Visual Assesment of Thyroid Uptake With Thyroid Scintigraphy

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TİROİD UPTAKE'İNİN TİROİD SİNTİGRAFıSİ'NDEN GÖRSEL ARAŞTIRILMASI

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SUMMARY

The accuracy with which thyroid function can be estimated by comparison of pertechnctate uptake with that in the salivary glands was reviewed relative to uptake and clinical assessment in 96 patients with thyroid disease. Although there wot a general correlation, there was a tendency to over-estimate thyroid function by visual assessment. It is not clear whether this was due to uncontrolled variations in the photographic hard copy or is an intrinsic limitation of the technique. This method is accurate when it indicates a low or normal gland activity, but a quantitive test is required to distinguish the true hyperthyroids.

Key **Words: Thyroid uptake, Thyroid scan,** Craves' **disease, Tc'''', 1'''.**

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ÖZET

96 Tirioid** hastasında **uygulanan teknisyum** siutigra**fisinde** tükrük **bezlerinin radyoaktif madde** tutuşları **ile tiroid radyoaktivite** tutuşları arasındaki **ilgi, tiroid** fonksiyonları açısından **kıyaslandı. Genel olarak** doğruya yakın **fikir vermesine** rağmen **tiroid** fonksiyonları görüntü kıyaslaması **ile** kısmen yüksek **olarak tahmin edildi. Bu dezavantajın** kıyaslamanın yapıldığı film **ve** fotoğraf kağıtlarındaki **doz, banyo ve teknik uygulama** farklılıklarından doğduğu **tahmin edilmiştir. Bu metod,** özellikle düşük **ve normal gland aktivitesinde tam netice vermesine** rağmen, **hipertiroidi ve derecelerini** ayırt **edebilmek** için **kautitalif testlere ve yeni** yaklaşımlara ihtiyaç **vardır.

Anahtar Kelimeler: Tiroid **uptake,** Tiroid **»can, Cnıvrs hastalığı, Ti''''.!'''.**

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INTRODUCTION

In-vitro tests have superseded radio-iodine uptake measurements as an aid to clinical assessment of most patients with thyroid disease, although iodine uptake still has a place in the diagnosis of some patients, some consider it useful for the calculation of therapeutic doses of I^{131}. Thyroid scintigraphy is a routine procedure in most centres. It is used for assessment of suspected nodules and for mapping of the thyroid prior to operation or radio-isotope treatment (1). When performed with pertechnetate it avoids the high radiation exposure inherent in diagnostic I^{131}, imaging, is less time consuming for the patients and requires less technician time than uptake measurement. We have not been able to trace any study of the accuracy of estimation of thyroid function made by simple visual assessment of these images. We have retrospectively evaluated a method which compares the relative ratio of Tc^{99m} uptake by the thyroid and that in salivary glands.

PATIENTS AND METHOD

264 patients were referred from the Western General Hospital to the Department of Nuclear Medicine for an I^{131} uptake study during the last five years. Of these 121 were excluded because they did not have a scintigraphic study within three days of the I^{131} uptake measurement and af further 47 because detailed notes were not available, leaving 96 in whom both examination and follow up were available. These were divided into five categories:

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6 Ekim 1986'da Glaskow-U.K'da British Nuclear Medicine Kongresinde tebliğ edilmiştir.

(1) 43 patients with Graves' disease
(2) 22 patients with toxic nodular goitre.
(3) 22 euthyroid patients (including simple goitres).
(4) 7 patients with thyroiditis.
(5) 2 hypothyroid patients.

A Technicare Sigma 100 gamma camera fitted with a pinhole collimator and connected to a Nodecrest computer system was used for imaging, which was performed as two anterior projections, one as close to the skin as possible and the other at a fixed pinhole to skin distance of 10 inches, 20 minutes after intra-venous injection of 100 MBeq Tc^{99m} (2). Within three days of the scintigraphic study the patients were given 5 Ci (0.2 MBeq) of sodium iodide (I^{131}) solution orally. The thyroid uptake was measured at 4 hours.

The scintigraphic assesment of thyroid function was made by comparing the relative intensity of radioactivity in salivary glands with that in the thyroid gland as viewed on black and white photographic films. The comparisons were made using the criteria shown in table I.

The final clinical diagnosis was made by the endocrinologist considering all the available tests, clinical assessment of the patient, follow up and biopsy material.

Table - I

Criteria for Visual Assessment of Thyroid Uptake

Thyroid/Salivary ratio	Thyroid Function	
T » S	High	Salivary gland not visible.
T > S	Normal	Thyroid uptake more than salivary.
T =S	Normal	Thyroid and salivary glands have similar uptake.
T < S	Low	Thyroid uptake less than salivary but well visualized.
T « S	Low	Thyroid gland not visible

RESULTS

In group 1 (Graves' disease) all patients (43) had high thyroid to salivary (T/S) ratios and high I^{131} uptake. All group 2 patients (22) with toxic nodular goitre had high thyroid/salivary gland ratios (T>>S) while only 18 had high I^{131} uptake (4 discordant results). There were 2 discordant results in patients with thyroiditis (29%), 3 in the euthyroid patients (14%) and none in the hypothyroid group (table II).

I^{131} uptake was compared with the T/S ratio for all patients regardless of the clinical diagnosis. There were 3 discordant results in the low I^{131} uptake group (23%) and 6 in patients with normal uptake of I^{131} (18%). There were none in the high uptake group (table III). In all cases the discrepancy was such that the thyroid to salivary glands ratio was higher than expected from the I^{131} uptake.

Table - II

Comparison of I^{131} Uptake and Visual Assessment of Thyroid Uptake in Each Group of Patients.

Group	Diagnosis	RESULTS	
		Concordant	Discordant
1	Graves' Disease (n=43)	43 (100%)	0 (0 %)
2	Toxic Nodular Goitres (n=22)	18(82 %)	4 (18 %)
3	Euthyroids (n=22)	19(86 %)	3 (14%)
4	Thyroiditis (n=7)	5 (71 %)	2 (29%)
5	Hypothyroids (n=2)	2(100%)	0 (0 %)
	TOTAL	87 (91 %)	9 (9 %)

Table - III

Comparison of I^{131} Uptake and Visual Assessment in all Patients.

UPTAKE	THYROID TO SALIVARY GLAND RATIO					RESULTS	
	T » S	T>S	T=S	T<S	T « S	Concordant	Discordant
Low n=13	1	1	1	3	7	10 (77 %)	3(23%)
Normal n=33	5	24	3	1	0	27 (82 %)	6)18%)
High n=50	50	0	0	0	0	**50 (100%)**	0 (0%)

DISCUSSION

With the advent of newer and more precise methods for the measurement of thyroid function, such as immune radiometric assay (IRMA) and TSH response to TRH, the use of I^{131} uptake has become more limited (3). The test requires the use of a relatively long half life -emitting radio-isotope associated with relatively high absorbed radiation dose and is time consuming. It is sometimes useful in identifying thyroiditis and trapping defects. Some centres use it for calculation of therapeutic doses (4,5), although most have found that a fixed dose regime is equally effective.

It is wel known (6,7) that pertechnetate uptake measurement is, useful in diagnosing hyperfunction, but that it is not useful for diagnosing hypothyroidism. A comparison of the thyroid uptake with the salivary gland uptake has been suggested for diagnosis of salivary gland disease (8). Here we have used thyroid uptake to salivary gland uptake ratio as a measure of thyroid gland activety. There was a good correlation with uptake measurements in hyperthyroid patients. In other categories there was an unacceptable number of patients where this method overestimated the actual uptake. It is of interest that Sucupira et al (9) had similar finding when hormonal values and Tc^{99m} uptake were compared. They also found a better correlation in hyperthyroid than in normal or hypothyroid patients. Some of the discordant results are due to localized and uneven uptake which have specific patterns such as small discreet hyperthyroid nodules and are thus distinguishable. Other factors which can contribute to this discrepancy include reduced uptake by the salivary gland due to infections, alcoholism, connective tissue disease or aging (8,10,11).

Variations in contrast of the photographic hard copy can lead to misinterpretation in some cases. The unavoidable drift in the contrast of the monitor screen is a well recognized problem with many forms of hardcopy display. Despite regular checks and correction, changes in contrast from day to day are inevitable. A high contrast gives an exagerated impression of the difference between the uptake in different areas especially in patients with hot nodules, resulting in the appearance of suppression of the rest of gland and non-visualization of the salivary glands. The pattern of uptake in these "false" hyperthyroids is often diagnostic of conditions which distinguishes them from Graves' disease. In our study there was no hyperthyroid patient who could not be diagnosed by thyroid scintigraphy alone. Thus a false low uptake seems unlikely to occur with this scintigraphic method.

CONCLUSION

Estimation of thyroid function made by visual assesment of thyroid scintigrams with black and white photographic hard copy has detected all hyperthyroid patients, but underestimated the prevalence of hypothyroidism. This is related to uneven uptake by the thyroid and the contrast quality of the hard copies. Scintigraphy thus tends to overestimate the prevalence of hyperfunction and underestimate hypofunction. Caution should be exercised when reporting thyroid function from scintigrams.

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