



## Correlation of Thyroid Hormone Levels with Radioactive Iodine (I-131) Thyroid Uptakes

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### Abstract

Radioactive iodine uptakes (RAIU) by thyroid gland is often performed to evaluate its functional status. How accurately it correlates with the Tri-iodothyronine ( $T_3$ ), Tetra-iodothyronine ( $T_4$ ) and thyroid stimulating hormone (TSH) radioimmunoassay (RIA) levels was studied in a total of 134 patients. It was observed that there was a significant positive correlation between 2 and 24 hours thyroid RAIU values with  $T_3$  &  $T_4$  RIA values.

### Key Words

Thyroid, Radioactive Iodine Uptake, Radioimmunoassay

### Introduction

Radioimmunoassay, enzyme linked immunosorbent assay (ELISA) and immunoradiometric assay (IRMA) constitute the main tools for biochemical evaluation of thyroid functions. (1) Thyroid radioactive iodine uptake study is a simple and cost effective method to investigate thyroid function and retains a confirmatory and clarifying status when the results of other tests are ambiguous or contradictory (2,3). RAIU by thyroid is also performed for calculation of therapeutic dose of iodine-131 in thyrotoxicosis (4). In the present study, the objective was to find out the correlation between thyroid RAIU at 2 hours, 24 hours and 48 hours and thyroid hormone levels obtained by radioimmunoassay (RIA).

### Material and Methods

A total of 134 adult patients in the age range of 20 to 60 years, that included 76 females and 58 males, referred to the department of Nuclear Medicine, Sher-i-Kashmir Institute of Medical Sciences, Srinagar between August 94 to August 99 for thyroid radioactive iodine uptakes were evaluated to study the correlation between their serum  $T_3$ ,  $T_4$ , TSH radioimmunoassay values and their 2, 24, and 48 hours thyroid RAIU. Prior to oral administration of the isotope, a history to rule out the intake of any iodine containing agents or drugs known to affect thyroid function was asked from all the patients. A blood sample was withdrawn from the patients for estimation of  $T_3$ ,  $T_4$ , TSH by radioimmunoassay. Patients were then asked to swallow a 25 microcurie capsule of

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Iodine-131. Thyroid RAIU was performed on each patient at 2, 24 and 48 hours using Mecanides (U.K) thyroid uptake probe consisting of a collimated sodium iodide crystal coupled to a single photomultiplier tube with accompanying electronics. Radioimmunoassay on blood samples was carried out in the department of Immunology, Sher-i-Kashmir Institute of Medical Sciences, Srinagar using kits procured from Bhabha Atomic Research Centre, Mumbai. Correlation coefficients(r) were calculated and tested for statistical significance. Regression lines for various variables were computed using the Microsoft excel software.

**Results**

Two hour thyroid RAIU values studied in 134 patients(Table 1) had a statistically significant positive correlation ( $r=0.645$  and  $p<0.001$ ) with  $T_3$  values assessed by radioimmunoassay (RIA). Two hours thyroid RAIU values studied in the same number of patients also revealed a moderately positive and statistically significant correlation ( $r = 0.56$  and  $p = <0.001$ ) with the  $T_4$  values assessed by RIA. The 2 hours thyroid RAIU values showed an expected negative correlation ( $r= -0.07$ ) with the TSH-values, however, this was not statistically significant ( $p=>0.10$ ).

Twenty four hours thyroid RAIU values (Table 1) had a positive correlation ( $r=0.65$ ) with  $T_3$  values (Graph 1) and this correlation was statistically significant ( $p=<0.001$ ). The 24 hours thyroid uptake values also had statistically significant ( $p=<0.001$ ) correlation with  $T_4$  values (Graph 2). The expected negative correlation ( $r= -0.18$ ) with TSH values though observed was not of statistical significance.

The 48 hours thyroid RAIU values (Table 1) had statistically insignificant ( $p>0.100$ ) correlation with  $T_3$ ,  $T_4$  and TSH values.

**Table 1: Correlation of  $T_3$ ,  $T_4$ , TSH RIA with 2, 24 and 48 hours RAIU of thyroid**

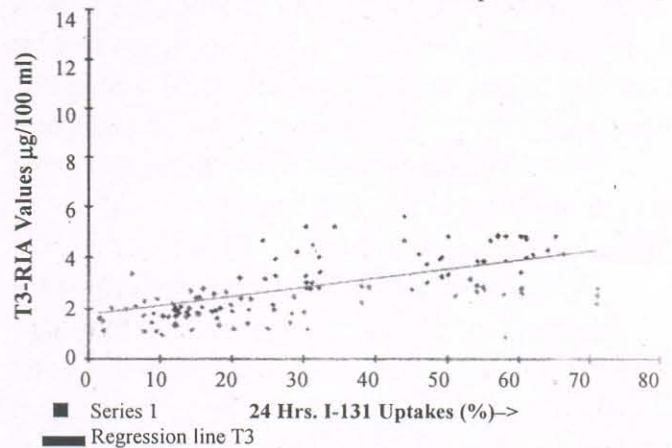
RAIU	$r(T_3)$	$r(T_4)$	$r(TSH)$
2 hours	0.645 ( $p<0.01$ )	0.56 ( $p<0.001$ )	-0.07 ( $p> 0.100$ )
24 hours	0.65 ( $p<0.001$ )	0.50( $p<0.01$ )	-0.18( $p>.0.100$ )
48 hours	0.03( $p>0.100$ )	0.15( $p>0.100$ )	-0.08( $p>.0.100$ )

- r = correlation coefficient
- p = probability at 5% confidence interval
- RAIU = Radioactive Iodine uptake
- $T_3$  = Tri-iodothyronine
- $T_4$  = Tetra-iodothyronine
- TSH = Thyroid stimulating hormone

**Graph-1**

**24 Hrs. I-131 UPTAKES versus T3**

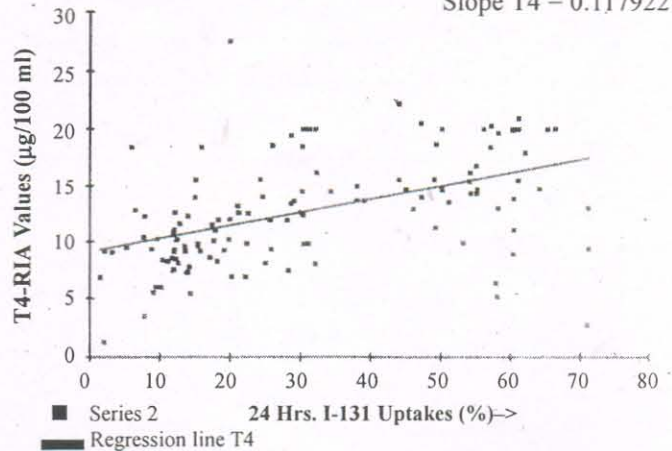
Slope T3 = 0.034895



**Graph-2**

**24 Hrs. I-131 UPTAKES versus T4**

Slope T4 = 0.117922



## Discussions

In general, any disorder associated with increased iodine turnover causes elevation in RAIU. Conversely, hypothyroidism with low iodine turnover is associated with a decreased RAIU. Other disorders with low uptake include subacute (deQuervain's) thyroiditis, thyrotoxicosis factitia, straua ovarii, and functional metastatic thyroid cancer (5). Factors other than thyroid disease may adversely effect the measurement of RAIU (6). Expansion of iodine pool by the ingestion or parenteral administration of iodine-containing agents is the greatest problem in this regard. Drugs like steroids, ointments (Iodex), contraceptive agents, amoebicides and goiterogenic agents like cabbage, turnip, kale and rutabaga are known to alter RAIU. Chronic renal failure depresses uptake by impairing iodide clearance and expanding its body pool (7). Increased RAIU may occur due to iodine depletion in patients with inflammatory bowel disease, chronic diarrhoea and nephrotic syndrome and in those on sodium restriction or diuretics (8). In the present study, no doubt, a significant correlation between  $T_3$ ,  $T_4$ , RIA values and 2, 24 hours RAIU was observed (table 1) but it was not a perfect one ( $0 < r < 1$ ). The non-perfect correlation can be attributed to non-thyroidal factors which have an influence on the iodine haemodynamics and thus adversely affect the measurement of RAIU.

## Conclusion

Thyroid RAIU study at 2 and 24 hours is a simple and cost effective method to investigate the functional status of thyroid gland and retains a corroborative and

clarifying status in situations where the results of other tests are ambiguous or contradictory. Thyroid RAIU cannot be recommended as the sole diagnostic investigation as the positive correlation between  $T_3$ ,  $T_4$ , RIA values with 2 and 24 hours RAIU though statistically significant in this study was not a perfect one because correlation coefficient ( $r$ ) though greater than zero ( $r > 0$ ) was less than one ( $r < 1$ ). The practice of performing a 48 hours RAIU should be abandoned on account of insignificant correlation.

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