Correlation of Thyroid Function Tests and Goitre

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Abstract

Background: To correlate the biochemical thyroid profiles with the clinical presentation of patients with enlarged thyroid gland.

Methods: In this descriptive study, 100 patients with goiter were selected. Clinical signs of hyper or hypothyroidism were noted. After history and examination, findings were recorded on the proforma and diagnosis was established whether the patient was clinically euthyroid or not. Blood samples were taken for biochemical evaluation to make a comparison of clinical finding with laboratory findings. The spearman correlation coefficient was calculated to determine the correlation between various attributes of the patient with the problem of goiter. A multivariate regression analysis was used to establish the neutrality between the clinical assessment and biochemical examination (two alternate tests) employed for the evaluation of the status of thyroid in patients with goitre.

Results: Sixty eight patients were clinically found to have simple goitre and 62 out of these were confirmed to be so by thyroid function tests. Whereas remaining 6 patients were found toxic biochemically. Clinical diagnosis was accurate in 91.17 % of cases of clinically euthyroid. Thirty two patients were having clinical features of toxicity which was confirmed to be so by biochemical assessment. Accuracy of clinical assessment of toxicity was 100 %.

Conclusions: Thyroid status of a patient with goitre can be promptly assessed clinically. Though the importance of thyroid function tests still stand when one or more of clinical features of toxicity make clinical judgment confusing, for medico legal purpose and patients on beta blockers

Key Words: Goitre, thyroid function test, Hyperthyroidism, hypothyroidism.

Introduction

Goitre is the cardinal symptom of most thyroid diseases. It develops as a result of stimulation of thyroid gland by TSH in response to a low level of circulating thyroid hormones. The goitre prevalence in iodine-deficient regions is up to 25%-54%. The mountain regions in north-west of Pakistan & Kashmir are probably the worst affected areas in the World. These areas are labelled as goitre belt due to high incidence of the disease in the area4. The recommended daily allowance of iodine is about 100 nanogram per day. The deficiency of iodine can cause a lot of complications like goitre, mental retardation, cretinism, high infant mortality rate, decreased fertility rate and increased perinatal death rate. Multinodular goitre is the most common presentation of thyroid disease in these areas. The female preponderance is well known and is due to increased requirement of iodine at the age of puberty (puberty onset goitre). Another situation when females require extra iodine is during pregnancy. 1-4

Thyroid is a Greek word which means "shield" after the shape of the related thyroid cartilage. Clinically patient can be euthyroid, hyperthyroid or hypothyroid. Hyponatremia, hyperlipidemia, myopathy with increased creatine phosphokinase levels, hypochromic microcytic anemia (up to 15% in primary hypothyroidism) increased homocysteine and lipoprotein levels with primary hypothyroidism, potentially contributing to an increased risk of atherosclerotic disease are few examples of complicated thyroid physiology. Hormonal production of the thyroid gland is constituted of thyroxine or T4 (80%) and triiodothyronine or T3 (20%). In the circulation, whole T4 originates from thyroid secretion but most of T3 (80%) is produced extrathyroidally from conversion of T4 to T3 and may be influenced by various conditions. Circulating T3 is a less reliable reflection of thyroid hormone production than T4. In serum most of T4 and T3 is bound to binding proteins and only 0.02% of T4 and 0.3% of T3 is free. Because of their higher diagnostic performance, free T4 (FT4) and free T3 (FT3) measurements have superseded total (free + bound) hormone determination.5-7

Hands, ears and eyes of the thyroid clinician are cost-effective tools to evaluate thyroid. Thus, despite the elegance of today’s thyroid function tests, their proper use and interpretation still require careful observation of the patient's symptoms and signs and assessment of the overall clinical situation of the patient.8,9
Treatment is often influenced by the evaluation of history and examination of thyroid as well as biochemical evaluation. Clinical technique for evaluation of thyroid gland could offer a quick and easy initial examination method for discovering most thyroid diseases. However, this clinical technique is frequently underestimated and its accuracy is not evaluated since technological advances have given the clinician a large armamentarium of tests permitting measurement of every aspect of thyroid. Frequently laboratory tests are used to manage thyroid disease. Therefore, we examined the question whether history and examination of thyroid can be determined with sufficient precision to undermine the biochemical evaluation.

**Patients and Methods**

This study was carried out in the Department of Surgery, Fauji Foundation Hospital, Rawalpindi from July 2010 to December 2011. Information was collected on pre designed proforma. Clinical signs of hyper or hypothyroidism were noted. Based on these findings, 100 patients were examined. After history and examination, findings were recorded on a proforma and diagnosis was established whether the patient is clinically euthyroid or not. After that, blood samples were taken for biochemical evaluation so that a comparison of clinical findings could be made. Recurrent goiter and patients with proven malignancy of thyroid were excluded from the study.

The Spearman correlation coefficient was calculated to determine the correlation between various attributes of the patient with the problem of goitre. A multivariate regression analysis was used to establish the neutrality between the clinical assessment and bio chemical examination (two alternate tests) employed for the evaluation of the status of thyroid in patients with goitre.

**Results**

Majority (99%) of the patients were females. Around 72 percent of the total females were up to the age of 47 years indicating that problem was dominant in mostly young or middle aged women. Pearson correlation coefficient for clinical diagnosis and biochemical diagnoses was 0.70, indicating quite high correlation between the two tests. The correlation coefficient was found relatively high -.23 between age and goitre with negative sign that re-confirmed the enormity of the problem in particularly among young and middle aged women. The correlation coefficient of the other observed attributes of the patients like emotional lability, palpitation and tiredness with goiter etc were found to be comparatively low(Table 1). The results from multivariate regression analysis showed that there was neutrality between two models based on two thyroid function tests; clinical versus bio-chemical diagnoses as the R-square value was found statistically significant for both models as well as very small difference was found between two competing tests(table 2). The two models were found to have similar adjusted R-square value that was .82 that confirmed the neutrality of the two tests. The F-value was also found to be highly significant for two models that indicated that predictors jointly affect the clinical and bio chemical diagnosis significantly. In clinical diagnoses model, pulse, palmar sweating, and tremors were found statistically significant as the p value of each was found to be less than 0.05. In biochemical diagnoses, the values of TSH was found statistically significant

<table>
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<th>Co-efficient</th>
<th>p-value</th>
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<td>Bruit</td>
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**Discussion**

Seventy two out of 100 patients in our study were of the age of 47 years, substantiating the preponderance
of young or middle aged women. 10,11 The specificity of thyroid stimulating hormone is very high, in establishing laboratory diagnosis. Guidelines recommend serum thyroid stimulating hormone (TSH) as the single most reliable test to diagnose all common forms of hypothyroidism and hyperthyroidism. 2 On the contrary, few studies showed that when the thyroidal status is unstable (first months of a thyroid treatment, altered L-T4 dose, sub-acute thyroiditis or when the hypothalamic-pituitary function is disturbed i.e. central hypothyroidism), TSH determination is diagnostically misleading and only free hormone measurements are reliable for thyroid function assessment. 13

In present study the clinical diagnosis of euthyroid patients was made with an accuracy of 91.17% and the accuracy was 100 % in cases of hyperthyroidism. Presently there are a sufficient number of sensitive and specific tests of thyroid function available to establish a diagnosis of thyroid disease with a high degree of precision. A variety of clinical situations, however, including but not limited to thyroid hormone resistance states, alterations in thyroid-binding proteins and nonthyroidal illness, challenge the clinicians to evaluate the thyroid status of the patient beyond that which can be done with routine laboratory tests. 14

Studies reveal that accuracy is high in clinical assessment of thyroid functioning as compared to assess the size and nodularity. 15, 6 Ultrasound is helpful where a solitary nodule will prove to be otherwise multiple. 17,18 Patient may present with other symptoms of thyroid disease. These include weight loss, anxiety or nervousness, increased sweating, tremulousness, diarrhea, palpitations, muscular weakness, heat intolerance, or history of treatment of an "overactive" thyroid.

Conclusions
1. Despite the elegance of today's thyroid function tests, their proper use and interpretation still require careful observation of the patients' symptoms and signs and assessment of the overall clinical situation of the patient.
2. Without clinical diagnosis, laboratory test can result in inappropriate treatment of patients.

References