

Original Article**Characterization of Thyroid Nodules using Thyroid Scintigraphy**

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ABSTRACT

Thyroid scintigraphy and Fine needle aspiration cytology is a diagnostic tool used in the clinical workup of solitary thyroid nodules, to triage them into operative and non-operative lesions, as they have higher incidence of malignancy. The main objective of this study was to characteristics of thyroid nodule/s use thyroid scintigraphy in comparison to FNAC. Thyroid scan and FNAC was performed in 52cases with clinically palpable thyroid nodule/s in the department of Nuclear medicine in (RICK). Out of 52cases, 44(84.6%) were female and 8(15.4%) were male. The mean age is 41 years. diagnosed 48(92.3%) cases as benign and 4(7.7%) cases as malignant. The most common benign nodule was colloid goiter nodule38(73%). Although thyroid scan and FNAC is a good diagnostic tool for solitary thyroid nodules, ultrasound guided FNAC would have been better option for increasing accuracy of the diagnosis.

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INTRODUCTION

Thyroid disorders affect a wide spectrum of our population. Numerous imaging modalities, including nuclear medicine, ultrasonography, X-ray fluorescence, computerized tomography (CT) and, more recently, magnetic resonance imaging MRI, have been used in an attempt to provide a pathophysiologically related diagnosis in patients with diseases of the thyroid¹

Nuclear medicine imaging of thyroid provides useful information about the shape, size and site of thyroid tissue, the function of thyroid nodule, and functioning thyroid tissue in patients with thyroid carcinoma. Either iodine -123 (I^{123}) or technetium-99m (Tc^{99m}) may be used². Iodine deficiency continues to be a significant public health problem in many areas of the world^{3,4}.

A thyroid nodule is a 'discrete lesion within the thyroid gland that is palpably and/or ultrasonographically distinct from the surrounding thyroid parenchyma⁵. Thyroid

nodules are extremely common, with 7% of adults having palpable nodules⁶ and up to 50% of adults having nodules visible on ultrasound⁷ around 5% of thyroid nodules are malignant⁸. Thyroid nodules may occur as isolated, often incidental findings, or they may be associated with systemic features of thyrotoxicosis or hypothyroidism.

They may be solitary or may present as a dominant nodule in a multinodular goitre. Solitary nodules have a higher likelihood of being malignant although overall the prevalence of cancer is similar between patients with a solitary nodule and patients with multiple nodules^{9,10}. The challenge for the general practitioner is to assess the nodule and determine which patients require referral to a surgeon or endocrinologist for further investigation and management. Referral may be required to exclude or confirm malignancy and is also indicated for patients who are symptomatic from benign thyroid nodule.

This study is based on the fine needle aspiration cytology and thyroid scintigraphy is highly sensitive and specific in detecting thyroid malignancies in solitary thyroid nodules and can be used as sole investigation for deciding management protocol in solitary thyroid nodule. Role of thyroid scintigraphy in distinguish thyroid nodule (benign-malignant) and characterized them into appropriate management.

This study aimed to Detect, localization, and evaluation of independent functioning nodule, to Differentiate benign from malignant nodules ,to determine the histopathology type of nodule ,to determine sensitivity and specificity for both motilities ,and to determine endemic distribution. This study provides information about: explain how and when we should use physical exam, ultrasound, biopsy and nuclear medicine procedures as important tools in detection of nodule, differentiation between benign and malignant nodule and sensitivity of thyroid scintigraphy and fine needle aspiration to detect and recognize thyroid nodule.

MATERIAL AND METHODS

This study was done in Nuclear Medicine Department, Radiation and Isotope Center of Khartoum (RICK)

Study sample and method of data collection:

Written consent was taken from patients included in the study. Clinical evaluation of the nodule/s was performed. Clinical history regarding appearance of nodule/s, pain was thoroughly inquired. Inquiry was made regarding duration of symptoms and any other associated complain. The demographic details of the patient like age, associated family history were noted on the Performa. The examiner filled Performa after asking questions and examinations. All the patient included in the study underwent to scan thyroid uptake use TC99m

Inclusion Criteria

- Patients admitted through outpatient department having solitary thyroid swelling.
- Both sexes and all ages were included.

Exclusion Criteria:

- Patients with diffuse thyroid disease.
- Patients with associated medical illness e.g. hypertension, hepatic or renal failure.
- Patients not giving consent for the FNAC.

Study equipment:

The gamma camera is the principal instrument for imaging in nuclear medicine it consists of a large detector in front of which the patient is positioned. Gamma cameras with more than one detector are now common, allowing a higher throughput of patients by acquiring two or more views simultaneously. Every aspect of the modern gamma camera is under computer control, allowing the operator to select the study acquisition time, or the number of counts to be acquired, to set the pulse height analyzers to reject scattered radiation, control the detector and patient bed positions for SPECT and whole body procedures, and display the image.

The basic principles of how a camera works are shown in Figure 2.3. The image of the distribution of the gamma-ray-emitting radiopharmaceutical is produced in the scintillation crystal by a collimator. The gamma rays, which are not visible to the eye, are converted into flashes of light by the scintillation crystal. This light is, in turn, transformed into electronic signals by an array of photomultiplier tubes (PMT) viewing the rear face of the crystal. After processing, the outputs from the PMTs are converted into three signals, two of which (X and Y) give the spatial location of the scintillation while the third (Z) represents the energy deposited in the crystal by the gamma ray. To improve their quality these signals then pass through correction circuits. The Z signal goes to a pulse height analyzer (PHA), which tests whether the energy of the gamma ray is within the range of values expected for the particular radionuclide being imaged. If the Z signal has an acceptable value, then a signal is sent instructing the display to record that there has been a gamma ray detected, the position being determined by the X and Y signals.

fine needle aspiration:

- Syringe holder or syringe pistol. The most commonly used is the Cameco syringe pistol (Belpro Medical, Anjou, Quebec). The pencil-grip syringe holder is another such device (developed by Tao and Tao Technology, Inc, Camano Island, Washington).
- Disposable 10-mL plastic syringes
- Disposable 25- or 27-gauge needles, 1.5 inches long
- Glass slides, with 1 end frosted on 1 side, 1.0 mm thin (Gold Seal; Erie Scientific Co, Portsmouth, New Hampshire)

- Alcohol preparation sponges
- Alcohol bottles for immediate wet fixation of smears
- Gloves. Current regulations of the US Occupational Safety and Health Administration require that the person performing a biopsy wear protective gloves
- Containers for cystic fluid collection and transportation to the cytology laboratory
- Laboratory slips with the patient's name, clinic number, biopsy sites, and other relevant information for transfer to the cytology laboratory

Method of Data analysis:

The data would be analyzed by using statistical professional for social studies. Demographic data, symptoms, examination and investigation variables were described by simple

statistical manners, e.g. mean, S.D, operational variables were described by percentages.

RESULT

The present study deals with investigation of thyroid nodules using thyroid scintigraphy and biopsy.

Out of 52cases, 44(84.6%) were female and 8(15.4%) were male. The mean age is 41 years. diagnosed 48(92.3%) cases as benign and 4(7.7%) cases as malignant. The most common benign nodule was colloid goiter nodule38(73%). Although thyroid scan and FNAC is a good diagnostic tool for solitary thyroid nodules, ultrasound guided FNAC would have been better option for increasing accuracy of the diagnosis.

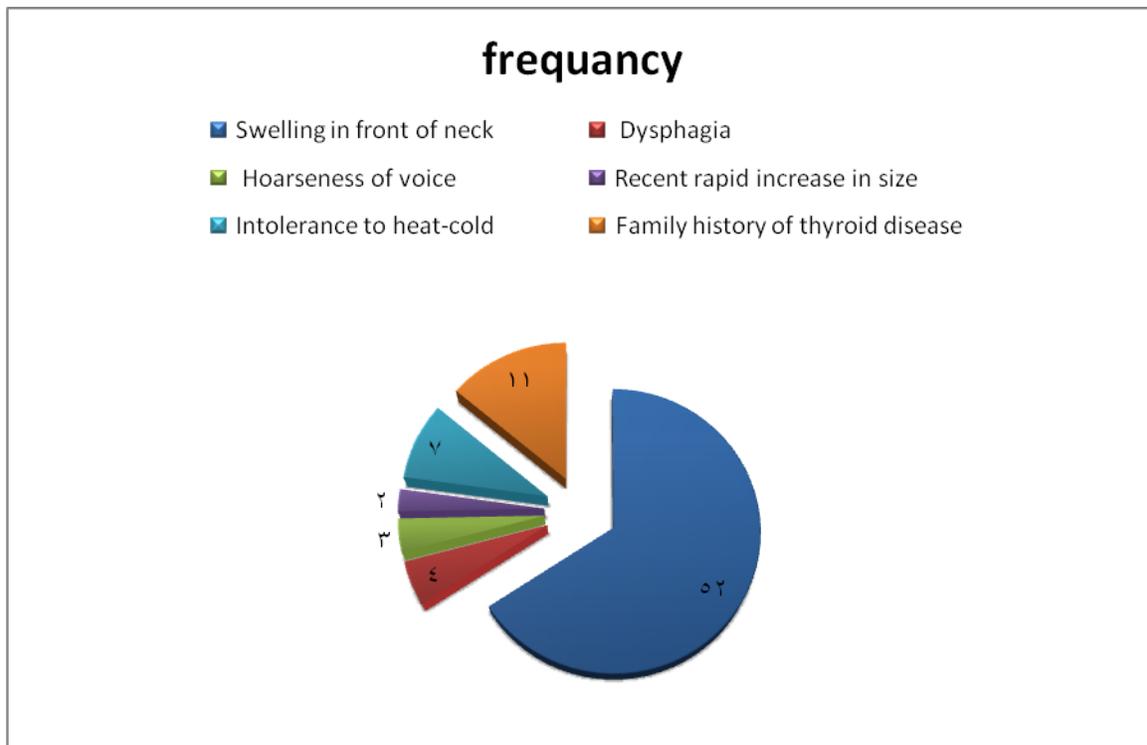


Fig. 1: represent the Clinical presentation of patient of thyroid nodule

DISCUSSION

Thyroid scintigraphy and FNAC plays an important role in the diagnosis of STN. Nature of disease, experience and understanding of certain limitations determine its diagnostic utility.

This study deals with thyroid scintigraphy and FNAC of thyroid performed in 52 patients.

Mean age of the patients under study was 41 yrs and the majority of them were females, with female to male ratio being 1 Thyroid scan confirmed that 2 (3.9%) cases having hot nodule and 50 (96.1%) of the cases showed cold nodules so it was by far the most common group in this study. with in the range of previous study of other authors and the majority of them were the cold nodule.

Most the malignant nodule are cold in scan because the cancer cell is not function mostly .

Cytological evaluation of the aspirate in the present study was indicative of non neoplastic lesions in majority of the cases (92.3%) and the ratio of non-neoplastic to neoplastic lesions was 13:1. Similar incidence of non-neoplastic lesions was mentioned in the literature. (table 3)

Overall incidence of malignancy in STN of thyroid in various studies showed

Variation, and in our study it was 7.7%.(table 2) Kaur et al¹¹

Nodular colloid goiter was the most common thyroid lesion in this study.

Inflammatory disease of thyroid gland formed 1.9% of the present study. In one patients, where cytological diagnosis of Hashimoto thyroiditis was made, there were good numbers of Askanazy cells showing anisonucleosis.

Neoplastic lesions formed 7.7% of the total cases in the present study. consisted papillary of 3 cases (5.8%) and one follicular carcinoma(1.9%).

In this study, cytological diagnosis of papillary carcinoma was made in three cases. In all the cases of cytologically diagnosed papillary carcinoma, there were intranuclear cytoplasmic inclusions.

In this study, No case of Medullary carcinoma was encountered.

Metastatic lesions in thyroid can be detected by thyroid scintigraphy and aspiration cytology but in the present study, there were no incidence of metastatic lesions of thyroid.

Mean Uptake level in the study 3.9 with in the range (.5-4) and suggest that most of thyroid with nodule are normal function.

This study concluded that Thyroid nodules are common, occurring in 4% to 7% of the population and affect women more commonly than men. most thyroid nodules are benign. Before the widespread acceptance of fine-needle aspiration (FNA) cytology, ultrasonography and nuclear medicine imaging were the main investigations of thyroid nodules. Thyroid scans can be used to classify nodules as 'hot' (functioning) or 'cold' (non-functioning). While functioning nodules are usually benign, however, less than 20% of nonfunctioning nodules are malignant.

Thyroid scan and FNAC was performed in 52cases with clinically palpable thyroid nodule/s in the department of Nuclear medicine in (RICK).

The main limitation of this study is ignoring the demographic distribution of patient and effect of nodule in thyroid hormone production. And also ignore the main management.

This study suggest the use of combination of thyroid ultrasound and thyroid scintigraphy and FNAB for patient to decide the effective treatment.

Thyroid scan ,ultrasound And FNAC is recommended as a routine prime investigation in the work-up of the solitary thyroid nodule.

Use I131 to determine if the nodule functioning because the iodine is organized by thyroid in contrast to TC99m

Determination of the role of preoperative and postoperative staging with diagnostic imaging and laboratory tests

Determination of the appropriate operation for differentiated thyroid cancer

Determination of the appropriate features of long-term management

Determination of the best method of long-term follow-up of patients with thyroid nodules

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Table 1: Comparative incidence of non-neoplastic and neoplastic lesions in different studies:

Studies	Benign	Malignant	Ratio
Gupta et al (10)	470	30	15.66:1
Kaur et al(11)	32	15	2.13:1
PRESENT STUDY	52	4	13:1

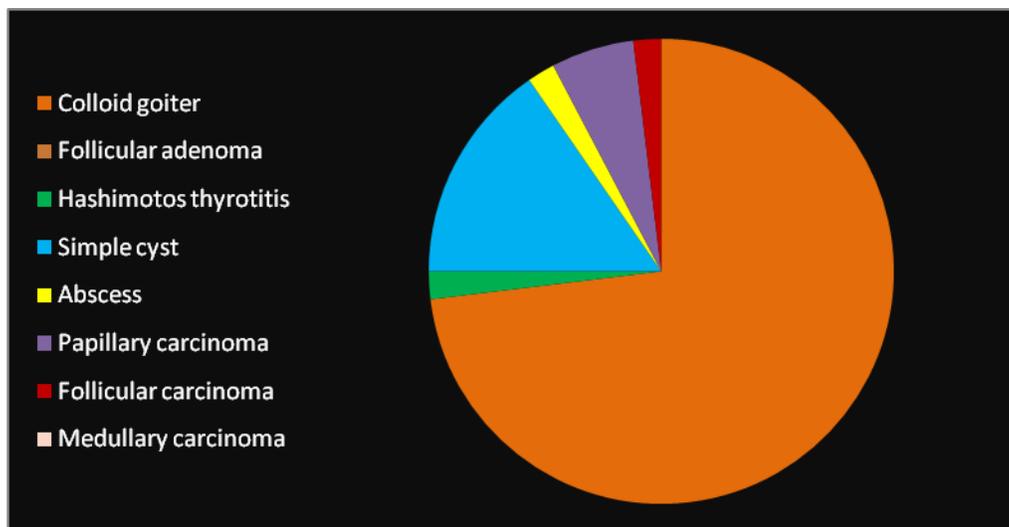


Fig. 2: represent the Histopathology finding in patient of thyroid nodule