

PREOPERATIVE LOCALIZATION OF PARATHYROID DISEASE WITH 18F-CHOLINE PET IN COMBINATION WITH SECOND LOOK ULTRASOUND

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Introduction

PET/CT or PET/MR with fluorine-18 or carbon-11 labeled choline (choline PET) is the best imaging modality to localize hyperfunctioning parathyroid glands.

We questioned whether an ultrasound examination (US) is still warranted in combination with choline PET in cases where initial localization studies with ^{99m}Tc-sestamibi scintigraphy and US were negative or inconclusive.

Methods

Retrospective cohort study
Single institution
No blinding
One radiologist specialized in neck performed all ultrasound

62 patients included

All choline PET between 2019-2022 with biochemically verified hyperparathyroidism.

- 57 patients with pHPT
- 5 patients with sHPT
- 21 had previous surgery

12 patients not operated:

- 7 patients: comorbidity
- 2 patients: mild disease
- 2 patients: awaiting decision
- 1 patient: rejected treatment

50 patients were operated

- 27 had focused surgery
- 7 had unilateral exploration
- 16 had bilateral exploration

48 patients

Enlarged parathyroid removed and calcium normalized

2 patients

Enlarged parathyroid removed but persistent hypercalcemia

Results: Diagnostic accuracy

	Ultrasound		Choline PET	
Per gland analysis	n	157	n	176
	Sensitivity	79.7%	Sensitivity	94.3%
	Specificity	95.9%	Specificity	100%
	PPV	92.7%	PPV	100%
	NPV	87.7%	NPV	96.4%
Per patient analysis	n	46	n	50
	Sensitivity	85.7%	Sensitivity	96.0%
	PPV	90.0%	PPV	100%

	Number of identified lesions	
	All patients	Operated
Negative	6	5
1 lesion	36	28
2 lesions	9	9
3 lesions	1	1
4 lesions	3	3
Not performed	7	4

	Number of identified lesions	
	All patients	Operated
Negative	4	2
1 lesion	41	34
2 lesions	12	10
3 lesions	2	2
4 lesions	3	2
Not performed	0	0

	Number of lesions on US	Number of excised glands				Total
		1	2	3	3.5	
0	5	0	0	0	5	
1	22	4	2	0	28	
2	3	6	0	0	9	
3	1	0	0	0	1	
4	0	1	0	2	3	
Total	31	11	2	2	46	

Cohen kappa = 0.36

	Number of lesions on PET	Number of excised glands				Total
		1	2	3	3.5	
0	2	0	0	0	2	
1	32	1	1	0	34	
2	1	9	0	0	10	
3	0	0	1	1	2	
4	0	1	0	1	2	
Total	35	11	2	2	50	

Cohen kappa = 0.71

Postoperative results

ioPTH 0 min	13.3 [4.7-51]
ioPTH 15 min	3.4 [1.4-28]
Parathyroid weight (µg)	337 [110-1908]
Biochemistry at follow-up:	
Free calcium	1.26 [1.12-1.41]
Total calcium	2.37 [2.18-2.64]
PTH	5.3 [0.7-19]

Biochemical normalization in 96% of patients.

Patient characteristics

	All patients	Operated	Unoperated
n	62	50	12
Female gender	36 (58%)	29 (58%)	7 (58%)
Age (years)	61.5 [28-84]	61 [28-84]	62.5 [36-83]
Calcium (mmol/L)	2.67 [2.32-3.10]	2.68 [2.35-3.10]	2.65 [2.32-2.73]
Free calcium (mmol/L)	1.41 [1.21-1.71]	1.42 [1.21-1.71]	1.38 [1.22-1.47]
PTH (pmol/L)	12.2 [5.7-54.8]	12.35 [5.7-43.8]	10.8 [6.1-54.8]
Previous parathyroid surgery	21	17	4
Secondary HPT	5	2	3

Conclusion

PET with ¹⁸F-choline in combination with US performed by an experienced radiologist specialized in neck ultrasound provides reliable information in selected patients with hyperparathyroidism.