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The Accuracy of 99mTc-MIBI Scintigraphy for Preoperative Parathyroid Localization in Primary and Secondary-Tertiary Hyperparathyroidism

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Abstract:
Objective: The aim of this study was to assess the accuracy of preoperative parathyroid localization using double phase planar 99mTc-methoxyisobutylisonitrile parathyroid scintigraphy (MIBI scintigraphy) in patients with primary hyperparathyroidism (pHPT) and secondary-tertiary hyperparathyroidism (stHPT) due to chronic renal failure .
Material and methods: A retrospective study was conducted. Between1995 and 2010, seventy-one patients with hyperparathyroidism (mean age 47±15 years; range 14-84 years) underwent neck surgery ; 18 with pHPT and 53 with stHPT. None of these patients had undergone previous neck surgery. Preoperative demographics , clinical and laboratory values, MIBI scintigraphy , operative findings, location, size and histopathological results of all abnormal parathyroid glands were recorded.
Results: The abnormal parathyroid glands excised from 18 pHPT patients included 11 solitary adenoma (61%), 5 carcinoma(28%) , 1 patient with single gland hyperplasia (6%) and 1 patient with two gland hyperplasia (6%). MIBI scintigraphy correctly lateralized and localized 17 of 19 abnormal parathyroid glands with sensitivity 90%, specificity 100%, positive predictive value (PPV)100% and accuracy 97.2%.The abnormal parathyroid glands excised from 53 stHPT patients included 48 patients with multiple hyperplasia(91%), 1 patient with single gland hyperplasia(2%),1 patient with solitary adenoma(2%) and 3 patients with multiple adenomas (6%).MIBI scintigraphy correctly lateralized 116 of 173 abnormal parathyroid glands with sensitivity 67.1 %, specificity 92.3%, positive predictive value (PPV) 97.5% and accuracy 71.7 %. Precise localization occurred in 63.6 % of the abnormal parathyroid glands. Significant differences were found with respect to age , intact parathyroid hormone, serum calcium , phosphorus, BUN levels between the pHPT and stHPT($p<0.001$). The average size of abnormal parathyroid glands in pHPT(2.28±1.05 cm) was greater than that of stHPT (1.56±0.58 cm) with significant difference ($p<0.001$).Surgical parathyroid size were significantly greater in MIBI true-positive glands (1.79±0.68 cm) compared to MIBI-false negative glands(1.29±0.52 cm) with significant difference ($p<0.001$)
Conclusions : MIBI scintigraphy is very sensitive and highly accurate for pre-operative localization of parathyroid lesion in patients with pHPT . So, it was useful for surgeon as a guide in the preoperative localization for performing unilateral surgery to reduce operating time and morbidity. In stHPT,MIBI scintigraphy appears fair sensitive and is not yet accurate to detect all abnormal parathyroid glands in multiple hyperplasia .So, it is not an essential prerequisite before surgery.

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