THE COMPARISON OF Tc99m-PERTECHNETATE/MIBI SUBTRACTION AND DOUBLE PHASE Tc99m-MIBI TECHNIQUES IN PARATHYROID IMAGING

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INTRODUCTION:

Experienced parathyroid surgeons can localize nearly %90-95 of the abnormal parathyroid glands with total thyroid bed exploration. For this reason, for the first surgical exploration preoperative imaging of the gland could be considered unnecessary.

However, localization of the abnormal parathyroid tissue preoperatively could be beneficial in ectopic adenomas which consists %20 of all adenomas and also in shortening surgical procedure in single adenomas with the use of unilateral exploration.

Re-exploration after an unsuccesful surgery is the most widely accepted indication for parathyroid imaging.

Today, although Tc99m-MIBI is the accepted radionuclide with the advantages of giving better image quality with lower radiation dose over Tl-201, for imaging hyperfunctioning parathyroid tissue, there is no consensus on the ideal imaging protocol.

Single-tracer double-phase imaging (STDP) and dual-tracer substraction technique (Tc99m-pertechnetate/Tc99m-MIBI) (DTST) are proposed protocols using Tc99m-MIBI.

The aim of this ongoing study is; to compare STDP imaging with DTST and to compare sensitivity of pinhole and high resolution parallel hole images in STDP protocol.

MATERIAL AND METHOD:

Study group was selected from the patients which were referred for parathyroid imaging with the suspicion of hyperparathyroidism according to clinical and laboratory findings and that had positive STDP MIBI scan. A total of 12 pts (11 female, 1 male) were included in the study group. Age range was; 37-64. Seven of 12 patients were later proved to have adenoma and 5 secondary hyperplasia. Following STDP imaging, 3-7 days later DTST was performed. For STDP imaging, after the injection of 20 mCi MIBI, 15 min, 3 hr pinhole images of the neck and high resolution parallel hole images were obtained.

* For DTST, after the injection of 5 mCi Tc99m-pertechnetate, pinhole and parallel hole images were recorded respectively. After parallel hole image, without moving the patient 20 mCi MIBI was injected and 10 min later a static image was obtained. Computer subtraction of the parallel hole pertechnetate images from MIBI images was performed.

RESULTS:

Pt no	STDP (parallel hole)		STDP (pinhole)		DTST (subtraction)
	Early	Late	Early	Late	
1 (H)	-	+	-	+	+
2 (A)	+	+	+	+	-
3 (A)	+	-	+	-	+
4 (H)	+/-	+/-	+	+	+
5 (A)	+	+	+	+	+
6 (A)	+	+	+	+	+
7 (H)	+/-	+/-	+	+	+
8 (H)	-	-	-	+	-
9 (A)	+	-	+	-	-
10 (A)	-	-	+	+	-
11 (A)	+	+	+	+	+
12 (H)	+	+	+	+	-

Table 1: STDP (parallel and pinhole) and DTST results of the study group.

(+): positive, (-): negative, (+/-): equivocal results.

(A): Adenoma, (H): Hyperplasia

In STDP protocol, all patients (12) had a positive pinhole study while parallel hole images failed to demonstrate 1 hyperplasia (pt no: 8), 1 adenoma (pt no:10) and gave equivocal information on 2 hyperplasias (pt no: 4 and 7). When early and late pinhole images were compared; 2 adenomas (pt no: 3 and 9) showed rapid washout and were not visualized on late images. On the other hand two hyperplasias (1 and 8) were visible only on late image after the washout of the physiologic MIBI uptake of the thyroid. In DTST only 6 of 12 pts had positive results (4 adenomas and 2 hyperplasias). Sensitivity of the DTST was not related to the size of the parathyroid pathology. While interpreting STDP studies, in 5 of 12 patients pertechnetate scan was found to be supplementary in detecting parathyroid pathology. Motion of the patient in DTST was a major problem. In 3 of 12 patients motion correction was necessary.

CONCLUSION:

When comparing STDP protocol with DTST, parallel hole images were used since for subtraction was performed over these images. STDP was found to be superior to DTST. In STDP, pinhole images were more sensitive than parallel hole images. Although early images are more sensitive, late images are also necessary, since in 2 hyperplasias only late images showed pathological finding. Pertechnetate scan is recommended as a complementary test in the interpretation of STDP images. Patient motion is a considerable limitation of DTST. The use of parallel hole images for DTST was the limitation of the study, subtraction of pinhole views could have given better results.