

Original Research Article

THE ROLE OF RADIOACTIVE IODINE IN THYROTOXICOSIS PATIENTS

ABSTRACT

Aims: The primary objective of this study is to investigate the treatment of Graves' Disease (GD) ~~treatment with~~ applying treatment with radioactive iodine active iodine ($^{131}\text{I-Nal}$), ~~presenting and correlate~~ the clinical symptoms ~~suffered from patients, and evaluating the level of triiodothyronine (T3), thyroxine (T4) and thyroid-stimulating hormone (TSH) before and after the therapy~~ eutic procedure, ~~while also evaluating T3, T4 and TSH level.~~

Study design: Clinical symptoms produced by GD were stratified according to patients' gender and age, and a comparison ~~between clinical symptoms and the level of T3, T4 and TSH was done before and after the radioiodine therapy~~ is done and some factors examined such as age and most common symptoms in hyperthyroidism.

Place and Duration of Study: This study was made under supervision of the Department of Nuclear Medicine, King Abdulaziz University Hospital (KAUH) and the Department of Diagnostic Radiology (KAU), Jeddah, KSA, ~~from between November 2012 to and~~ May 2013.

Methodology: Data from ~~3939~~ patients ~~were~~ collected before and after the administration of radioiodine therapeutic active iodine dose. Specifically, ~~t~~Thyroid scintigraphy ~~ans~~ and ~~t~~Thyroid ~~Functional~~ ~~t~~Test (TFT) ~~results were co~~ were conducted to all patients enrolled in the present study. ~~aiming to compare T3, T4 and TSH level and the cure rate~~ are obtained before and after radio-iodine therapy. Patients evaluated within TFT, thyroid survey test to illustrate the demographic feature and response to treatment.

Results: The most common clinical symptoms ~~produced by~~ ~~esenting by patients with GD~~ ~~were~~ are tachycardia, weight loss, excessive sweating and tremors. A total of 90% of patients were under anti-thyroid drug medication ~~Ninety percent of 90% of patients were on anti-thyroid medication~~ before taking radioiodine therapy while 10% were not. TFT results showed that 95% of patients presented abnormal thyroid function. ~~Ninety-five percent 95% of them had abnormal TFT results.~~ Aside from excessive sweating, no significant association between age and clinical symptoms ~~was~~ ~~discovered~~ observed. ~~Three months post-radioiodine therapy~~ radio-iodine therapy. A significant increase in TSH level and decrease in T3 and T4 was observed at three-months after therapy procedure. ~~showed significant increase in Thyroid-Stimulating Hormone (TSH) and decrease of Triiodothyronine (T3) and thyroxine (T4).~~ Within more than six months post-therapy, 60% of patients showed clinical symptoms of hypothyroidism, ~~30% of patients presented TFT results compatible with normal thyroid function, and being standard and only 10% showed no response to therapy~~ treatment.

Conclusion: Radioactive iodine is an excellent ~~and definitive treatment~~ alternative for GD ~~treatment~~ patients compared to other therapeutic approaches ~~therapy~~, presenting less complications than surgery procedure and reverse possibility when patients are treated with ~~anti-thyroid drug medication with less complications in reverse of taking anti-thyroid medication or performing surgery.~~

Keywords: Hyperthyroidism, Graves' disease, Thyroid hormone, radioactive iodine.

1. INTRODUCTION

Hyperthyroidism is a type of thyrotoxicosis. If T3 or T4 serum levels are elevated (or both), a hypermetabolic clinical syndrome will occur.^[1]

The most common cause of hyperthyroidism is Graves' disease (GD). GD is characterized and recognized when the patient's immune system attacks the thyroid gland leading to a overwith an overproduction of the thyroxine hormone and resulting in a increased body's an increased metabolic rate. This condition promotes can lead to a host of health problems in involving vital organs such as to the the heart, and to the central nervous system (CNS), reproductive and system and human gastrointestinal tract (GIT) systems. Also there are a The variety of very alarming physical and mental effects caused by high level of thyroid hormones in blood circulation this activity.^[2]

GD, followed by toxic multi-nodular goiter, is considered the most common cause of thyrotoxicosis.^[3] The most frequent clinical symptoms signs of thyrotoxicosis are heat intolerance, nervousness, heart palpitations, fatigue and weight loss. Common symptoms also include sinus tachycardia, tremor, hyperreflexia and agitation.^[3] being evidenced a There is some correlation between the degree of thyroid hormone excess and the clinical severity.^[4]

The thyroid-stimulating hormone (TSH) level is a exquisitely sensitive indicator of the thyroid status in patients with an intact hypothalamic-pituitary axis is called the TSH serum. It is rare that the patient is thyrotoxic when the TSH level is within considered a standard normal value. The TSH suppression with elevated free T3, but normal free T4 describes the thyrotoxicosis condition. Subclinical hyperthyroidism is defined by either suppressed TSH, or weak presence of normal free thyroid hormones concentrations.^[5]

Serologic data, combined with thyroid imaging and radiotracer thyroid uptake measurements enable accurate diagnosis and appropriate patient treatment.^[6]

Treatment options for GD may include anti-thyroid drug medication, surgery and Radioactive iodine (RAI) administration therapy. Some patients treated surgically with uncomplicated GD with many choices of treatment that depend on the countries and locations.^[9]

The last alternative therapy is based on radiation dose given to thyroid gland when the radioactive iodine is disintegrated into thyroid cells. The follicular cells are destroyed by beta particles emitted in this disintegration and consequently a reduction in thyroid volume is observed and a control of gradually volume decreased and thyrotoxicosis occurs will be controlled.^[7,15]

The primary purpose of this study is to investigate the treatment of GD with radioactive iodine (¹³¹I-Nal), presenting the clinical symptoms suffered from patients, and evaluating the level of T3, T4 and TSH before and after the therapy procedure, as The primary purpose of this study is to investigate the effect of radioactive iodine therapy on patients who suffer from GD, as this procedure it is the first line of therapy recommended by the American Thyroid Association.^[8,10]

Another goal is to measure the sensitivity of thyroid uptake by investigating the condition while giving reasons for hyperthyroidism. Using the static's works, a comparison is done based on confounding factors such as gender, age and most common symptoms in hyperthyroidism.

2. MATERIALS AND METHODS

This study was conducted on nonrandomized and —observational clinical cases. The subjects (patients enrolled in this study) were all diagnosed with thyrotoxicosis and are registered in the Nuclear Medicine Department to perform RAI therapy. (academic year 2012/2013) This study was made under supervision of the Department of Nuclear Medicine, King Abdulaziz University Hospital (KAUH) and the Department of Diagnostic Radiology

(KAU), Jeddah, KSA, from November 2012 to May 2013, to perform thyroid scanned retrospectively analyzed.

Data from 3939 patients presenting clinical symptoms of GD and confirmed by medical exams who were subjected to nuclear medicine with symptoms of thyroid disorder and diagnosed with grave's disease were collected. All The patients were submitted to performed a TFT test performed before and after RAI therapyradioiodine therapy. The exclusion criteria examined in the case of patients who had previous radioiodine treatment doses. Both male and female patients, with age ranging from 15 to 65-years old, were considered for entering in this study, with an age range between 15 to 65-years old. Before administering the radioiodine therapeutic activityactive iodine treatment dose, a thyroid scintigraphy, using either injection of ^{99m}Tc -pertechnetate or ^{123}I -Nal administration, was performed to all patients aiming to confirm applied to confirm the type of thyroid disorder. The clinical symptoms suffered by GD patients were stratified according to patients' age and gender using the results acquired through TFT. The scan clarified the importance and role of radiography scintigraphy in the detection of disease. The patients evaluated using the TFT results to illustrate the demographic feature and response to treatment. Patients who have received previous radioactive iodine for therapy purposes were all excluded from statistic analysis.

Thyroid Scintigraphy was performed using a radioactive material, which was either ^{99m}Tc injected or ^{123}I swallowed in the form of capsules or liquid.

Radioactive iodine (^{131}I -Nal) therapy was applied to all patients who have GD confirmed by thyroid scintigraphyAfter obtaining the test results, and Graves' disease was confirmed from the thyroid scan, the treatment ^{123}I was given. Therapeutic activities ranged from 555 MBq to 925 MBq, and all of them were given to patients orally, either in liquid or capsule form. Data from TFT acquired from patients before and after therapy were used to evaluate the therapy response when applying RAI therapy.

Blood samples were collected from all patients prior therapy and within two and four months after therapeutic procedure aiming to measure TSH, T3 and T4 and helping to evaluate therapeutic response. Patients are then required perform a blood within two to four months after the treatment is given, and compared with blood test results done prior to the treatment. This will assist in observing the response of the thyroid gland to therapy by measuring TSH, T3 and T4.

The collected data were statistically analyzed using SPSS computational software. Patients were given doses of radioactive iodine orally, either in liquid or capsule form. The range of the doses was between 555 – 925 MBq. The PACS images produced were evaluated. The collected TFT data of each patient in the study before and after the treatment doses is used to evaluate the rate of treatment by using ^{131}I . The collected data is statistically analyzed using SPSS to investigate the role of radioactive idonine therapy ^{131}I in the treatment of Graves' disease.

3. RESULTS AND DISCUSSION

3.1 Results

From a total of 39 patients collected in the KAU Hhospital, only 11 have performed the TFT, and thyroid survey results, while 28 have not entered in this survey, did not.

Thyrototoxicosis was confirmed only on 21 patients21 patients suffered from Thyrototoxicosis. The majority of Data was tested with demographic variables. Mostlyregistered data were from patients aged from , samples were from patients aged between 25 to 35-years old, corresponding to (42.9% of the total number of patients, with 61.9% of them identified as female patients as shown in Table 1.), with a majority of them being females (61.9%) as

118 | shown in Table 1.

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122 | **Table 1. Patients' characteristics**~~Descriptive Statistics of collected data~~

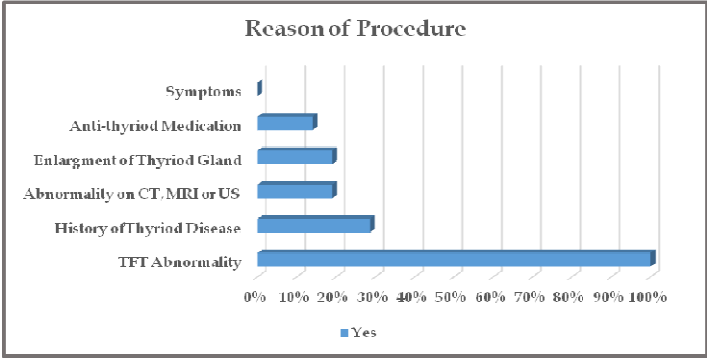
Variable		Number of Patients	Number %
Age	15 – 25	5	(23.83.8%)
	25 – 35	9	(42.92.9%)
	35 – 45	4	(19.0-0%)
	45 – 55	2	(9.59.50%)
	55 – 65	1	(4.54.80%)
Gender			
Gender	Male	8	(38.1%)
	Female	13	(61.9%)

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124 | From the assessment of the thyroid survey, 90% of the patients were on anti-thyroid drug
125 | medication before taking radioiodine therapy. According to the thyroid survey analysis, 95%
126 | of the patients have abnormal thyroid function- (obtained from thyroid scans), while 29%
127 | have a history of thyroid disease.

128 | _However, 19% of them had an abnormality on computed tomography (CT), magnetic
129 | resonance imaging (MRI) and on ultrasound (US). In fact, 19% complained of enlarged
130 | thyroid gland while 14% of them were on anti-thyroid drug medication (Figure 1)as it seen
131 | from Figure 1. _The most common type of drugmedication was Carbimazole. Patients
132 | showed symptoms such as tachycardia, weight loss, excessive sweating and tremors. Heat
133 | intolerance was more prevalent in female patients, while other clinical symptoms were equal
134 | in both gender groups, as shown in Table 2.

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137 | **Figure 1. Clinical findings indicating thyroid disorders**

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Table 2. The Relationship between patients' gender and correlation between gender and clinical symptom each symptoms respectively.

Symptoms		Gender		Uncertainty Coefficient			Test
		Male	Female	Symmetric	Gender	Symptom	
Heat Intolerance	Yes	2	6	0.391	0.383	0.400	Fisher's Exact
	No	12	1				Sig. (0.003*)
Nervousness	Yes	5	11	0.051	0.047	0.057	Fisher's Exact
	No	3	2				Sig. (0.325)
Rapid heart rate	Yes	8	0	0.055	0.035	0.123	Fisher's Exact
	No	12	1				Sig. (1.000)
Weight Loss	Yes	8	0	0.055	0.035	0.123	Fisher's Exact
	No	12	1				Sig. (1.000)
Eyes Changing	Yes	3	5	0.041	0.041	0.040	Chi-Square
	No	8	5				Sig. (0.284)
Excessive sweating	Yes	7	12	0.006	0.005	0.010	Fisher's Exact
	No	1	1				Sig. (1.000)
Tremors	Yes	7	1	0.006	0.005	0.010	Fisher's Exact
	No	12	1				Sig. (1.000)

* 0.0 = No Association, 0.0 < r ≤ 0.2 Very weak, 0.2 < r ≤ 0.4 Weak, 0.4 < r ≤ 0.6 Moderate, 0.6 < r ≤ 0.8 Strong, 0.8 < r ≤ 1.0 Very Strong.

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The Fisher Exact test shows a significant relationship between the correlation between patients' gender and symptoms (p=0.003). The results suggest a strong relationship between gender and the symptoms. level of significance.

However, most young male patients showed excessive sweating with a significant association (p=0.033). In addition, there are no significant associations between age groups and symptoms factors except for excessive sweating. In excessive sweating, there is a significant relationship between it (p=0.604), and it is a moderate association as it is shown seen in Table 3. The most common symptoms that have presented a statistical significance were tremors, tachycardia, excessive sweating and weight loss, which correspond to the with universal joint clinical symptoms.

Table 3. Relationship between patients' age and clinical symptoms
between Age and each symptoms.

Symptoms		Age					Contingency Coefficient	Test
		15 - 25	25 - 35	35 - 45	45 - 55	55 - 65		
Excessive sweating	Yes	5	9	3	2	0	0.608	Fisher's Exact
	No	0	0	1	0	1		Sig. (0.033*)
Nervousness	Yes	4	6	4	2	0	0.458	Fisher's Exact
	No	1	3	0	0	1		Sig. (0.346)
Rapid heart rate	Yes	4	9	4	2	1	0.371	Fisher's Exact
	No	1	0	0	0	0		Sig. (0.571)
Weight Loss	Yes	5	9	3	2	1	0.419	Fisher's Exact
	No	0	0	1	0	0		Sig. (0.333)
Eyes Changing	Yes	3	3	4	1	0	0.476	Fisher's Exact
	No	2	6	0	1	1		Sig. (0.173)
Heat Intolerance	Yes	3	7	4	0	0	0.539	Fisher's Exact
	No	2	2	0	2	1		Sig. (0.073)
Tremors	Yes	4	9	4	1	1	0.469	Fisher's Exact
	No	1	0	0	1	0		Sig. (0.262)

* 0.0 = No Association, 0.0 < r ≤ 0.2 Very weak, 0.2 < r ≤ 0.4 Weak, 0.4 < r ≤ 0.6 Moderate, 0.6 < r ≤ 0.8 Strong, 0.8 < r ≤ 1.0 Very Strong.

Thyroid Function Test (TFT)

The thyroid gland absorbed the radioactive material within 15-30 minutes of administration when using $^{99m}\text{Tc}^{[9]}$. The results were collected from 29 patients before and after they dose administration. Analysis of the blood samples permitted to verify the significant changes in T3, T4 and TSH levels within three months after radioiodine therapy administration. There is a significant change within three months after the ^{131}I treatment. It was observed a gradual drop in the level of T3 and T4. There is a gradual drop of T4 after three months, this last not

consistent with therapy response, inconsistent with responses to therapy and at the same time an increase in TSH level. It should be noted that TSH is increased within normal ranges with decreases in both T4 and T3. There is a substantial variation among all parameters analyzed, and in other words indicating that radioactive iodine administration produces substantial changes in thyroid functionality and permitting to use this type of therapy as an efficient procedure for cure patients (which means that the radioactive iodine response was very high (Table 4) and Figure 2).

The correlations relationship between TFT results, acquired before and after treatment, is shown in Table 5. There is a significant relationship between T4 before (T4_B) and after (T4_A) therapy taking radioactive iodine, whilst this relationship between either and TSH_B and T3_B or TSH_A and T3_A was considered not statistically significant, this suggesting that it is increasing but it is not significant between (TSH_B) and (T3_B) before and after (TSH_A) and (T3_A) treatment.

The relationship was not significant between test results before and after. These suggest that the random change in TSH level before and after treatment has no trend. However, it is important to note that TSH level changes in value, before and after therapy simultaneously, this does not indicate that there is no difference between TSH before and after treatment. (Please consider revising this part!! It does not match with Table 5 e Table 6)

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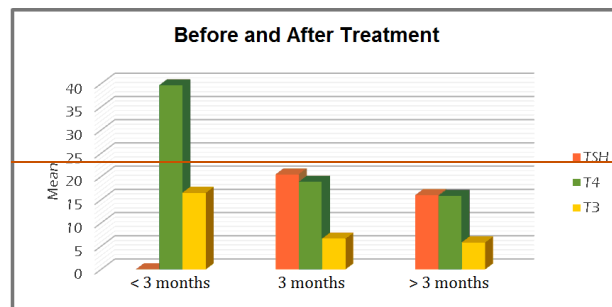
198 **Table 4. Descriptive statistics of variation in changing the value of TSH, T3 and T4**
199 **level before and after**
200 **radioiodine therapy the treatment**
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Variables		Descriptive Statistics		
		Mean	Std. Deviation	Skewness
Before Therapy	TSH_B	0.038	0.172	5.35
	T4_B	39.69	28.21	1.06
	T3_B	16.54	14.44	1.39
After Therapy	TSH_A	16.02	26.61	1.97
	T4_A	15.89	17.17	4.43
	T3_A	5.857	8.567	3.97

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206 **Figure 2. Histogram graph of TSH, T3 and T4 values before and after the treatment**
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Table 5. Relationship between Paired correlation of TSH , T3 and T4 level acquired before and after radioiodine therapy the treatment

Comparison Variables	Paired Correlation	
	Correlation	P-Value
TSH_B & TSH_A	-0.088	0.651
T4_B & T4_A	0.357	0.057
T3_B & T3_A	0.486	0.008*

* 0.0 = No Association, 0.0 < r ≤ 0.2 Very weak, 0.2 < r ≤ 0.4 Weak, 0.4 < r ≤ 0.6 Moderate, 0.6 < r ≤ 0.8 Strong, 0.8 < r ≤ 1.0 Very Strong.

Table 6. Statistical analysis presenting the difference between TSH, T3 and T4 level acquired before and after therapy procedure

Comparison	Paired T-test				
	Mean Differ	95% CI		t	p-Value
TSH_B & TSH_A	-15.98	-26.1	-5.85	-3.23	0.003*
T4_B & T4_A	23.80	13.41	34.18	4.69	0.000*
T3_B & T3_A	10.69	5.851	15.52	4.53	0.000*

* 0.0 = No Association, 0.0 < r ≤ 0.2 Very weak, 0.2 < r ≤ 0.4 Weak, 0.4 < r ≤ 0.6 Moderate, 0.6 < r ≤ 0.8 Strong, 0.8 < r ≤ 1.0 Very Strong.

One can infer from Table 4 and Table 5 that there is a significant difference between TSH, T3 and T4 values before and after radioiodine therapy, which means that the treatment is seen in Table 5 that there are significant differences before and after the treatment for TSH, T4 & T3, which means that the treatment has a strong effect on thyroid functionality and disease control. TSH is seen to increase after treatment whereas T4 & T3 decrease.

However, it was noted that within six months post-therapy administration, that 60% of patients were on Thyroxin, indicating a good response to the treatment, 30 % ; this is an indication of good response to treatment. On the other hand, 30% presented standard values of TSH, T3 and T4, and therapy failure was associated to only 10% of patients, this group needing to retake were normal after treatment and 10% of them encountered failure of therapy by the retaking Carbimazole. The degree of response to therapy for all patients can be observed through Figure 3.

On the other hand, Table 6 shows the relationship between TFT results before and after treatment. It is seen that there is a significant relationship between T4 before and T4 after taking radioactive iodine, and it is increasing but not significant between TSH and T3 before and after treatment. The physiological role of the radioactive iodine (RAI) describes the mechanism of RAI. The iodide transporter of the thyroid takes up the RAI in the similar way as the natural iodine process.

Table 6. Paired T-test shows the difference before and after the treatment of TSH, T3 and T4

Variables	Paired T-test				
	Mean Differ	95% CI		t	P-Value
TSH_B - TSH_A	-15.98	-26.1	-5.85	-3.23	0.003*
T4_B - T4_A	23.80	13.41	34.18	4.69	0.000*

247 $T3-B-T3-A$ 10.69 5.851 15.52 4.53 0.000*

248 $\ast 0.0 = \text{No Association, } 0.0 < r \leq 0.2 \text{ Very weak, } 0.2 < r \leq 0.4 \text{ Weak, } 0.4 < r \leq 0.6 \text{ Moderate, } 0.6 < r \leq 0.8 \text{ Strong, } 0.8 < r \leq 1.0 \text{ Very Strong.}$

249 The relationship between test result before and after was not significant. This suggests that

250 the random change in TSH before and after has no trend. At the same time, this also does

251 not mean that there is no difference in TSH before and after treatment. There are significant

252 differences before and after the treatment for TSH, T4 & T3, which means that the treatment

253 has a high impact on the disease. TSH is increasing after treatment, but T4 & T3 show

254 decrease. However, from Figure 3, 60% of the patients were on Thyroxin, and this is an

255 indication of good response to therapy. On the other hand, 30% were normal after the

256 treatment whereas 10% encountered failure to therapy by the retaking of Carbimazole.

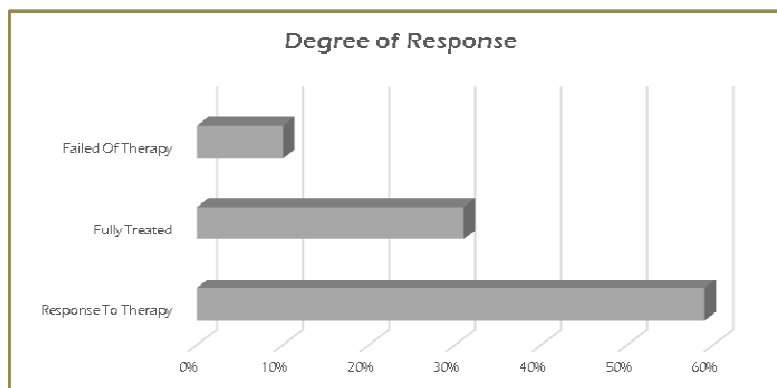
257 The routine thyroid gland imaging due to the high amounts of absorbed radiation doses

258 related to the long physical half life (eight days) and beta emissions is no longer used.

259 However, ¹³¹I continues to be valuable for the detection of metastases and recurrences in

260 differentiated thyroid cancer.^[16,17,18]

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263 **Figure 3. Treatment response experienced by patients after receiving radioiodine**

264 **therapy for Graves' Disease**

265 **The response to therapy of collected data during the**

266 **treatment duration.**

267 4. DISCUSSION

268 3.2. Discussion

269 It was observed in this study that Graves' disease (GD) is as an autoimmune disorder

270 characterized by the presence of thyroid-stimulating hormone (TSH) receptor antibodies. GD

271 clusters are found in families and genetic relations, but there is no single gene known to be

272 necessary or sufficient to cause GD.^[11, 12] In this study, the from the majority (42.9%) of

273 patients were between 25 to 35-years old, where most were females (61.9%). Assessment

274 of the thyroid survey shows that 90% of the patients were on antithyroid medication before

275 taking radioiodine therapy while 10% were not.^[4] The prevalence of thyrotoxicosis increases

276 with age.^[13, 14]

277 Graves' disease patients on radioactive iodine therapy responded highly significantly to the

278 treatment with radioactive iodine. Hypothyroidism was evidenced in 60% of patients and

279 euthyroidism was evidenced in developed hypothyroidism, 30% of them within six months

280 after therapy. being standard and only 10% did not respond to treatment. These results

281 agree conclusion comes with the recommendation of ATA regarding the treatment decision

282 based on among this category of patients and shows the importance of performing thyroid

283 scintigraphy and TFT in order to diagnose thyroid disease more accurately.

284 GD treatment seeks to suppress thyroid function. Options include anti-thyroid drug

285 medication, surgery or radioactive iodine administration therapy (¹³¹I-Nal). Radioiodine is

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considered a safe and effective therapysubstance with great potential for producing cure rate, although is expected to have a good patient selection and regular follow-up when indicating this therapy a potentially high cure rate although there are differences for the treatment of thyrotoxicosis with radioactive iodine with proper patient selection and regular follow-up.^[7,15]

Radioactive Iodine (¹³¹I) for Graves' hyperthyroidism has no adverse effects on the health of the patients' offspring.

The purpose of radioiodine therapy is to destroy sufficient thyroid tissue mass to lead the patient to help the patient either euthyroidism or hypothyroidism state. It remains the radionuclide choice for treatment because of the long half life of just over eight days.^[15] In the present study, the radioactive substance was absorbed by the thyroid gland within 15-30 minutes of administration, in case of using ^{99m}Tc or 4-6 hours using of ¹²³I. These were observed in 29 patients before and after taking the doses. There are a significant changes in TSH, T3 and T4 values within three months after the administration of taking ¹³¹I to patients, the treatment. There is a gradual drop in of T3 and T4 values, which is very clear after three months, but, not inconsistent with therapy responses responses to treatment. It was noted that TSH level increases in the majority of patients, whilst at a normal rate with decreases in both T4 and T3 decreases. There is considerable variation among TSH, T3 and T4 values measured before and after radioiodine therapy, and thus indicating that the radioactive iodine has a strong impact on thyroid function. all parameters, which means that the radioactive iodine therapy had a strong impact.

The requirement of high energy collimators results in a reduced spatial resolution. Combined with the fact that the radiation dose delivered is high, this explains why ¹³¹I is unfavorable for thyroid imaging. The two commonly used radiopharmaceuticals for imaging are ¹²³I and technetium-99m pertechnetate as TcO₄.^[7,8]

According to the thyroid survey analysis, 95% of patients have an abnormal thyroid function estimated from thyroid scintigraphy due to thyroid scan, while only 29% have a history of thyroid disease. However, 19% of patients had abnormal on CT, MRI and US, 19% complained of enlarged thyroid glands, while 14% were on antithyroid medication. The most common types of medication was Carbimazole. It can also be noted that most of the patients preclinical esented symptoms weresuch as tachycardia, weight loss, excessive sweating and tremors, compatible with other studies.^[9,17, 108, 116]

The clinical symptom of According to these symptoms, the heat intolerance was more evident in female patient while other symptoms were equal in both gender groups. These results can help physicians to better manage GD patients according to Though GD can have adverse effects if left untreated, it is not typically life threatening. It was found that GD is 5-10 times more common in women than in men. their necessities and respecting their individualitie.^[15]

54. CONCLUSION

The present study indicates that radioactive iodine therapy provides excellent treatment for Graves' disease. This alternative therapy is a safe procedure and with lower cost it is seen as a safer, compared to lower cost and effective alternative for hyperthyroid patients (with less complication) compared to anti-thyroid drug medication and thyroid medication or surgery.

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