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Dr. Amitkumar J Choudhari
Assistant Professor,
Department of Radiodiagnosis,
Tata Memorial Centre,
Mumbai, India

Dr. Nijalingappa
Assistant Professor,
Department of Radiology, Al amen Medical College, Bijapur, Karnataka, India

Corresponding Author:
Dr. Nijalingappa
Assistant Professor,
Department of Radiology, Al amen Medical College, Bijapur, Karnataka, India

Profile of patients with thyroid diseases of ultrasonography

Dr. Amitkumar J Choudhari and Dr. Nijalingappa

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Abstract
Many diagnostic approaches have been described for imaging the thyroid including Ultrasonography with Colour Doppler, Scintigraphy, CT, Sonoelastography, Magnetic Resonance Imaging, Positron Emission Tomography, and Single Photon Emission Computed Tomography Ultrasound examination is a relatively cheaper and easily available and sensitive modality for imaging the thyroid without the hazards of radiation. This was a prospective study to evaluate if nodule/s is/are benign or malignant by ultrasonography and Doppler study and pathological correlation in at least 50 patients referred in view of clinically / incidentally (Carotid Duplex Doppler / neck ultrasound for non thyroid pathologies) detected goitre / thyroid nodule. Of the pathologically proven cases of malignant nodules (2), one (1.43%) case with malignant nodule showed evidence of microcalcifications and one (1.43%) did not. Out of all 70 nodules, 2 (2.86%) cases of pathologically proven benign nodules showed micro calcifications and 66 (94.29%) benign cases were negative for microcalcification. The sensitivity of micro calcifications as a ultrasound risk factor for malignancy was found to be 50% and specificity, 97.1%.

Keywords: Profile, Thyroid diseases, Ultrasonography

Introduction

Historical references to what we now know as the thyroid gland arise early in medical history. In 1600 BC the Chinese were using burnt sponge and seaweed for the treatment of goitres (enlarged thyroid glands). Celsus first described a bronchoceole (a tumour of the neck) in 15 AD. Around this time Pliny referred to epidemics of goitre in the Alps and also mentioned the use of burnt seaweed in their treatment, in the same way as the Chinese had done 1600 years earlier. In 150 AD Galen, an instrumental figure in the transition from ancient to modern medicine, referred to 'spongia usta' (burnt sponge) for the treatment of goitre. He also suggested (incorrectly, as it turns out) that the role of the thyroid was to lubricate the larynx [1].

In 650 AD, Sun Ssu-Mo used a combination of seaweed, dried powdered mollusc shells and chopped up thyroid gland for the treatment of goitre. Ali-ibn-Abbas was the first to discuss surgery as a treatment for goitres in 990 AD. Jurjani's 'Treasure of Medicine' in 1110 AD first associated exophthalmus, the protrusion of the eyes we now associate with Graves' disease, with goitre.

It was not until 1475 that Wang Hei anatomically described the thyroid gland and recommended that the treatment of goitre should be dried thyroid. Paracelsus, some fifty years later, attributed goitre to mineral impurities in the water. Finally, In 1656 Thomas Wharton named the gland the thyroid, meaning shield, as its shape resembled the shields commonly used in Ancient Greece [2].

In 1811, Paris discovered iodine in the burnt ashes of seaweed and the idea that this was the active ingredient in the treatments that were prescribed for goitre developed. Ten years later Prout was the first to recommend iodine in the treatment of goitre. In 1835, Graves published his accounts on exophthalmic goitre. Ord first described myxoedema in1878. Rehn carried out the first thyroidectomy (removal of the thyroid gland) for exophthalmic goitre in 1880 [3].

Theodor Kocher demonstrated that total thyroidectomy caused hypothyroidism but thought that the symptoms were due to chronic air way obstruction, it was not until 1888 that it was realised that the cause of the symptoms was the lack of thyroid. Recommended treatment was "half a sheep's thyroid lightly fried and taken with current jelly once a week". Kocher was awarded the Nobel Prize for Medicine in 1909.Kocher was one of greatest surgeons of his era, he was born ar Berne in 1841 and died during the first world war in 1917 [4].

The name thyroid is derived from the Greek description of a shield-shaped gland in the anterior aspect of the neck (thyreoides). Direct surgical approaches to thyroid masses had frighteningly high complication and mortality rates.

The tissue bud that ultimately becomes the thyroid gland arises initially as a midline diverticulum in the floor of the pharynx. This tissue originates in the primitive alimentary tract and consists of cells of endodermal origin. The main portion of this cellular structure descends into the neck and develops into a bilobar solid organ. The original attachment in the pharynx is in the buccal cavity at the foramen cecum. This structure becomes the thyroglossal duct, which is usually reabsorbed after 6 weeks of age. The very distal end of this remnant may occasionally be retained and mature as a pyramidal lobe in the adult thyroid [5].

Microscopic thyroid follicles first appear as the lateral lobes develop. When the embryo is about 6 cm in length, these follicles begin to develop colloid. In the third month the follicular cells first demonstrate iodine trapping, and thyroid hormone secretion initially begins. Calcitonin-producing C cells arise from the fourth pharyngeal pouch and migrate from the neural crest into the lateral lobes of the thyroid. These cells migrate into the lateral and posterior upper two thirds of the thyroid lobes and are distributed among the follicles. In adults, they remain limited to the upper and middle areas of the gland, usually in the posterior and medial aspects. These C cells are the only component of the adult gland not of endodermal origin [6].

Many diagnostic approaches have been described for imaging the thyroid including Ultrasonography with Colour Doppler, Scintigraphy, CT, Sonoelastography, Magnetic Resonance Imaging, Positron Emission Tomography, and Single Photon Emission Computed Tomography Ultrasound examination is a relatively cheaper and easily available and sensitive modality for imaging the thyroid without the hazards of radiation.

Methodology

This was a prospective study to evaluate if nodule/s is/are benign or malignant by ultrasonography and Doppler study and pathological correlation in at least 50 patients referred in view of clinically / incidentally (Carotid Duplex Doppler / neck ultrasound for non thyroid pathologies) detected goitre / thyroid nodule.

USG and Doppler study of thyroid nodule was performed on Philips iU22 (Philips Medical Systems, Bothell, WA, USA) using linear transducer of 5MHz To 17MHz.

US options utilized for the diagnosis of thyroid diseases include the following:

1. Grayscale
2. Color Doppler Imaging
3. Power Doppler Imaging
4. Panoramic scan

The patient was positioned supine, with the head thrown back and a bolster under the shoulders.

USG and color flow in each nodule will be characterized under the guidance of consultant radiologists.

Further, above patients were subjected to US Guided FNAC using 23 – 27 G needle as per the consensus recommendation of the Society of Radiologists in Ultrasound for confirmation of benign and malignant lesions.

Results

Table 1: Distribution of thyroid nodules based on sex

Sex	Total	Percent
Female	55	76
Male	17	24
Grand Total	72	100

In the present study, nodular thyroid disease was more common in female population. Of all the patients with thyroid nodules, 76% were females and 24% were males. Thus, thyroid nodular disease is more common in women, which is in concordance with several studies.

Table 2: Age based distribution of thyroid nodules

Age group (years)	Total
21-30	4
31-40	15
41-50	14
51-60	16
61-70	18
71-80	5
Grand Total	72

The distribution is scattered over various age groups. As per several studies (45, 59), the incidence of thyroid nodules increases with increasing age. There is similar increase in frequency of thyroid nodules with advancing age in this study, though some reduced incidence is noted in the age group 71 – 80 years, probably related to less number of patients seen in this age group.

Table 3: Age based distribution of thyroid nodules

Age (years)	Nature		Grand Total
	Malignant	Benign	
21-30		4	4
31-40	1	14	15
41-50	1	13	14
51-60		15	15
61-70		18	18
71-80		5	5
Grand Total	2	69	71

In our study, malignancy in thyroid nodule was seen in the 31 – 40 and 41 – 50 age groups.

Table 4: Association of microcalcification with malignant and benign thyroid nodules

Microcalcifications	Nature		Grand Total
	Malignant	Benign	
Present	1.43%	2.86%	95.71%
	1	2	67
Absent	1.43%	94.29%	4.29%
	1	66	3
Grand Total	2.86%	97.14%	100.00%
	2	68	70

Table 5: Validity Parameters

Parameter	Estimate
Sensitivity	50.0 %
Specificity	97.1 %
Positive Predictive Value	33.3 %
Negative Predictive Value	98.5%

Of the pathologically proven cases of malignant nodules (2), one (1.43%) case with malignant nodule showed evidence of microcalcifications and one (1.43%) did not. Out of all 70 nodules, 2 (2.86%) cases of pathologically proven benign nodules showed microcalcifications and 66 (94.29%) benign cases were negative for microcalcification.
The sensitivity of microcalcifications as a ultrasound risk factor for malignancy was found to be 50% and specificity, 97.1%.

Discussion

Thyroid nodules are common in people living in iodine sufficient areas, their prevalence being dramatically increased in iodine-deficient areas. The great majority of nodules are benign, less than 5% of them being malignant.
Various imaging techniques have been developed for imaging the thyroid, since. Ultrasound has been a very sensitive modality in diagnosing and characterizing thyroid pathologies. Ultrasound has a special role in guiding fine needle aspiration of thyroid and extrathyroid lesions [7].
In this study, 72 patients with thyroid nodules were evaluated on sonography and results compared with pathological diagnosis.
In the present study, nodular thyroid disease was more common in female population. Of all the patients with thyroid nodules, 76% were females and 24% were males. This finding concurs with several studies showing higher rates of thyroid nodular disease in female population.
Out of the 72 cases, two cases had inadequate cytological material and hence pathological correlation was available in 70 cases. Most of the thyroid nodules studied were benign with only 2 lesions being malignant. This is in keeping with the low prevalence of thyroid malignancy as per several studies.
Malignant nodules were observed in the 31 – 40 and 41 - 50 years age groups.
The sensitivity of microcalcifications as a ultrasound risk factor for malignancy was found to be 50% and specificity, 97.1%. Various studies have shown that microcalcification is a highly specific ultrasound fing in malignant thyroid nodules, but lacks specificity [8, 9].
The sensitivity of solid consistency of a nodule as a predictor of malignancy was found to be 100% and specificity, 57.4%.
In our study, the sensitivity of a solitary nodule being malignant was 50% with a specificity of 86.8%. Many studies have refuted the belief that the rate of malignancy is higher in solitary thyroid nodule as compared to multinodular thyroid [10].

Conclusion

- Ultrasonography is a very sensitive modality for detection of thyroid nodular disease that may or may not be clinically evident.
- Ultrasonography may help in differentiating malignant from benign disease in cases with thyroid nodules, however FNAC continues to remain the gold standard for thyroid nodule characterization.

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