

Original Research Article

Tchnetium scintigraphy as a predictive tool of thyroid malignancy

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ABSTRACT

Background: Thyromegaly is a common cause of physician consultation. Solitary thyroid nodules are conventionally viewed with suspicion. Clinical examination cannot reliably distinguish between a solitary thyroid nodule and a dominant nodule in multinodular goiter. Ultrasonographical examination has its own pitfalls. Tchnetium 99 is a commonly used modality for the functional assessment of solitary thyroid nodule detection. It has the advantage of low cost with lower radiation dose to the exposed patients. On literature search, studies on tchnetium 99 scintigraphy for thyroid in context to the Indian scenario do not yield much information and very few studies are notable. This study was conducted to correlate and qualify thyroid cold nodule as detected by Tchnetium 99 pertechnetate thyroid scan. This study was conducted to correlate, qualify and compare the predictive value of Tchnetium 99 pertechnetate scintigraphy on solitary thyroid nodule via fine needle aspiration cytology and to countercheck with histopathological examination.

Methods: A prospective cohort study in a NABH, NAAC and JCI accredited tertiary care teaching university hospital was conducted over a period of 36 months. All the subjects underwent clinical assessment of the neck included standard examination techniques to segregate solitary thyroid nodules. They were then subjected to Tchnetium 99 pertechnetate scintigraphy using the standard protocol. All the patients with solitary cold nodule underwent FNAC followed by nodule excision or hemi-thyroidectomy under general anaesthesia. All the specimens underwent histopathological examination by an experienced histopathologist. The results were statistically analysed using Pearson chi-square test.

Results: Cold nodules as detected by Tchnetium 99 pertechnetate thyroid scan is a reasonable indicator of probable malignancy via fine needle aspiration cytology. Occurrence of cold nodules is highest in 3rd to 5th decade of life (21-50 year age group). Occurrence of cold nodules is higher in females (83%) whereas occurrence of malignancy in cold nodules is higher in males (85%). Occurrence of malignancy in cold nodules is higher in subjects less than 21 and above 50 years.

Conclusions: Tchnetium 99m pertechnetate thyroid scintigraphy is an important preoperative tool in management of thyroid nodules and its routine use in all such patients is recommended especially to rule out cold nodules.

Keywords: Thyromegaly, Tchnetium scintigraphy, Solitary thyroid nodule, Fine needle aspiration cytology thyroid malignancy

INTRODUCTION

Thyromegaly is a common cause of physician consultation for the general population since it produces obvious cosmetic disfigurement. Clinically detectable

thyroid nodules occur in 4-7% of the population.⁷ Of all the causes of thyromegaly, solitary thyroid nodule is a clinical subset of medical concern since malignancy is known to occur more frequently in solitary thyroid nodule than multi nodular goitre, Solitary thyroid nodules

are conventionally viewed with suspicion.⁸

Clinical examination cannot reliably distinguish between a solitary thyroid nodule and a dominant nodule in multinodular goiter. Ultrasonography can determine whether thyroid nodules are solitary and can categorize them into solid, cystic and mixed nodules but cannot give information on the functional status and the interpretation is subjective - depending on expertise of the sonographer and also ultrasound machine dependent.⁹

Scintigraphy using isotopes has been described as one of the earliest investigational tools to detect the functional and delineate malignant behavior of the thyroid lesions. Technetium 99 is a commonly used modality for the functional detection.⁴ It has the advantage of low cost with lower radiation dose to the exposed patients.

On literature search, studies on technetium 99 scintigraphy for thyroid in context to the Indian scenario do not yield much information and very few studies are notable. This study was conducted to correlate and qualify thyroid cold nodule as detected by Technetium 99 pertechnetate thyroid scan.

METHODS

Study type

We conducted a prospective cohort study in a NABH, NAAC and JCI accredited tertiary care teaching university hospital over a period of 36 months was from May 2009 to April 2012. All the patients who fulfilled the inclusion and exclusion criteria were included in the study after obtaining Informed consent from the patient and with due sanction of Institutional Ethics committee clearance.

Inclusion Criteria

All the patients included were biochemically in an euthyroid state and they had a solitary or multi nodular goitre within an age group of 15-70 years in both gender.

Exclusion Criteria

Few patients with biochemical hypothyroidism or hyperthyroidism, pregnant women, patients with bleeding disorders, patients unfit for general anesthesia and patients on substances and drugs known to affect thyroid uptake were excluded from the study.

Sampling size

40 patients who fulfilled the inclusion and exclusion criteria were included in the study and pearson chi-square (student p test) was used to analyse this study. In this study $p < 0.05$ was considered as the level of significance.

Clinical assessment of the neck included standard examination techniques to segregate solitary thyroid nodules. They were then subjected to Technetium 99 pertechnetate scintigraphy using the standard protocol with necessary radiological precautions and were classified into cold nodule functionally.

All the patients with solitary cold nodule underwent FNAC followed by nodule excision or hemithyroidectomy under general anaesthesia. All the specimens underwent histo-pathological examination by an experienced histopathologist.

RESULTS

Age group wise classification of cold nodule

In our study of 40 patients, youngest patient was of 19 years, eldest being of 66 years. Most of the patients were in age groups of 21-50 years. Chi-square value with yate's correction = 2.928 at def. = 2 (not significant: $p > 0.05$). There is no significant difference between "different age groups" with regard to "cold nodule".

Sex wise incidence of "cold nodule"

Chi-square value with yate's correction = 6.233 at d.f. = 1 (highly significant: $p < 0.001$). There is high degree of significant difference between males and females with regard to "cold nodule". Hence we can conclude solitary thyroid nodule is more common in female gender. The same is tabulated in Table 1 below.

Table 1: Sex wise incidence of cold nodule.

Gender wise incidence	
Male	Female
7	33

Correlation between cold nodules and FNAC

Preoperative FNAC showed 35 patients to be benign and malignancy in 5 patients as seen in table 2 below. 87.5 % of cold nodules are benign and 12.5% are malignant as per the fine needle aspiration cytology in our study in Table 2 below.

Table 2: Correlation between cold nodules and FNAC.

Cold nodules	FNAC – (pre-op)	
	Benign	Malignant
40	35	5

Correlation between cold nodules and HPE

19 (out of 40) i.e., 47% of the cases with cold nodules were reported as malignant with postoperative histopathology report as seen in Table 3 below.

Table 3: Correlation between cold nodules and HPE.

Cold nodules	Histopathological examination	
	Benign	Malignant
40	21	19

Gender wise prevalence of malignancy in cold nodules in different age groups

Chi-square value with yate's correction = 0.910 at d.f. = 2 (not significant: p > 0.05). There is no significant gender difference with regard to the presence of malignancy in cold nodules in different age groups as seen in Table 4 below.

Table 4: Gender wise prevalence of malignancy in cold nodules in different age groups.

Sex of the patient	Age			Total
	Up to 20 years	21-50	51 & above	
Males	1	3	2	6
Females	2	10	1	13
Total	3	13	3	19

Correlation between FNAC, HPE and Technetium 99m pertechnetate scan

Out of the 40 patients with cold nodules on FNAC, 35 were benign, 5 were malignant. 19(out of 40) cases with cold nodules were reported as malignant with HPE. Incidence of malignancy in cold nodules is 47.5% in this study as can be seen in table 5 below. This data reveals that FNAC has less positive predictive value with regards to malignancy whereas scintigraphy has more positive predictive value.

Table 5: Correlation between FNAC, HPE and Technetium 99m pertechnetate scan.

Technetium 99m scan	FNAC		HPE	
	Benign	Malignant	Benign	Malignant
Cold nodules: 40	35	5	21	19

DISCUSSION

On literature scan most studies on management of thyroid nodules are retrospective and therefore are prone to all the drawbacks of retrospective analysis. Hence, a prospective study and analysis is undertaken.

Age

In our study of 40 patients with cold nodules, 4 were below 20 years age group, 4 were above 50 years. 80 % of our patients were in 21-50 year age group which is

almost in synchronization with current literature studies.^{10,11}

Gender

In our study 7 (17%) were males and 33 (83%) were female. Thyroid nodules were found to occur 4.8 times higher in female population than men in our study. Thus according to our study the occurrence of cold nodules is higher in females whereas the occurrence of malignancy in cold nodule is higher in males. This is comparable to other studies which showed a higher incidence of thyroid nodules in women than men.^{10,12,13}

Laterality

In 19 patients, cold nodules involved right lobe of thyroid, in 10 patients left lobe was involved, both the lobes were involved in 11 patients. There is no significant difference between males and females with regard to location of cold nodules (p >0.05). Right lobe of thyroid was most commonly involved in all age groups followed by both the lobes and then by left lobe. This is consistent with previous studies.¹⁴

Cold nodule characteristics

In our study out of 40 patients with cold nodules, 47.5% of patients had papillary carcinoma, 20% had adenomatous goiter, 10% nodular goiter, 10% colloid goiter, 7% follicular adenoma, 2.5% lymphocytic thyroiditis, 2.5% Hurthle cell adenoma on histopathology. The incidence of malignancy in cold nodules was 47.5% in our study. This is comparable to the study done by Rosario et al where the incidence was 38.5%.³ Lowest incidence was reported by Antonino Belfiore et al 4.6%.⁷

CONCLUSION

Cold nodules as detected by Technetium 99 pertechnetate thyroid scan is a reasonable indicator of probable malignancy via fine needle aspiration cytology. Occurrence of cold nodules is highest in 3rd to 5th decade of life (21-50 year age group). Occurrence of cold nodules is higher in females (83%) whereas occurrence of malignancy in cold nodules is higher in males (85%). Occurrence of malignancy in cold nodules is higher in subjects less than 21 and above 50 years. Technetium 99m pertechnetate thyroid scintigraphy is an important preoperative tool in management of thyroid nodules and its routine use in all such patients is recommended especially to rule out cold nodules.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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