

14 , 3 , 2001 7

< >

:

diphosphonate (^{99m}Tc -MDP)

: , $^{99\text{m}}\text{Tc-methylene}$

:

4

가 가

32

$^{99\text{m}}\text{Tc-MDP}$

.

(radioactive)

isotope) (uptake)

가

가

:

32 12 1 19 (59.4%)

4.4 3-6 가 50% 가 .

17 12 (70.5%) 17.5 가 , 1 (6%)

.

0.76 , 15 1.00 . 4

0.93 1.00 .

:

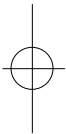
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10 (31%) , 22 (69%)

 $^{99m}\text{Tc-MDP}$

4 25mCi

6,7)

 $^{99m}\text{Tc-MDP}$ (Dupont , USA)

parallel collimator(General Electrics ,

USA)

11)

가

Tucker²⁰⁾ Boyed⁴⁾ ^{32}P

가

, Riggins¹⁶⁾ fluoride. Meyers¹²⁾ $^{99m}\text{Tc-methylene diphosphonate}$

(hot uptake)

($^{99m}\text{Tc-MDP}$)

(cold spot)

 $^{99m}\text{Tc-MDP}$

(fracture table)

4 Knowles pin 3

 $^{99m}\text{Tc-methylene}$

(cannulated screw)

diphosphonate($^{99m}\text{Tc-MDP}$)

6 1

3~4

frog leg lateral view

4

1989 1 1997 12

 $^{99m}\text{Tc-MDP}$

가

1 가가

가

32

24

88

54

가

11 , 가 21

18 (12 -48)

Garden

1 2

, 3 4

32



가 11

, 1 .

10 9 3.9 (3

-6) , 1 가 (cold

26 가 spot) 17 (53%) 1

. 22 10 (45.5%) 4.5

, 12 (54.5%) 15 (47%)

15 9 , 6 (Table 1).

Table 1. Pre-operative sintigraphy in 32 patients in relation to pre-operative displacement of the fracture and post-operative complication (non-union or necrosis of femoral head)

		Number of patients				
Fracture type		Displaced		Nondisplaced		Total
Complications		+	-	+	-	
Scintigraphic findings	Reduced	12	4	1	0	17
	Normal	0	6	0	9	15
	Total	12	10	1	9	32

† : presence, -: absence

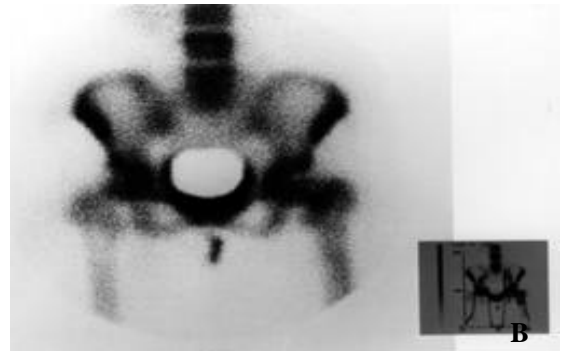


Fig 1-A. A : A preoperative radiograph of 41 years old female patient shows left displaced femur neck fracture(Garden stage IV).

1-B. A preoperative scintigraphy shows similar uptakes on both sides.

1-C. Closed reduction and internal fixation was performed with 4 Knowles pins.

1-D. Post-operative 22 months radiograph shows union on fracture site and no complications.



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17 12 (70.5%) 가 0.75(12/16), 1.00(6/6)
 17.5 가 , 1 (Table 3).
 (6%) (Fig. 1). 17
 15 4
 4 14 0.93,
 . 1.00
 17 4 (Table 4).
 3
 14
 , 3
 (Table 2).
 14 13 1
 (Fig. 2). 6,7).
 32
 0.76 (13/17) , 54.5%
 1.00(15/15) .
 22 2,5,10,14), Sikorski Barington¹⁹⁾

Table 2. Post-operative scintigraphy in 17 patients that have been shown reduced uptake at the pre-operative scintigraphy in relation to pre-operative displacement of the fracture and post-operative complication (non-union or necrosis of femoral head)

		Number of patients				
Fracture type Complications		Displaced		Nondisplaced		Total
		+	-	+	-	
Scintigraphic findings	Reduced	12	1	1	0	14
	Normal	0	3	0	0	3
	Total	12	4	1	0	17

† : presence, - : absence

Table 3. Predictive values of pre-operative scintigraphy

Predictive value	PV positive	PV negative
all patients (32 cases)	0.76	1.00
displaced patients (22 cases)	0.75	1.00

Table 4. Predictive values of post-operative scintigraphy in patients who have shown reduced uptake in pre-operative bone scintigraphy.

Predictive value	PV positive	PV negative
all patients (14 cases)	0.93	1.00
displaced patients (13 cases)	0.92	1.00

Table 5. Predictive values(PV) of pre-operative scintigraphy in other studies and authors.

Authors	PV positive	PV negative
Park et al	0.76	1.00
Lucie et al	0.82	0.91
Holmberg et al	0.73	0.96

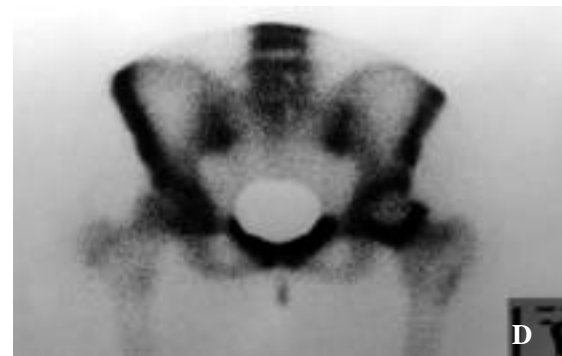


Fig 2-A. A preoperative radiograph of 28 years old female patient shows left displaced femur neck fracture(Garden stage IV).
2-B. A preoperative scintigraphy shows decreased uptakes on left side compared to the right side.
2-C. Closed reduction and internal fixation was performed with 4 Knowles pins.
2-D. A postoperative scintigraphy shows decreased uptake on left side continuously.
2-E. Postoperative 13 months radiograph shows collapsed femoral head and considered to be developed avascular necrosis.

, ^{99m}Tc-
 methylene diphosphonate(^{99m}Tc-MDP)

. Tucker²⁰⁾ Boyd ⁴⁾ radioactive
 phosphorus(³²P)

Greiff ⁸⁾ , Bauer ³⁾
 Holmberg Thonrgren⁹⁾ Lucie ¹¹⁾



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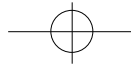
15 , 17 32
0.76,
1.00 5
4
15 4
17 3
4
 $^{99m}\text{Tc-MDP}$
Mussbichler¹³⁾가
가
가
4
14
13
6
1
5
0.93,
1.00 Alberts¹⁾가
가
Shin Wang¹⁸⁾ 5.9%,¹⁵⁾ 3%
20%
Schwarz¹⁷⁾

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Abstract

The Effectiveness of Bone Scintigraphy of Femur neck fracture

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Purpose : To evaluate the effectiveness of bone scintigraphy using ^{99m}Tc -methylene diphosphonate (^{99m}Tc -MDP) for prediction of viability of femoral head in femur neck fracture that have been treated with osteosynthesis.

Materials and Method : Thirty two patients were included in this study who underwent preoperative and postoperative bone scintigraphy using ^{99m}Tc -MDP following femur neck fracture. The uptake of isotope was estimated visually as either normal or reduced compared with the opposite side. The complications as avascular necrosis and non-union were checked and compared with the preoperative and postoperative bone scintigraphy and the predictive values of positive and negative scintigraphy were calculated.

Results : Among thirty-two patients, bone union occurred in nineteen patients except 12 avascular necrosis and 1 non-union. Average bone union period was 4.4 months and 50% was occurred between 3 and 6 months. In seventeen patients who showed reduced isotope uptake, twelve patients developed complications and predictive value of positive scintigraphy was calculated as 0.76. In fifteen patients shown normal isotope uptake, none developed complications and predictive value of negative scintigraphy was calculated as 1.00.

Conclusion : Preoperative bone scintigraphy using ^{99m}Tc -MDP was useful method to evaluate the viability of femoral head following femur neck fracture and to choose the treatment modality of displaced femur neck fracture especially in elderly person.

Key words : Femur neck fracture, ^{99m}Tc -MDP bone scintigraphy

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