

:
 : 36 (16 ,
 20)
 , empty notch sign,
 : (10/16
 : 4/20 , p=0.009), 가
 (11/16 : 2/20 , p=0.001).
 :
 가
 45. 가
 45. 가 가 .
 90% (1-3), (22%) 19 (53%), 8
 가 9 (25%) ,
 가 1 가 27 , 1 4
 가 3 , 4 가 6 .
 가 가 (4). Japan)
 0-15 15 (spin
 echo) T1 (TR/TE,500/20msec) -
 T2 (TR/TE, 4000/80) ,
 (gradient echo, TR/TE/flip angle, 500/20/30,)
 200mm, acquisition matrix 256 × 256,
 5mm 1mm .
 36 (1 ,
 1)가
 16 ,
 , 20 가 30 ,
 가 6 , 19 81 39.5 , empty notch sign,

가

가

16

45, 20 16, 2

(5), 107, 2 16

0.39, 7mm 10 (63%), 6

3.5mm 20 4

1.5mm (20%), 가

(5,6). (p=0.009) (Fig. 1).

가 5 (31%), 가 11 (69%)

4 (20%), 16 (80%)

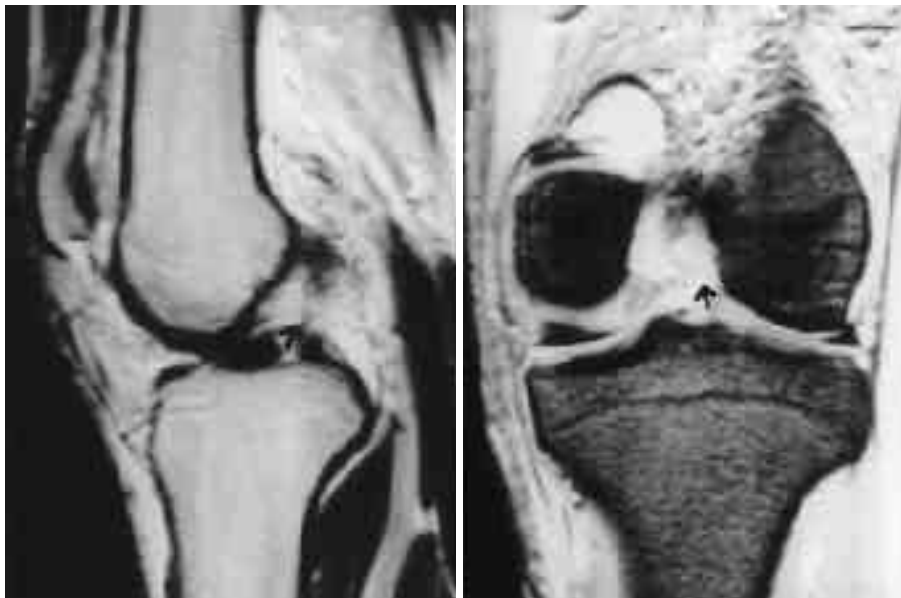
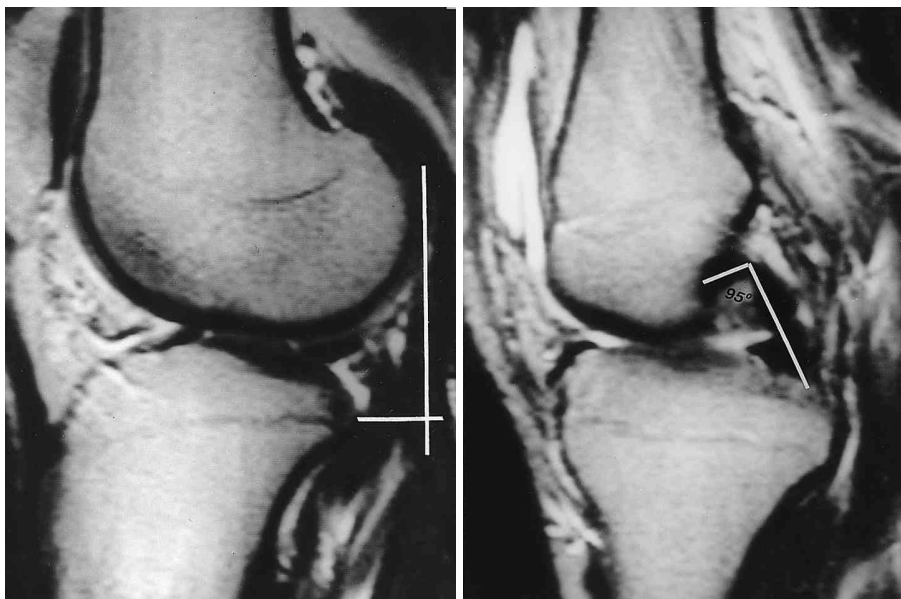


Fig. 1. Complete tear of the ACL. Two different patients.

A. T2 weighted sagittal image. The proximal (open arrow) and distal (arrow) segments of the ACL are identified, but the mid-portion is sharply angulated and discontinuous.

B. Coronal gradient echo image. The ACL is not visible at the femoral attachment site (arrow).

C, D. T2 weighted sagittal image. Anterior displacement of the tibia(C) and the PCL buckling(D) are seen in another patient.



11 (69%) 45, 2 (10%) 45, (p=0.001) (Fig. 2,3). 4 (25%), 2 (10%), 3 (19%), 2 (10%) 8 (50%), 3 (15%) (Fig. 1C). empty notch sign 3 (15%) 1 1 1 (Table 1). 6, 1

Table 1. Primary and Secondary Signs between Complete and Partial Anterior Cruciate Ligament Tears

Findings	Number of cases	
	Complete tear	Partial tear
Ligamentous discontinuity	10/16 (63%)	4/20 (20%)
Signal of ACL focal change	5/16 (31%)	4/20 (20%)
diffuse change	11/16 (69%)	16/20 (80%)
Decreased ACL axis	11/16 (69%)	2/20 (10%)
PCL angle change	3/16 (18%)	2/20 (10%)
PCL buckling	4/16(25%)	2/20(10%)
Anterior displacement of tibia	8/16 (50%)	3/20 (15%)
Uncovered meniscus sign	1/16 (6%)	-
Deep femoral notch sign	1/16 (6%)	1/20 (5%)
Empty notch sign	5/16 (31%)	3/20 (15%)

ACL : anterior cruciate ligament

PCL : posterior cruciate ligament

13 5 (/ , 3/2), 22 (12/10), 4 (3/1), 13 (6/7), 8 (4/4), 13 (9/4), 3 (1/2) 10 (5/5), (Table 2).

Table 2. Associated Injuries of Anterior Cruciate Ligament Tear

Findings	Number of cases	
	Complete tear	Partial tear
MCL tear	12/16 (75%)	10/20 (50%)
LCL tear	3/16 (18%)	1/20 (5%)
PCL tear	3/16 (18%)	2/20 (10%)
Medial meniscus tear	6/16 (36%)	7/20 (35%)
Lateral meniscus tear	4/16 (25%)	4/20 (20%)
Femur Contusion	5/16 (31%)	5/20 (25%)
Tibia Contusion	9/16 (56%)	4/20 (20%)
Fibula Contusion	1/16 (6%)	2/20 (10%)

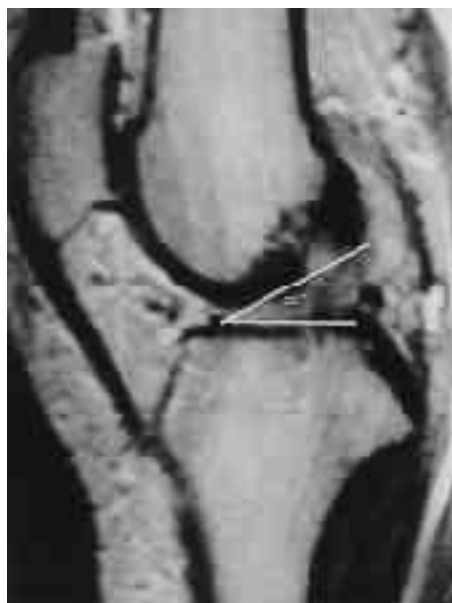
MCL : medial collateral ligament

LCL : lateral collateral ligament

PCL : posterior cruciate ligament



A



B

Fig. 2. Interstitial tear of the ACL. T2 weighted sagittal images. A poorly defined mass replaces virtually the entire ACL, there is no ligamentous discontinuity (A). The axis of the ACL is not parallel to the intercondylar roof, about 30° (B).

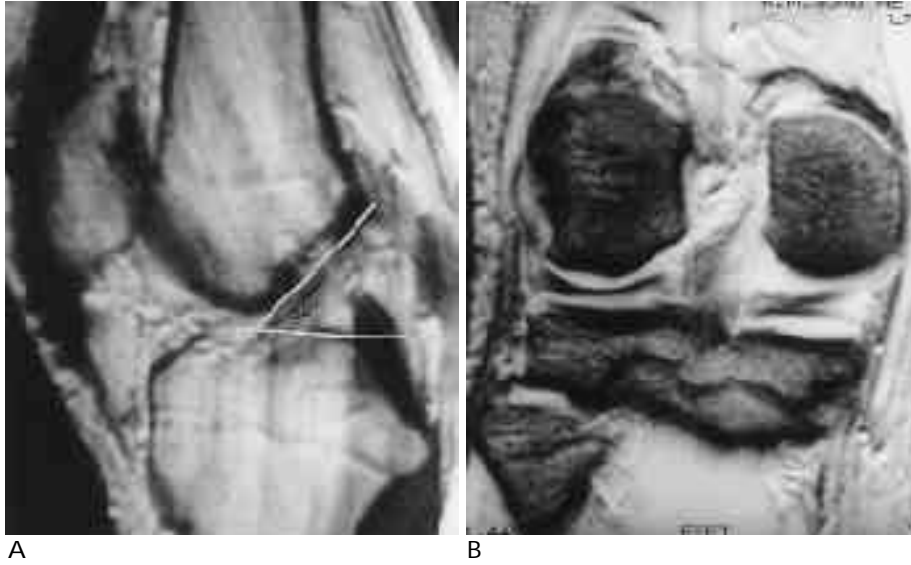


Fig. 3. Partial tear of the ACL.
A. T2 weighted sagittal image. The ACL is generalized increased in signal intensity without ligamentous discontinuity. The axis of the ACL is about 50°.
B. Coronal gradient echo image. There is no discontinuity of the ACL. At knee arthroscopy, the ACL was partially torn.

(3).
(63%),
(2,3,7).
4 (20%)
(p=0.009).
Gentili
550
가
(5),
(p=0.001).
(interstitial tear)
가 가
가 가
가 13 (/
90% 가 (1,2,8). , 5/8)
10- 5
43% (9), Noyes
가 25%
50% , 75% 86%
(10).
12%, 50% 가
가 가
가 가
가
Park
(9),
50%, 15%
empty notch
MRI 가 Chan
가 Vellet
(11), sign
가 (7,12),
3 (15%)
92%
5 (31%),
(5,13). McCauley
가 /
(4,14),
3가
Lee
(wavy contour), T2

(12),

450

1. , , , , , : .
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Complete and Partial-Thickness Tears of the Anterior Cruciate Ligament : Differential Features Seen on MR Imaging¹

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Purpose : To evaluate the differential features of complete and partial-thickness tears of the anterior cruciate ligament, as seen on magnetic resonance imaging(MRI).

Materials and Methods : We retrospectively reviewed MR images of 36 patients with ACL injuries (complete tear 16, incomplete tear 20). In all cases, the presence of an ACL tear was determined by arthroscopy or surgery. Primary and secondary signs of ACL injury and associated injuries were assessed.

Results : Ligamentous discontinuity of the ACL was observed in ten complete tears (63 %), but in only four (10 %) of those that were partial ($p=0.009$). In addition, complete tears were more likely to show a low degree of ACL axis, less than 45°. (11/16 : 2/20, $p=0.001$). There was, however, no statistically significant difference between complete and partial tears with regard to signal intensity of ACL, PCL buckling or angle, anterior displacement of the tibia, uncovered meniscus sign, deep notch sign, empty notch sign, and associated injuries.

Conclusion : Ligamentous discontinuity and the ACL axis are features which usefully differentiate between complete and partial tears of the ACL.

Index words : Knee, injuries

Knee, MR

Knee, ligaments, menisci and cartilage

Ligaments, MR

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