

가 22

(gap technique)
(measured resection technique)

(Fig. 2).

(anteroposterior axis)

가

(transepi-

condylar axis)

가

(Fig. 1).

(posterior condylar axis)

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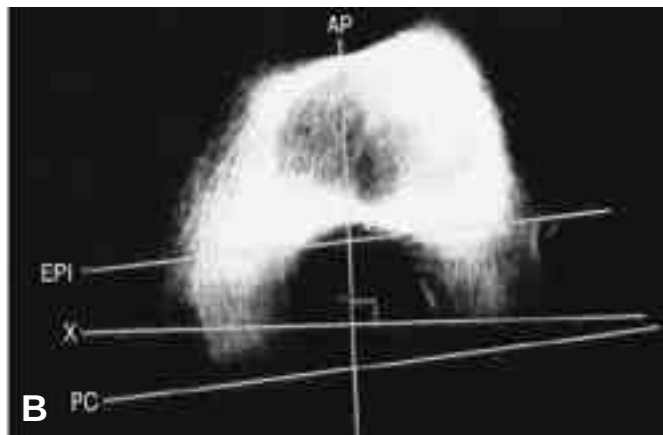
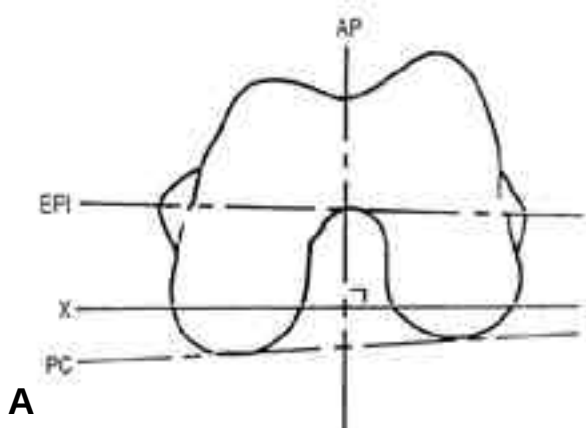


FIGURE 1-A. Diagram of the alignment axes in a knee with normal condylar shape. Resection perpendicular to the anteroposterior axis(AP) or parallel to the transepicondylar axis(EPI) results in a resection line(X) that is slightly externally rotated to the posterior condylar axis(PC).

B. Photograph of a cadaveric femur. A line(X) drawn perpendicular to the anteroposterior axis lies at an angle of 6 degrees of external rotation relative to the posterior condylar axis. The transepicondylar axis in this specimen lies at an angle of approximately 4 degrees of external rotation relative to the posterior condylar axis.

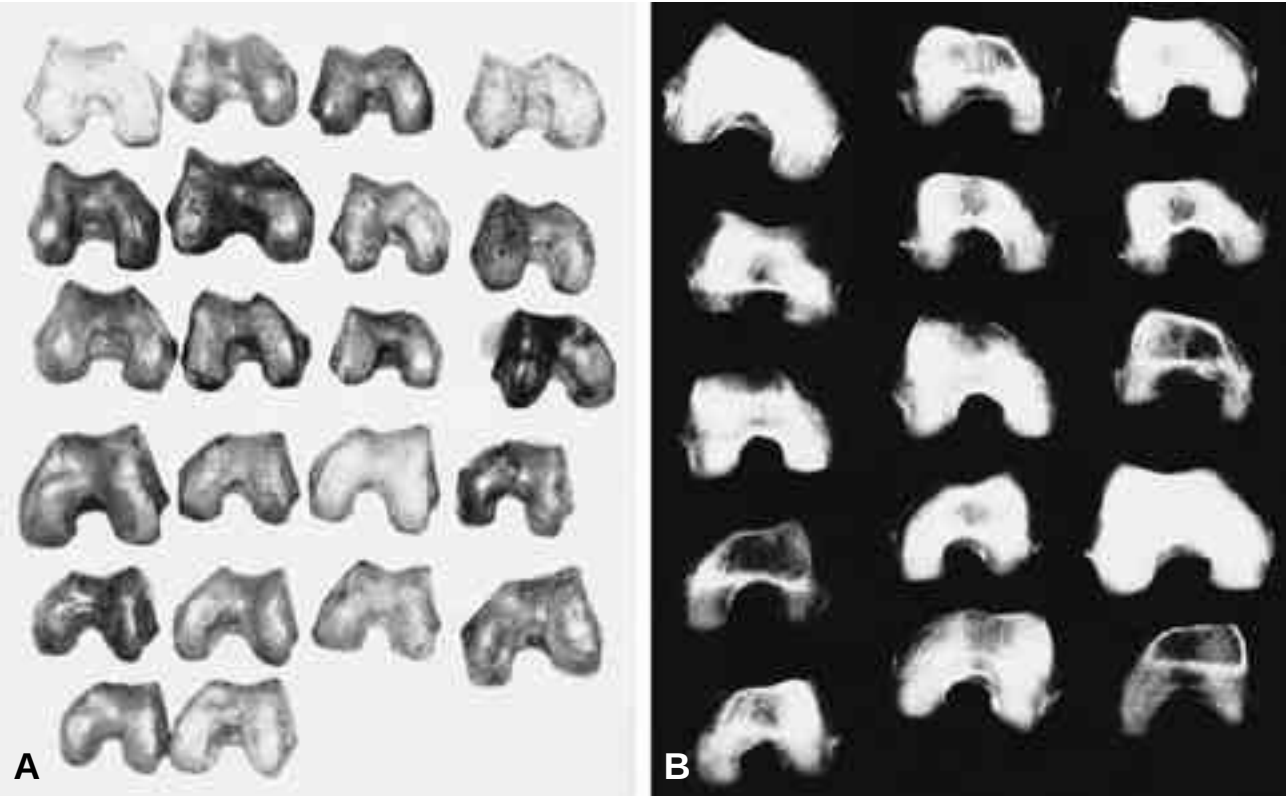


FIGURE 2. (A) All gross specimen and (B) some part of roentgenogram that is measured.

Table 1. Summary of the results of the five observers in roentgenogram.

Observers	Amount of external rotation of the perpendicular to the anteroposterior axis relative to the posterior condylar axis(Degrees)		Amount of external rotation of the transepicondylar axis relative to the posterior condylar axis(Degrees)		p-value
	mean	standard deviation	mean	standard deviation	
1	5.1	±1.2	3.8	±1.1	0.0006
2	4.8	±1.6	3.4	±1.2	0.0013
3	4.2	±1.5	3.3	±1.3	0.0223
4	4.8	±1.5	3.4	±1.1	0.0007
5	5.0	±1.4	3.6	±1.3	0.0015

t- , 5
 , p<0.05 . 5.1(±1.2).
 3.8(±1.1)°, 4.8(±1.6)°. 3.4(±1.2)°, 4.2(±1.5)°. 3.3(±1.3)°, 4.8(±1.5)°. 3.4(±1.1)°,
 5.0(±1.4)°. 3.6(±1.3)°, 7.0(±2.2)°. 4.9(±1.5)°, 6.4(±1.2)°. 4.0(±1.0)°, 4.7(±1.7)°. 3.3(±1.4)°, 5.0(±1.8)°. 3.0(±1.1)°, 6.8(±1.0)°. 4.2(±1.0)°. ,
 (Table 1,2)(p<0.05).
 4.8(±1.5)°, 6.0(±1.9)°. , 3.9(±1.4)°. 3.5(±1.2)°, (Table 3)(p<0.05).

Table 2. Summary of the results of the five observers in gross specimen.

Observers	Amount of external rotation of the perpendicular to the anteroposterior axis relative to the posterior condylar axis(Degrees)		Amount of external rotation of the transepicondylar axis relative to the posterior condylar axis(Degrees)		p-value
	mean	standard deviation	mean	standard deviation	
1	7.0	±2.2	4.9	±1.5	0.01
2	6.4	±1.2	4.0	±1.0	0.000
3	4.7	±1.7	3.3	±1.4	0.005
4	5.0	±1.8	3.0	±1.1	0.000
5	6.8	±1.0	4.2	±1.0	0.000

Table 3. Angles between the posterior condylar axis and the perpendicular to the anteroposterior axis and between the posterior condylar axis and the transepicondylar axis for simple axial roentgenogram and gross specimen.

	Roentgenogram mean and standard deviation	Gross specimen mean and standard deviation	p-value
Perpendicular to the anteroposterior axis	4.8(±1.5)°	6.0(±1.9)°	0.0000
Transepicondylar axis	3.5(±1.3)°	3.9(±1.4)°	

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3,13,14,15) 1,7,17)

(joint line restoration)

5,7,9,10,17,18)

2,4,8,11)

가

가

8,11,12,17,19)

2,4)

Arima 2)

가 2)

3.

가 , Berger 4)

1,15)

3.

1)

3.5(±1.2)°, 3.0(±1.2)°

Cho 6)

4. Whiteside

, Nagamine 16)

McCarthy 20)

5.1(±2.1)。
21,22)

5

1.2)。

5

6.0(±1.9)。

4.6(±2.0)。
Yoshioka

4.8(±1.5)。

3.5(±

3.9(±1.4)。

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— Abstract —

Measurement of the Axial Rotational Axis of Distal Femur Using Different Landmarks

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Purpose : To know the discrepancy of rotational alignment using human femur.

Materials and Methods : We used 22 adult human femurs which were not able to distinguish age and sex and absent articular cartilage. In a horizontal plane, we made a cross-section perpendicularly at supracondyle of femur to a mechanical axis and took a simple roentgenogram in coronal plane focusing on the center of transepicondylar axis. In terms of roentgenogram and gross specimen, the angle between perpendicular to the anteroposterior axis and the posterior condylar axis, the angle between the transepicondylar axis and the posterior condylar axis were measured by 5 observers. According to t-test in statistical method, we figured out the difference between two angles and made a significance at $p < 0.05$.

Results : About posterior condylar axis, the line perpendicular to anteroposterior axis was observed the average $4.8(\pm 1.5)^\circ$, $6.0(\pm 1.9)^\circ$ external rotation in roentgenogram and gross specimen respectively. The transepicondylar axis was observed the average $3.5(\pm 1.2)^\circ$, $3.9(\pm 1.4)^\circ$ external rotation in roentgenogram and gross specimen respectively. There was statistically significant difference between two angles. Moreover, angles measured by 5 observers were found that to have a line perpendicular to the anteroposterior axis has much more external rotation respectively and there was a statistically significant difference also.

Conclusion : On determination of a rotational alignment using human femur, there is statistically significant difference between the anteroposterior axis and the transepicondylar axis in gross specimen as well as roentgenogram.

Key Words : Human femur, Rotational alignment, Anteroposterior axis, Transepicondylar axis