

1

:

가
가
: 1990 8 1998 6 256

24
가 10 , 12 24 가 9 , 24 3
stage I 3 , stage II가 5 , stage III가 7 , stage IV가 9 , MRI
classification class A가 15 , class C가 1 , class D가 3 . Ficat
stage stage가

5.9% ,

가

MRI

가

1964 Starzl 3-41% 가 가
(1).

가

(5).

가 (2).

(MRI)

가 가

(3,4).

가

가

1990 8 1998 6
256

1999 5 3

1999 5 17

15

12 : 3

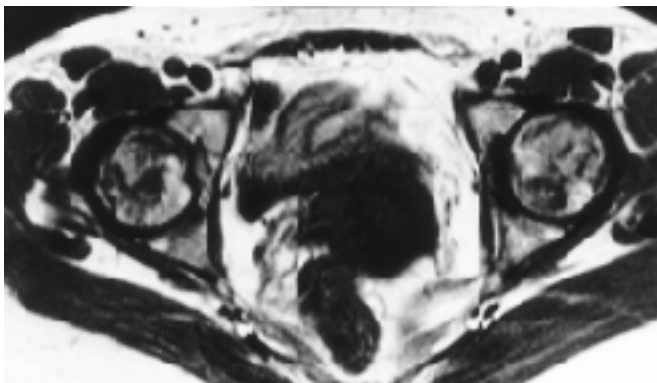
23 55 36.7 0.5
 13 MRI student t-test , p value 0.05
 가 29
 18 : 11 , 25 50
 40.3
 Ficat stage 5.9% 256 15
 , Ficat stage 9 6
 24 가
 10.7 6
 가 2 , 6 12 가 10 , 12 24
 가 9 , 24 3
 24
 Ficat stage stage I 3 , II가 5 , III가 7 , IV가
 9 . Mitchell classification MRI 19
 class A가 15 , C가 1 , D가 3 class A가
 가



A



B



C



D

Fig. 1. A 42-year-old woman with both hip pain.

A, B. Pelvis AP & frog leg views obtained 5 months after renal transplantation show subtle radiolucency in right femoral head with surrounding sclerotic change, but there is no evidence of definite bony abnormality in left femoral head.

C, D. Axial T1- & coronal T2-weighted images show focal bone marrow lesions with serpiginous low signal intensity rim in both femoral heads. Focal marrow lesions of both femoral heads are isointense relative to normal fatty marrow, so they are classified as Mitchell class A. In this case, MRI detects left femoral head lesion, which is not seen in plain radiography (Ficat stage I).

Ficat stage , 6 (sickle cell disease),
 stage I II가 1 , 6 , Gaucher ,
 12 II가 3 , III가 5 가 , 12 ,
 stage III IV가 ,
 stage가 (Table 1).
 67%, 31%
 40%, 21%
 가
 (p<0.05). steroid
 114mg, 79.8 mg
 (p<0.05) (Table 2).

Table 1. Correlation between Ficat Stage and Duration of Diagnosis

	Stage I	Stage II	Stage III	Stage IV
within 6 months	1	1	0	0
6-12 months	1	3	5	1
12-24 months	1	1	2	5
over 24 months	0	0	0	3

Table 2. Comparison of Risk Factors between AVN Group and Control Group

	AVN Group	Control Group	p value
Acute Rejection	67% (10*/15)	31% (9/29)	< 0.05
Osteopenia	40% (6/ 15)	21% (6/29)	< 0.05
Steroid Dose (mg)	114 ± 47.5	79.8 ± 41.3	< 0.05

*2 episodes of acute rejection in 2 cases of AVN group

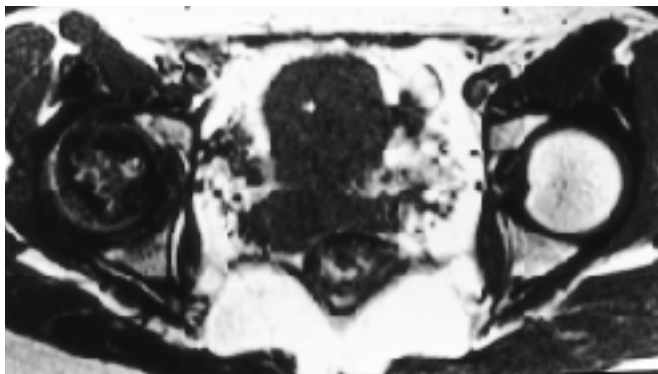
AVN: avascular necrosis



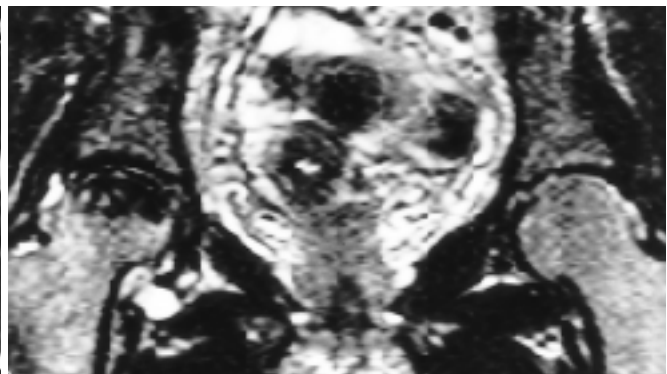
A



B



C



D

Fig. 2. A 31-year-old woman with right hip pain.

A, B. Pelvis AP & frog leg views obtained 11 months after renal transplantation show osteolytic lesion with surrounding thick sclerotic rim, crescent sign in subchondral area, and flattening of right femoral head, so this lesion is classified as Ficat stage IV.

C, D. Axial T1- and coronal T2-weighted MR images show focal bone marrow lesion with serpiginous low signal intensity rim in right femoral head. Focal marrow lesion of right femoral head shows low/low signal intensity compared to normal fatty marrow, so classified as Mitchell class D.

(18), 15
 (60%), 6 (40%)
 (19).
 (6).
 1964 Starzl
 (Ficat stage O, I, II)
 (1).
 3-41%
 가
 5.9%
 (4).
 MRI가
 MRI 85-
 (20,21,22).
 Tervonen
 100%
 MRI
 Ibels 1 2
 55%,
 2 가 85% (8),
 2 (6%
 (18). Mulliken 132
 MRI
 7.6%(10/132), 15
 11 Ficat stage O, 22 1
 MRI
 (amyloidosis) (3,9).
 가
 가
 가
 가
 (6). 1
 (4, 8, 10, 11)가
 (2, 12) 2
 30
 가
 가
 (10, 13, 14) 가
 , Naiker 가
 가
 (13), Saisu
 (14). 가 MRI
 Solomon
 (scurvy) (siderosis)
 가
 가 (trabeculae)
 (16).
 Levine
 (17).
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Avascular Necrosis of the Femoral Head after Renal Transplantation¹

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Purpose : To determine the incidence of avascular necrosis (AVN) of the femoral head after renal transplantation, evaluate plain radiographic and MR findings, and compare known predisposing factors between the AVN group and the control group.

Materials and Methods : Between August 1990 and June 1998, 256 renal transplantations were carried out at the Maryknoll hospital. The incidence of AVN was determined clinically, and in the AVN group, plain radiographic and MR findings were evaluated. A control group of 29 cases was randomly selected from among the remaining 241 patients, and acute rejection, mean daily steroid dose and osteopenia were compared between the AVN group and the control group.

Results : The incidence of AVN of the femoral head was 5.9%(15/256). Involvement was bilateral in nine cases and unilateral in six and 24 femoral heads were thus affected. The mean period required for diagnosis of this condition was 10.7 months(within 6 months: 2 hips, between 6-12 months: 10, between 12-24 months: 9, over 24 months: 3). Plain radiographs showed that three cases were Ficat stage I, five were stage II, seven were stage III, and nine were stage IV. MRI indicated that 15 cases were Mitchell class A, one was class C, and three were class D. Correlation between Ficat stage and the period required for diagnosis showed that the longer the latter, the higher the Ficat stage. A comparison of risk factors between the AVN group and the control group showed that the incidence of acute rejection and osteopenia, and the mean daily steroid dose, were higher in the AVN group than in the rejection group and that the difference was statistically significant.

Conclusion : The incidence of AVN of the femoral head after renal transplantation was 5.9%. The longer the period required for diagnosis of AVN, the higher the Ficat stage. A comparison of risk factors between the AVN group and the rejection group showed that the incidence of acute rejection and osteopenia as well as the mean daily steroid dose, were higher in the AVN group than in the rejection group, and these may thus be predisposing factors for AVN. In patients with these risk factors, even though plain radiographic findings are normal, MRI is necessary if AVN is to be diagnosed during its early stages.

Index words : Hip, necrosis
Kidney, transplantation

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