

Tl^{201}/Tc^{99m}

Tc^{99m} MBI

Preoperative Localization in Primary Hyperparathyroidism: Comparison of Tc^{99m} MBI Scan and Tl^{201}/Tc^{99m} Subtraction Scan

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Purpose: Recently Tc^{99m} MBI (methoxyisobutylisonitrile) has been described as an alternative to thallium for localizing parathyroid lesions. The purpose of this study was to compare the efficacy of a Tc^{99m} MBI scan with a Tl^{201}/Tc^{99m} subtraction scan for localizing parathyroid lesions in patients with primary hyperparathyroidism.

Methods: Among 31 cases of primary hyperparathyroidism operated on at the Department of Surgery, Seoul National University Hospital from January 1997 to June 2001, a Tl^{201}/Tc^{99m} subtraction scan was performed on 16 patients and a Tc^{99m} MBI scan on 22 patients. Seven patients underwent both.

Results: The pathology was a single adenoma in 28 patients, a hyperplasia in 1 patient and a carcinoma in 2 patients. Hypercalcemia was controlled postoperatively in all cases. The sensitivities of the Tl^{201}/Tc^{99m} subtraction scan and Tc^{99m} MBI scan were 53.3% and 86.4%, respectively. The positive predictive values were 100% of the two study groups.

Conclusion: We concluded that the better accuracy, superior image quality and lower cost of Tc^{99m} MBI scan will make it the new radiopharmaceutical parathyroid scan of choice. A unilateral approach can be used with a high degree of success, as in case of a preoperatively localized single parathyroid adenoma, which was confirmed when surgical exploration identified of a normal ipsilateral gland. (J Korean Surg Soc 2002;63:23-29)

Key Words: Primary hyperparathyroidism, MBI Scan, Tl^{201}/Tc^{99m} subtraction scan, MBI, Tl^{201}/Tc^{99m}

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가 (1)
 가 , 10%가 , 4%가 85%
 1%가 (2)
 가
 92 95% (3)
 62 72% (4,5)

(intact PTH)

Tc^{99m} MIBI

Tl²⁰¹/Tc^{99m}

가 60 70%

(6)

Tc^{99m} MIBI (methoxyisobutylisonitrile)

가

(7,8)

Tc^{99m} MIBI

Tl²⁰¹/Tc^{99m}

Tc^{99m} MIBI (methoxyisobutylisonitrile)

가

1997 1 2001 6

31

(32)

creatinine

(intact PTH)

Tc^{99m} MIBI

Tl²⁰¹/Tc^{99m}

가

1 2 mCi (37 75 MBq)

5 1

20¹tallium

80 KeV 25%

20

140 KeV 20%

^{99m}technetium 5 mCi (185 MBq)

1

10

²⁰¹tallium

1

^{99m}technetium

5 1 5

(Fig. 1). Tc^{99m} MIBI

20 25 mCi (740 925 MBq)

Tc^{99m} MIBI

10 15 10

(Fig. 2), 2 3 10 (Fig. 3).

(true positive),

(false positive), (false negative)

가

가

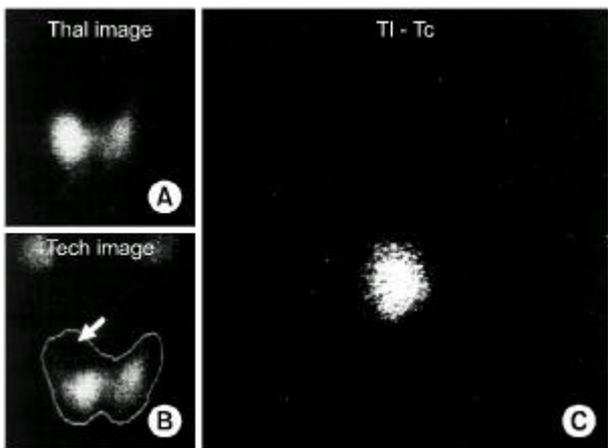


Fig. 1. Tl²⁰¹/Tc^{99m} subtraction scan. (A) Increased ²⁰¹tallium uptake is seen at the upper part of the right lobe. (B) No enhanced ^{99m}technetium uptake is seen at that area (arrow). (C) Tl²⁰¹/Tc^{99m} subtraction scan shows a single adenoma of right superior parathyroid.

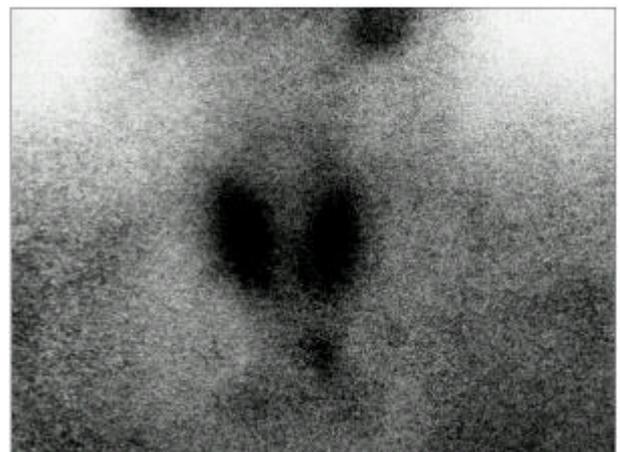


Fig. 2. Tc^{99m} MIBI scan at 15 minutes. Intense uptake of MIBI was visible in the normal thyroid and parathyroid adenoma. The adenoma was located in the upper mediastinum.

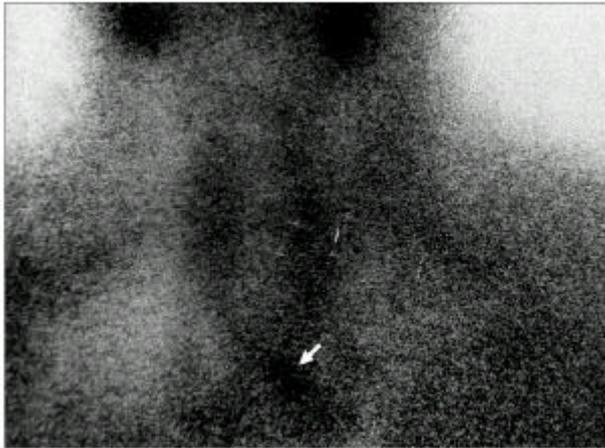


Fig. 3. Tc^{99m} MIBI scan at 2 hours. MIBI was washed out in the thyroid but remained in the parathyroid adenoma (arrow).

Table 1. Comparison between preoperative and postoperative calcium and PTH level

	Preoperative value	Postoperative value	Significance
Ca. (mg/dL)*	12.2±1.5	9.0±0.7	P<0.001
iCa. (mmol/L) [†]	1.65±0.68	1.13±0.10	P<0.001
PTH (ng/mL) [‡]	405.5±489.2	35.8±17.3	P<0.001

*Ca. = Calcium; [†]iCa. = ionized Calcium; [‡]PTH = parathyroid hormone.

creatinine 1.0±0.4 mg/dL (0.7 1.4 mg/dL)

2)

21 ,

9 ,

1

1

가
 ,
 .
 (true negative)
 (sensitivity)
 (positive predictive value)
 /((+)) ,
 /((+)) .
 SPSS for windows ver. 9.0
 , P-value가 0.05

2 ,

,

4

,

1 ,

2

2

1)

31

15

,

16

51±14

17

67

15

9

7

,

가 4

2

,

가 5

4

. 13

2

12.2±1.5 mg/dL (

8.8 10.5 mg/dL)

가

1.65±0.68 mmol/L (

1.05 1.35 mmol/L)

가

405.5±489.2

ng/mL (10 65 ng/mL)

가

2.4±0.5 mg/dL (

2.5 4.5 mg/dL)

Tc^{99m} MIBI

가

7

9.0±0.7 mg/dL

1.13±0.10 mmol/L,

35.8±17.3 ng/mL

(Table 1, P<0.001).

4

3)

. 31
 , 28 가 , 1 가 2
 가 . 5 mm 40 15 mm, 10 mm, 10 mm, 10 mm . 2
 mm 18.9±9.3 mm . 28 가 40 mm, 30 mm ,
 6 , 7 , 7 , . 1 , 2
 5 3 가 . 13 , 2
 Tl^{201}/Tc^{99m} 6 Tl^{201}/Tc^{99m} . 2
 6 , 1 .
 가 3 1 , 2
 . Tc^{99m} MIBI .
 21 Tl^{201}/Tc^{99m} 가 3 , Tc^{99m} MIBI
 3 . 3 가 2 (Table 2). 1 Tl^{201}/Tc^{99m}
 10 mm, 13 mm, 25 mm 2 Tc^{99m} MIBI
 Tl^{201}/Tc^{99m} . 2 Tc^{99m} MIBI
 , Tl^{201}/Tc^{99m}
 . Tc^{99m} MIBI . 6
 1 4 , 1 ,
 1 . Tl^{201}/Tc^{99m} Tc^{99m} MIBI
 Tl^{201}/Tc^{99m} 3
 2 , 1 .
 . 16 Tl^{201}/Tc^{99m} , 22 Tc^{99m} MIBI
 , 7 가 . Tl^{201}/Tc^{99m}
 , 16 8 7
 53.3%, 100% , Tc^{99m} MIBI
 Tc^{99m} . 1 1 Tl^{201}/Tc^{99m} 22 19 3
 Tc^{99m} MIBI 86.4%, 100% (Table 3).
 4 Tl^{201}/Tc^{99m}
 Tc^{99m} MIBI
 , 1 Tl^{201}/Tc^{99m}
 Tc^{99m} MIBI , 2
 . Tc^{99m} MIBI
 Tl^{201}/Tc^{99m}

Table 2. Results of the preoperative localization procedures for ectopic parathyroid lesions

Case	Location	Tl^{201}/Tc^{99m} scan	Tc^{99m} MIBI scan
1	Thymus	TP*	Not done
2	Mediastinum	FN [†]	TP
3	Mediastinum	FN	TP

*TP = true positive; [†] FN = false negative.

Table 3. Results of the preoperative localization procedures

Procedure	Patients	TP*	FP [†]	FN [‡]	Fail	Sensitivity	PPV [§]
Tl^{201}/Tc^{99m} scan	16	8	0	7	1	53.3%	100%
Tc^{99m} MIBI scan	22	19	0	3	0	86.4%	100%

*TP = true positive; [†] FP = false positive; [‡] FN = false negative; [§] PPV = positive predictive value.

가

Martin (25) 82%

31% 1

Tc^{99m} MIBI

MIBI가

가 MIBI

가 (oxyphilic)

MIBI (23,26) 가

MIBI

MIBI Tc^{99m} MIBI

MIBI 가

MIBI 3 (chief cell) (27)

Tc^{99m} MIBI

(21,24) Moka (28)

MIBI 가

, Tc^{99m} pertechnetate I¹²³

Tc^{99m} MIBI 6 3 1

MIBI 가

, Tc^{99m} MIBI 가

(7)

21

Tc^{99m} MIBI

가

Tc^{99m} MIBI

²⁰¹tallium Tc^{99m} MIBI Tl²⁰¹/Tc^{99m}

Tc^{99m} MIBI Tc^{99m}

Tl²⁰¹/Tc^{99m}

Tc^{99m}

MIBI 가

Tl²⁰¹/Tc^{99m}

가

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