT, lateral

A steeper tibial angle in AP view is associated with TE of tibial tunnel

Functional outcomes

Table 4 Patient-reported Outcomes*

	Scores	Enlarged	Not Enlarged	*P* value
Femoral Tunnel	Postoperative IKDC score	80.1 ± 15.6	86.5 ± 13.1	0.266
	Postoperative Lysholm score	81.1 ± 13.0	90.5 ± 12.3	**0.031**
	Postoperative VAS	1.3 ± 1.5	1.4 ± 1.6	0.891
Tibial Tunnel	Postoperative IKDC score	76.0 ± 17.4	87.1 ± 12.1	**0.031**
	Postoperative Lysholm score	81.9 ± 17.0	88.9 ± 11.7	0.150
	Postoperative VAS	1.4 ± 1.3	1.2 ± 1.4	0.687

- **Those with femoral TE have a lower postoperative Lysholm score**
- **Those with tibial TE have a lower postoperative IKDC score**

Conclusions & Limitations

- A steeper tibial tunnel angle in AP view is associated with tibial TE. Both biological and mechanical factors could possibly contribute to TE in patients receiving PCLR
- Both femoral and tibial TE are correlated with worse patient-reported outcomes
- Limitations: retrospective study; small number sizes; Lack of CT scan

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