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CORRELATION OF CLINICAL FINDINGS OF THYROID GOITRE WITH ULTRASONOGRAPHY

Endocrinology

Dr. Madhulika Mahashabde Professor, Department of Medicine, Dr.DY Patil Medical College And Hospital, Pimpri, Pune, Maharashtra, India.

Dr. Varun Nallamothu* PG Resident, Department Of Medicine, Dr.DY Patil Medical College And Hospital, Pimpri, Pune, Maharashtra, India. *Corresponding Author

ABSTRACT

Severe deficiency of iodine leads to thyroid goitre, which is an abnormal diffused or nodular growth of the thyroid gland. Diagnosis of goitre warrants a thorough examination of history, physical and clinical examination, laboratory testing and ultrasonography (USG). Goitre encompasses a wide spectrum of thyroid function disorders from hyperthyroidism, euthyroidism to hypothyroidism. Therefore, the present study was conducted to understand the various varieties of thyroid disorders with goitre, their clinical behaviour and analyse the various diagnostic methods we embark on a clinical study of goitre. A prospective study, conducted in a hospital between October 2016 September 2018, included patients with goitre with >12 years of age. All the patient underwent clinical examination, thyroid function tests and USG of neck with colour doppler. Fifty (n=50, 7 males, 43 females, age range: 31-40 years) patients were included. Clinical examination detected 19 patients with hyperthyroidism, 20 with hypothyroidism and one with subclinical hypothyroidism. However, based on USG, 21 (42%) patients were hypothyroid, 21 (42%) were hyperthyroid and the rest 8 (16%) were euthyroid. As per clinical presentation, 34 (68%) were diffuse goitres,10 (20%) were solitary nodules and 6 (12%) were multinodular goitres. However, according to USG, diffuse hypertrophy, diffuse hypertrophy with multinodular goitre, diffuse hypertrophy with solitary thyroid, nodule multinodular goitre and solitary thyroid nodule were present in 25, 9, 1, 9 and 6 patients, respectively. The present study concludes that USG accurately diagnosed 66.66% of multinodular goitres which were missed clinically.

KEYWORDS

Gioter, Thyroid, Hyperthyroidism, Hypothyrioidism, ultrasonography

INTRODUCTION

Imbalance in thyroid hormones lead to hypothyroidism and hyperthyroidism, which are further associated with devastating health related consequences [1]. Moreover, they are second most common endocrine disorder [2]. Generally, iodine nutrition has a key impact on thyroid health and its severe deficiency leads to (iodine intake <50 microgram) leads to thyroid goitre. About 1.5 billion people globally are at risk of developing iodine deficiency disorders amongst which 200 million people are Indians [3]. Prevalence of goitre in regions with severe iodine deficiency is expected to be 80% [4] while the prevalence in general population at global level is 15.8% [5]. Basically, goitre is an abnormal growth of the thyroid gland which can be of diffused or nodular type with the former being the most common type. Diagnosis of thyroid diseases, especially goitre, warrants a thorough examination of history, physical and clinical examination, laboratory testing and ultrasonography [6]. Goitre encompasses a wide spectrum of thyroid function disorders from hyperthyroidism, euthyroidism to hypothyroidism [4, 7]. Therefore, the present study was conducted to understand the various varieties of thyroid disorders with goitre, their clinical behaviour and analyse the various diagnostic methods we embark on a clinical study of goitre.

MATERIAL AND METHODS

Study design

A prospective study was carried out in Dr. D.Y. Patil Medical College and Hospital, Pune during the period of October 2016 to September 2018.

Study population

Patients, both males and females, above the age of 12 years, with goitre attending the department of medicine were included in the study. Pregnant patients, critically ill patients and patients with drug induced thyroiditis were not included in the study.

Diagnostic procedure

Initially, the patients underwent a detailed history followed by thorough clinical examination. Subsequently, thyroid function tests were performed followed by ultrasonography of neck with colour doppler using real-time high-resolution ultrasound transducer of 5MHz frequency. Colour doppler was used to determine the vascularity of the goitre. Ultrasonography was carried out in the department of radiology of the hospital.

RESULTS

Study population

A total of 50 (7 males and 43 females, mean [standard deviation; SD] age: , age range: 31-40 years) patients were included in the study. The demographic profile of the patients is presented in **Table 1**.

Parameter	Details
Total patients	50 (Female 43; Male 7)
Goitre grade	27 (Grade 1), 17 (Grade 2), 3 (Grade 1B), 2 (Grade 1A)

Diagnosis of goitre

Clinical examination

All the patients underwent clinical examination for the presence of goitre. Among the total patients, 19 patients were detected with hyperthyroidism, 20 with hypothyroidism and one with subclinical hypothyroidism. On clinical examination of thyroid, 34 (68%) were diffuse goitres,10 (20%) were solitary nodules and 6 (12%) were multinodular goitres.

Thyroid function tests

Post clinical examination, all the patients underwent thyroid function tests viz. TSH, T3, and T4. The normal range considered during the study has been presented in **Table 2**. Based upon the thyroid function tests analysis, 21 (42%) patients were found to be hypothyroid, 21 (42%) were hyperthyroid and the rest 8 (16%) were euthyroid.

Table 2: Normal range for thyroid function tests

Total T3	60-200 ng/dl
Total T4	4.5-12 µg/dl
TSH	0.3-5.5 µIU/ml

Ultrasonography

After biochemical confirmation, all the patients underwent ultrasonography. Ultrasonography confirmed the results of thyroid function tests and reported hyperthyroidism in 21 patients (3 males, 18 females), hypothyroidism in 21 patients (2 males, 19 females) and euthyroidism in 8 patients (2 males, 6 females).

Among 21 patients with hyperthyroidism, 12 patients had diffuse hypertrophy, six had diffuse hypertrophy with multinodular goitre and three patients had multinodular goitre. Patients with euthyroidism (n=8) had diffuse hypertrophy (n=3), diffuse hypertrophy with multinodular goitre (n=1), multinodular goitre (n=3) and solitary thyroid nodule (n=1). Ten (n=10) hypothyroid patients has diffuse hypertrophy while three had Diffuse Hypertrophy with Multinodular Goitre. Hypothyroid patients also had multinodular goitre (n=3) and solitary thyroid nodule (n=5) (**Table 3**).

Overall, 50% of patients had diffuse hypertrophy, followed by diffuse

hypertrophy with multinodular goitre and multinodular goitre affecting 18% each (**Table 3**). A total of 56% of patients had grade 3 goitre, 34% had grade 2 goitre and 10% had grade 1 goitre.

Table 3: Diagnosis of type of goitre using ultrasonography

USG Neck	Euthyroid	Hyperthyroid	Hypothyroid	Total	Percentage
Diffuse Hypertrophy	3	12	10	25	50
Diffuse Hypertrophy with Multinodular Goitre	0	6	3	9	18
Diffuse Hypertrophy with Solitary Thyroid Nodule	1	0	0	1	2
Multinodular Goitre	3	3	3	9	18
Solitary Thyroid Nodule	1	0	5	6	12

Table 4 shows the colour doppler findings according to which 48% of goitres had normal vascularity and 52% goitres had increased vascularity. About 66.7% of hyperthyroid patients had increased vascularity on colour doppler.

TABLE 4: VASCULARITY ON USG COLOUR DOPPLER.

Thyroid Status	Normal Vascularity	Increased Vascularity
Euthyroid	5	3
Hyperthyroid	7	14
Hypothyroid	12	9
Total	24	26
Percentage	48	52

Comparison between all the metohds of examination

Out of 21 cases of hyperthyroidism diagnosed biochemically, 19 were detected clinically, 2 were missed. Out of 21 cases of hypothyroidism diagnosed biochemically, 20 were detected clinically, one was subclinical hypothyroidism (**Table 5**).

Table 5: Clinical findinigs vs. ultrasonography in determining activity of thyroid goitre.

	Hypothyroid	Hyperthyroid	Euthyroid
Clinical examination	20	19	1
Thyroid function test	21	21	8
Ultrasonography	21	21	8

When compared with ultrasound findings, 8 out of 34 clinically diagnosed diffuse goitres were multinodular and 4 out of 10 solitary nodules were in fact multinodular. (Table 6).

Table 6: Type of goitres

	Diffuse Hypertrophy	Diffuse Hypertrophy with Multinodular Goitre	Diffuse Hypertrophy with Solitary Thyroid Nodule	Multinodular Goitre	Solitary Thyroid Nodule
Clinical examination	Diffuse: 34			6	10
Ultrasonography	25	9	1	9	6

DISCUSSION

Goitre, an abnormal growth of thyroid gland, generally has no or unspecific symptoms. However, in severe cases, symptoms may include cough, hoarseness of voice, dysphagia and difficulty in breathing [8]. Goitre is caused due to iodine deficiency, Hashimoto's thyroiditis, grave's disease injuries, etc. among these iodine deficiency is the most common[2].

Goitre is generally diagnosed via clinical or physical examination of neck. The goitre is considered diffused when the gland swells up entirely while if only a specific region or nodule swells up, it is a nodular goitre. However, to determine the activity (hypo- or hyperthyroidism) of thyroid gland, it is essential to perform thyroid function tests. Ultrasonography is usually recommended to all the patients with thyroid disorders so as to determine the characteristics of the goitre including thyroid size and type of goitre [2, 3, 8, 9]. Ultrasonography or ultrasound scanning is a non-invasive, cost-effective imaging test [10]. Epidemiological studies reported higher prevalence of goitre in studies using ultrasonography as a diagnostic test than the studies assessing the presence of goitre by physical examination.[11].

The present study was conducted to compare the clinical findings of patients with goitre with the ultrasonographical findings. All the diagnostic tests, *i.e.*, physical examination, thyroid function test and ultrasonography were performed on all the patients. However, the results were more accurate using ultrasonography as diagnostic test. Comparing all the tests, clinical examination identified lesser number of patients with thyroid disorders than the other two tests (hypothyroidism: 20 vs 21; hyperthyroidism: 19 vs. 21; euthyroidism: 1 vs. 8). Literature also supports the present study as studies report higher percentage of patients with nodules who are detected using ultrasonography (up to 50% using autopsy surveys vs. 20-76% using ultrasonography) [11]. Reiners et al., 2004 assessed the prevalence of thyroid nodules or goitre in 96278 patients aged 18–65 years using ultrasonography and reported 33.1% with thyroid goitres or nodules (size: >0.5 cm), 9.7% with enlarged gland without nodules and 14.3% population with nodule without thyroid enlargement. About 9.1% of population had nodular goitre. In addition, the patients with a single palpable nodule has 20–48% additional nodules which were detected by ultrasonography[12].

Ultrasonography is also superior in confirming clinically diagnosed goitres. In the present study, 8 out of 34 clinically diagnosed diffuse goitres were multinodular, 4 out of 10 solitary nodules were multinodular and 4 out of 10 clinically solitary nodules were in fact multinodular. Similarly, Kumar et al. found clinically nonpalpable accessory nodules in 20.6% cases using ultrasonography in 193 patients with solitary thyroid nodule[13]. Another study by Mazzaferri et al. reported that 40% of solitary nodules diagnosed clinically were in fact multinodular goitres and this was confirmed using ultrasonographic technique[14].

Although there is a clinical grading system for goitre size, USG is undoubtedly better in assessing goitre size and volume. In the present study, on USG colour doppler, 26 patients were found to have increased vascularity of thyroid gland, of which 14 patients (61.5%) were hyperthyroid. Bogazzi et al observed increased vascularity in patients with hyperthyroidism. Slightly increased vascularity was observed in hypothyroidism Hashimoto's thyroiditis as well[15]. This suggests that thyroid stimulation is by TSH or TSH-receptor antibody and is responsible for the increased thyroid blood flow.

Ultrasonography (USG) accurately diagnosed 66.66% of multinodular goitres which were missed clinically. The diagnosis of solitary thyroid nodule, multinodular goitre and diffuse goitre by ultrasound was nearly 100% accurate. Thus, USG has a clear-cut edge over clinical examination of thyroid in identifying the nature of swelling.

The advantages associated with the use of ultrasonography includes that it is a simple, painless, non-invasive, easily reproducible procedure and doesn't require patient preparation. It is highly accurate (>90%) in giving number, size and nature of nodules like solid, cystic and mixed. USG is definitely better than physical examination, MRI, CT, thyroid scan in detecting thyroid nodules and volume [14]. It enhances diagnostic accuracy of FNAC by guiding needle into nodule[16].

CONCLUSION

Ultrasonography is one of the most important diagnostic tools. It was almost 100% accurate in giving the number and size of lesions of thyroid. It helped in differentiating solid, cystic and mixed lesions. Thus, it is the most important investigation to be done in a patient with goitre.

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