Detection of Correlation of Histological changes with Hormone concentrations in Nodular Non Toxic Goiter Patients

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ABSTRACT

Background: Numerous physiological conditions are included in thyroid illness. One of these conditions is toxic nodular goiter, which is characterized by an enlarged thyroid gland which displays rounded growths that are known as nodules. Those nodes produce an excessive amount of thyroid hormone and are aberrant.

Methods: In order to identify the microscopic and macroscopically changes happening in thyroid glands that are affected by toxic nodular goiter in the two sexes, this work was carried out. There were thirty patients in total affected with toxic nodular goiter (8 men and 22 women).

Results: An examination under the microscope revealed a mono- and multi-nodular lesion with the hypertrophy. Some of the follicles and atrophy others. In the matrix of thyroid tissue, hemorrhages, calcifications, and fibrous bundles were observed. Microscopically, cellular hypertrophy, lymphoid nodules, hyperplasia, and an increase in follicular cysts were discovered. Diameters of the epithelial measurements were higher (Pandlt; 0.05) than those of the intact tissues. Those alterations may be brought about by the thyroid gland's ongoing stimulating action, which raises the activity of tissues and glands.

Conclusion: Numerous hormonal and histological changes are correlated with the formation of different types of Non Nodular Toxic Goiter Nodules.

Keywords: Nodular Non Toxic goiter, Fibrosis, TSH, T3, Hyperplasia, T4.

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INTRODUCTION

Tetraiodothyronine (T4) and Triiodothyronine (T3), two significant hormones, are produced by the thyroid gland, a sizable endocrine gland in the body¹.

Thyroid disorders, such as goiter, hypothyroidism, and hyperthyroidism, can develop in a person without any symptoms, and can progress to more serious stages before being diagnosed². A number of disorders can cause goiter, or an enlarged thyroid gland. Different types of goiters include those that are solitary, numerous, nodular, diffuse, and non-toxic or toxic. Thyrotoxicosis, a disorder brought on by an excess of thyroid hormones, and thyroid nodules work together to generate toxic nodular goiter³. lodine deficiency is common in people over forty years old, and it's more common in Europe than in Canada or the United States. This is because Europeans don't usually consume enough iodine in their diets⁴. The symptoms of hyperthyroidism, also known as thyrotoxicosis, include increased synthesis of the hormones T3 and T4, which causes tissues to burn through nutrients more quickly⁵. A common cause of hyperthyroidism is toxic multinodular goiter, which is characterized by functionally autonomous thyroid nodules6 that produce excessive amounts of thyroid hormones without thyroid stimulating hormone⁷ stimulation. Numerous conditions, including autoimmune diseases⁸ and malignant or benign tumors, as well as problems with the pituitary gland, can result pathogenicity in hyperthyroidism. Thyrotoxicosis' progresses through the thyroid's increased hypertrophy and activity, which may then result in the formation of nodules⁹. Goiter frequently develops as a result of thyroid tissue hyperplasia as its cause¹⁰.

MATERIALS & METHODS

Study Subjects: Over the course of 5 months, this investigation was carried out at the Hilla Teaching Hospital's Histopathology Department. 30 patients, 20 to 64 years old, of both sexes, participated in the study. The patients were transported to the hospital by consultant surgeons for surgery (thyroid gland ectomy). The patients' blood was drawn before to surgery for hormone therapy analysis. For comparison purposes, blood samples from healthy patients were also collected.

Methods: T3, T4, and TSH measurement. As a result, the procedure was conducted utilizing the Minividas method with the use of a kit provided by the French company Merieux¹¹.

Many procedures were done in this approach to prepare the histological sections, including assessing the color, quantity of nodules, calcification, cysts, and bleeding of the thyroid tissue following thyroidectomy. For preparing histological sections, all standard procedures were followed, including fixation, dehydration and washing, cleaning, sectioning, mounting, staining and infiltration. An Olympic microscope and an eye microscope were used to document different histological alterations in the thyroid tissues¹².

Statistical analyses: Two-way analysis of variance (ANOVA) has been utilized for the analysis of the data in the statistical program, and the lowest significant difference testing was then applied at P < 0.050 for confirming the statistical significances amongst the groups under study¹³.

RESULTS

Both sexes can develop hyperplastic nodules (also known as Nodular Nan Toxic Goiter), yet females seem to be more prone to the condition. Only 8 of the 30 patients were men, and median age of the patients has been 54 years (range: 20 to 70 years), whereas average age of the controls has been 35.26 21.43. The patients' female to male ratio was 2:1, but the control was 1.75:1. There has not been any substantial difference (P > 0.05) between the patient and control groups' female to male ratios. The distribution of patients based on nodule count. Hyperplastic nodules as follows, 11 (36.6) patients had a Single nodule, while 18(60%) patients had Multiple nodules, show present calcification for female16 (53.3%), while the male 4(13.3), distribution of patients according to the fibrosis the male 5(16.6) but the female 9(30.3), show hemorrhage in female 9 (30.0 %), while all other glands in male 2 (6.6%). Distribution of patient's male according to Lymphocytic in filtration female 6(20%) while mal 1 (3.3 %), show vascular degeneration male 1(3,3) but female7(23), show Table 1 and Figure 1-3.

Histological studies reveal variations in thyroid component values between diseased tissues and healthy tissues. The thyroids of patients showed a considerable rise in epithelial thickness, follicular diameter, and colloid diameter Table 2.

Thyroid hormone levels show improvement in all patients. Women have higher TSH than men and the difference is very important, patients have significantly higher T4 than healthy people Table 3.

The majority of individuals with Non Toxic Goiter have thyroid glands that are < 100cm in diameter, whereas the least number of the patients have thyroid glands that are 300–400 cm in diameter Table 4 and Figure 4,5.

Variable	n (%)
Mean age:	± st. deviation (years)
Patient	51.840±15.7
Control	39.260±21.430
Gender	

Table 1. Show Vascular Degeneration

Male	8 (26.6)
Female	22(73.3)
No nodule	2(6.6)
Single nodule	11 (36.6)
Multiple nodule	18(60%)
Calcification	(66,6%)
Male	4(13.3)
Female	16(53.3)
Hemorrhage	(36,3%)
Male	2(6.6)
Female	9(30.0)
Fibrosis	(43.30%)
Male	5(16.6)
Female	9(30.0)
Lymphocytic infiltration	(23%)
Male 1	3.3
Female	6(20)
vascular degeneration	(26.30%)
female	7(23)
male	1(3.3)



Figure 1: Shows Calcification & Sclerosis.



Figure 2: Shows Lymphocytic (H.E. 400x).



Figure 3: Shows Haemorrhage (H.E. 400x).

Table 2. Variations of the follicles, colloid and epithelium diameter of the thyroid that had been affected with the Non Toxic Goiter.

Groups		Measurements	
	Epithelium Thickness	Colloid Diameter	Follicle
Normal tissue	0.05 ± 0.570	1.480±5.230	1.100±5.890
Pathological tissue	0.33±0.810	1.620±7.690	1.020±9.510

Table 3. Mean values of the T3, T4 and TSH levels of the patients that have been affected with the Toxic Nodular Goiter.

Hormones levels	Ма	lles	Fema	ales
	Controls	Patients	Controls	Patients
T3(nmol)/L	0.19 ±1.28*	0.12 ±1.26*	0.14 ±1.59*	0.15 ±1.30*
TSH(Miu/ml)	0.3 ±1.57*	0.06 ±2.03*	0.53 ±1.85*	0.35 ±2.23*
T4(nmol/L)	2.05 ±71.12*	0.62 ±70.59*	3.71 ±74.59*	3.32 ±75.67*

Values are mean \pm SD

- Values with (*) are significantly at (P<0.050)

Table 4. Distribution of the patients affected with the Nodular Non Toxic Goiter according to the thyroid gland size.

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Volume (cm)	Male	female	Total No	Percentage
0-100 cm	4	12	16	53.3
200-100 cm	4	8	12	40
300-200 cm	1	1	2	13.3
400-300 cm	0	1	1	3.3
Total	8	22	30	100



Figure 4: Shows increase of Scalloping colloid in the follicles.



Figure 5: Shows increase in epithelial thickness.

DISCUSSION

The study found that out of 30 patients with thyroid diseases, 18.8% had Non Toxic Nodular Goiter. This is similar to previous studies which found that 20% of thyroid glands were affected with this condition. The rise in cases of a toxic nodular goiter could be caused by iodine shortage in the diet or the formation of autoantibodies (IgG) against TSH receptors ¹⁴. After exposure to foreign substances, immunoglobulin synthesis might be increased, and this could be related to hormonal abnormalities that are linked to the prevalence of immunodeficiency and autoimmunity¹⁵. The level of the lymphocytic infiltration of thyroid gland and TPOAb titer are highly correlated¹⁶.

In this study, 22out of 30 patients were female, and 8 were male. This shows that females are more likely to be affected by Non Toxic Goiter, and this is supported by previous studies. These researches discovered that the condition is predisposed by hormonal imbalance throughout pregnancy and adolescence¹⁷.

Levels of thyroid hormones (T3 and T4) were higher in people with a healthy thyroid than in people without a healthy thyroid, and this was linked with a decrease in the levels of thyroid-stimulating hormone (TSH)¹⁸. This suggests that people with a healthy thyroid produce too much thyroid hormone, which results in the production of antibodies which react with specific thyroid receptor proteins¹⁹. Those anti-bodies activate follicular cells, which produce excess T3 and T4 amounts. This reduces the production of TSH by a negative feedback mechanism²⁰.

The histological appearance of thyroid sections showed that there is a higher ratio of the thyroid glands with a volume that is greater than 100 cm than those with a volume greater than 200 cm. This was consistent with the study by Satpathy MC et al.²¹.

Some nodules on your thyroid gland can be caused by overproduction of thyroid hormones, and if this happens to elderly people, it could lead to hyperthyroidism. In addition, our results showed that all of the thyroid nodules observed were benign in form, and that the patients ranged in age from 20 to 70 years old. Those findings have been in agreement with earlier researches²².

The study found that 40% of affected tissues were cysts, and 85% of those tissues have been necrotic and degenerative²³. This agrees with previous studies, which found that 66.6% of the affected tissues were calcifications with hemorrhage, and that those calcifications made the gland get firmer and harder. It was also discovered that there was an accumulation of fibers linked to hemorrhage, which made up 43.3% of the total²⁴.

CONCLUSION

According to this work, women are more likely than males to have thyroid nodules. Additionally, a strong link was found between thyroid hormone improvement and histopathology.

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