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Comparative Study of Ultrasound Findings with Nuclear Medicine Scan Findings and Clinical Correlation with Pathological Findings

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ABSTRACT
The disorders of thyroid disease are most common in female population compared to male population. Maximum number of patients were in the second to fifth decade.
Patients of benign multinodular goitre formed the largest proportion of the cases in our study. The second most striking comparison was the possibility of detecting solitary nodules. Ultrasound was able to detect an increase in gland size. Both microcalcification and macrocalcification were detected only by ultrasound study but could not be detected by radionuclide study. Ultrasound was able to detect lymph node metastasis.
Ultrasound was able to detect cystic degeneration. The most striking finding on radionuclide scanning was the presence of hot / cold nodules which helps in depicting the functional nature of the gland.
Radionuclide scan was able to detect ectopic thyroid gland as well as accessory thyroid tissues more correctly but ultrasound was less sensitive in detecting Radionuclide scan was able to predict correctly, the distant metastasis to the skull which was not possible by ultrasound.
Functional adenomas were seen as hot solitary nodules with decreased activity by its rest of the glands in a case of compensatory adenoma and in decompensatory adenoma the affected lobe is so highly uptake activity that the contralateral lobe of the thyroid gland showed almost no uptake pattern. So radionuclide scan helps in identifying the functional adenomas.
In cases of thyroiditis, radioisotope scans showed very less uptake which shows the destruction of the gland cells. So radioisotope study better detect the functional status of the gland in case of thyroiditis. However, overall diagnostic efficacy of ultrasound is 76.66% as compared to 60% by radionuclide scanning. But both studies were found to be complimentary to each other in the detection of thyroid abnormalities.
Keywords- *Thyroid Disorders*

INTRODUCTION

The thyroid gland is located in the anterior part of the neck with lateral lobes lying on either side of the trachea joined across by a midline by the isthmus. The pretracheal fascia binds the thyroid to the trachea and it moves with the trachea on swallowing. An accessory lobe, may be present in up to 50% of population and may arise from thyroid isthmus.

Each lobe measures about 5cms long, its greatest transverse diameter anterio-posterio extent being about 3cms and 2cms respectively. The thyroid in Greek means a shield. As the name implies, the thyroid gland is shield shaped, sometimes being more H or U shaped. Galen, around the year 199 A.D was the first person who named the thyroid. In the year 1543, Vesal first described the anatomy of thyroid gland. Each of the elongated lateral lobes of the thyroid consists of a superior and an inferior pole. In normal subject, the thyroid isthmus overlies the third tracheal ring. In some patients, it may be absent so that the gland exists as two separate lobes.

Radionuclide imaging of thyroid gland provides functional information that complements the anatomical information obtained from Ultrasound. Technetium^{99m} pertechnetate is the most widely used thyroid imaging agent and is used as a first line diagnostic tool in the evaluation of the thyroid.

Although pertechnetate is concentrated within thyroid, unlike iodine it is not incorporated into thyroglobulin.

Radioisotopes of iodine permit tracer studies of the entire metabolic pathway of iodine within the thyroid. This includes trapping, organification, coupling, hormone storage and secretion.

Clinically used isotopes of iodine are I^{123} and I^{131}. I^{123} decays by electron capture with a single gamma-ray photon of 159 KeV which is ideal for imaging and releases no β particles. 13 hr half-life makes it excellent radiotracers for functional evaluation.

Disadvantages of iodine ^{123} are its limited availability and high cost of production as it requires cyclotron. Iodine^{123} is given I.V and imaging is performed after administration at which time most of the iodine within the thyroid is present as radio iodotyrosine residues on thyroglobulin, reflecting hormonogenesis.

Iodine^{131} has long half life (8 days) and release a wide spectrum of β particles and high-energy photons.

AIMS AND OBJECTIVES

To compare the diagnostic efficacy of ultrasonography and scintigraphy in evaluating different thyroid disorders in patients presenting to K.L.E.S Hospital and MRC, Belgaum and clinically suspected thyroid disorders.

MATERIALS AND METHODS

PROTOCOL OF ULTRASOUND STUDY IN OUR EXAMINATION:

High-resolution gray scale ultrasound was performed in 30 cases who had previously undergone a radioisotope scan.

The ultrasound scan was performed using SONOLINE ADARA distributed by SIEMENS MEDICAL SYSTEM, Model No. GM-6703. Scanning was done in both longitudinal and transverse planes by using linear probe with 8.5 and 10 MHz.

Protocol of radionuclide scanning in our examination:

Preparation:

1. Patient should stop anti-thyroid drugs and thyroid medications.
2. Contraindicated for pregnant and lactating women.
3. Recent blood investigation reports are collected.
4. After injection, patient should drink water to avoid salivary gland activity.

Image acquisition:

1. Tc^{99m} pertechnetate 2-3 mci is administered intravenously.
2. Patient was made to wait for 15-20 minutes after administration of radioactivity.
3. Prior to image acquisition, patient was hydrated well to avoid salivary gland uptake.
4. Patient positioned - Supine position with neck elevated with help of the pillow under the shoulders in the Diacom Siemens gamma camera interfaced with Icon software.
5. Low energy all purpose collimator used and 140 KeV energy window selected with 15% window.
6. Detector angles kept as zero degree in the anterior view position and table height was kept 14 cm from the ground.

7. Detector was kept close to patient's neck including salivary gland visualization.
8. Static images acquired upto 600,000 counts in matrix 128 x 128.

Advantages of radionuclide scanning:
Inexpensive, detection of the ectopic thyroid and provide functional information.

Disadvantages:
- High radiation exposure due to β decay.
- Photon energy is higher than optimal for imaging.

Radioisotope
The three most widely used radionuclides for scanning the thyroid are :
1. I^{123}
2. I^{131}
3. Tc^{99m} pertechnetate

Iodine^{123}:
Physical half-life – 13 hours
Usual dose – 200-400 μci
159 KeV energy
Delay between administration of radiopharmaceutical and imaging 6-24 hours.

Iodine^{131}:
Physical half-life – 8 days
364 KeV energy
Dose range 50-100 μci.
Delayed between administrations of radiopharmaceutical and imaging is 24 hours.
It decays to release wide spectrum of the β rays and very high photons.

Uptake studies are most commonly performed with an isotope of iodine, although in our study Technetium^{99m} pertechnetate has been used in almost all the cases because
1. Tc^{99m} pertechnetate is the pure gamma emitters, available.
2. Its parent nuclide molybdenum-99 (^{99}MO) can be produced in either a reactor or a cyclotron. ^{99}Mo has a half-life of 66 hours and therefore $^{99}Mo/^{99}Tc$ generators can conveniently be supplied weekly to the nuclear medicine department.
3. Half-life of ^{99}Tc is 6 hours and is sufficiently long for most imaging applications.
4. Its 140 KeV gamma radiation has reasonable tissue penetration.
5. ^{99m}Tc can be administered in free form as the pertechnetate ion and it can also be incorporated into various pharmaceuticals for visualization of organ systems.
6. Tc^{99m} pertechnetate is accumulated or trapped by the thyroid but not "organified". Uptake requires cellular integrity and metabolic energy.

Advantages of Tc^{99m} uptake studies include reduced radiation dose, lower radiopharmaceutical cost, immediate results, relative lack of effect of blocking agents and potential for earlier restudy and do not produce any β rays.

RESULTS

OBSERVATION AND RESULTS

In our study, we have taken 30 patients with clinically suspected thyroid disorders.

Tables 1 : Age and sex distribution of the patients (n=30)

Age (Yrs)	Male	Female	Total	Percentage
11-20	1	0	1	3.33 %
21-30	2	2	4	13.33%
31-40	3	12	15	50.00%
41-50	1	6	7	23.30%
51-60	1	1	2	6.70%
Above 60	1	0	1	3.33%
Total	9	21	30	100.00%

Male - 30%, Female – 70%.

The above table shows that out of 30 patients, maximum number of patients were between the age of 20 to 50 years and 70% of patients were female but only 30% were males. So thyroid disorders are common in female patients.

Table 2 : Clinical history and presentation (n=30)

Clinical history	No of patients	Percentage
Swelling	27	90%
Increase tiredness	6	20%
Pain	6	20%
Dysphagia	1	3.33%
Tremor	10	33.33%
Intolerance to heat	2	6.7%
Palpitation	6	20%
Hoarseness of voice	1	3.33%
Hair loss	3	10%
Weight loss	6	20%
Change of appetite	10	33.33%
Menorrhagia	2	6.7%
Sleeplessness	7	23.30%
Sweating	4	13.33%

The above shows that the most common finding clinically is swelling in 27 patients (90%) out of 30 patients. The next common symptoms in patients with thyroid disorders are tremor (33.33%) and change of appetite. (33.33%).

Table 3 : Clinical examination (n=30)

Clinically examination	No of patients	Percentage
Single palpable nodule	19	63.33%
Multiple nodules palpable	6	20.00%
Fixity to underlying structure	3	10.00%
Movement on deglutition	25	83.33%
Cervical lymph nodes palpable	3	10.00%

The above table shows that in patients with thyroid disorders, 25 numbers of patients (83.33%) showed movement on deglutition on clinical examination.

Table 4 : Histopathological diagnosis (n=30)

Histopathological	No of patients	Percentage
Multinodular goitre	12	40.00%
Hashimoto's Thyroiditis	2	6.66%
Adenoma	5	16.66%
Ectopic thyroid	1	3.33%
Accessory	1	3.33%
Papillary carcinoma	2	6.66%
Follicular carcinoma	1	3.33%
Medullary carcinoma	1	3.33%
Colloid cyst	4	13.33%
Colloid goitre	1	3.33%

The above table shows that maximum patients in our study was a case of multinodular goitre. So out of all thyroid disorders, multinodular goitre is the most common disorder detected. 12 patients (40%) were detected as multinodular goitre out of total number of 30 patients.

Table 5 : Overview of various ultrasound findings seen (n=30)

Ultrasound findings	No of patients	Percentage
Normal gland size	6	20.00%
Increase in gland size	17	56.66%
Solitary nodule	5	16.66%
Multiple nodules	13	43.33%
Diffuse gland	2	6.66%
Micro calcification	4	13.33%
Macro calcification	2	6.66%
Hypoechoic nodule	10	33.33%
Hyperechoic nodule	4	13.33%
Iso echoic	5	16.66%
Mix echoic texture/Heterogeneous nodule	3	10%
Cystic lesion of the gland	10	33.33%
Peripheral halo sign	3	10%
Associated lymph node	3	10%
Ectopic thyroid	-	-
Accessory	-	-
Distant metastasis	-	-

The above table shows that ultrasound can detect multiple nodules in 13 patients (43.33%) and single nodule in 5 patients (16.66%). Ultrasound successfully detected the cystic changes in the gland 10 patients, (33.33%) but it could not detect the ectopic / accessory thyroid.

Table 6. Radionuclide findings (n=30)

Radionuclide findings	No of patients	Percentage
Normal gland size	13	43.33%
Solitary hot nodules	2	6.66%
Generalized reduce uptake	6	20.00%
Unilateral enlargement of the lobe	7	23.33%
Diffuse enlargement of the gland with increase uptake	6	20.00%
Cold nodule	6	20.00%
Normal uptake	5	16.66%
Inhomogeneous uptake pattern	1	3.33%
Solitary cold nodule	4	13.33%
Solitary nodule	4	13.33%
Lymph nodes metastasis	-	-
Ectopic thyroid	1	3.33%
Accessory	1	3.33%
Distant metastasis	1	3.33%
Multi nodular goitre	5	16.66%

The above table shows the ability of detecting the presence of hot or cold nodules in the gland which helps in depicting the functioning nature of the gland. The above table also showed the ability of radionuclide study to depict ectopic / accessory thyroid tissues.

Table 7 : Overall sensitivity in detection of thyroid abnormalities (n=30)

Findings	Ultrasound	Radionuclide
Normal gland size	20.00%	43.33%
Increase in the gland	56.66%	20.00%
Solitary nodules	16.66%	13.33%
Multi nodularity	36.66%	16.66%
Micro calcification	13.33%	-
Macro calcification	6.66%	-
Diffuse enlargement of gland	56.66%	20.00%
Necrosis/cystic lesions	33.33%	-
Hot nodule	-	6.66%
Cold nodules	-	20.00%
Retrosternal extension	-	-
Accessory thyroid	-	3.33%
Ectopic thyroid	-	3.33%
Lymph node metastasis	10%	3.33%
Distant metastasis	-	3.33%

The above table shows that ultrasound was able to detect cystic degenerative changes in 33.33% of patients while radionuclide study could not do so. Ultrasound can also better detect calcification present in the gland an it can successfully detect solitary nodules and multiple nodules present in the gland as compare to radionuclide study.

Assessment of diagnostic efficacy of ultrasound and radionuclide study with the FNAC findings

Screening test	Matched diagnosis		Unmatched diagnosis	
	No. of patients	Percentage	No. of patients	Percentage
Ultrasound	23	76.66%	7	23.33%
Radionuclide study	18	60%	12	40%
Total no. of patients	30		30	

Since all the persons included in our study are having disorders of thyroid, so to compare the efficacy of the ultrasound and radionuclide study, the agreement of diagnosis made by these two tests with FNAC are shown as in the above table.

Total no. of patients = 30

Percentage of agreement between FNAC and ultrasound

Matched diagnosis = 23 patients

Percentage = 76% (Diagnostic efficacy of ultrasound study)

Unmatched = 7 patients

Percentage = 23.33%

Percentage of agreement FNAC and Radionuclide study

Matched = 18 patients = 60% (Diagnostic efficacy of radionuclide study)

Unmatched = 12 patients = 40%

Diagnostic efficacy of ultrasound is 76.66%

Diagnostic efficacy of radionuclide study is 60.00%

So diagnostic efficacy of ultrasound is more than radionuclide study

DISCUSSION

A total of 30 patients with various thyroid disorders formed the study sample. Age and Sex distributions

The female to male ratio in our study was 70% versus 30% i.e. 7:3 which is consistent with the findings of various workers.[1]

Maximum number of patients were in the second to fifth decade, (86.66%) which again coincides with the age distribution patterns as mentioned in the literature.[1]

Multinodular goitre

Patients of benign multinodular goitre found the largest proportion of cases studied by us. 12 out of 30 (40%) cases were simple benign multinodular goitre.

USG features

The most common ultrasound finding was the ability to detect the multiple nodules. In 8 cases thought to be single nodule clinically on palpation, ultrasound was able to establish the multinodularity of the gland. This ability of ultrasound is in accordance with available data which states that 20-40% of the cases referred ultrasound for a single thyroid nodule will be found to be having multiple nodules.[2,3]

All the four patterns i.e. hypoechoic (33.33%) nodules, mixed echogenicity (10.00%) nodules and hyperechoic (13.33%) nodules and isoechoic nodules (16.66%) were found. The presence of cystic degeneration seen in our study is 33.33% of the cases. Literature mentions this incidence to be around 30%.[4]

Radionuclide scanning

The most important finding seen on radioisotope scanning was the functioning status of the gland as has been stated in the literature.[5]

Out of 12 histological proved multinodular goitre cases, only 5 cases were diagnosed by scintigraphic study.

Thyroiditis

A total of 2 patients of thyroiditis were part of our study sample. Histopathologically, they were proven to represent Hashimoto's thyroiditis which is the most common form of thyroiditis.[6]

Ultrasound

In both the cases there was a uniform increase in gland size. The texture of the gland was hypoechoic without any evidence of a focal lesion in both the cases. These findings on ultrasound are consistent with those reviewed in literature according to which the ultrasound appearance of Hashimoto's thyroiditis is that of a diffuse glandular enlargement with irregular margins.[7]

In a study, all 12 cases of Hashimoto's showed a gland which consisted of low level echoes with a decrease in the overall echogenecity of the gland.[8]

Radionuclide scanning

The common radioisotope finding seen was a diffuse delayed low uptake in both the cases. The finding has its basis in the review which states that radioisotope scanning in the stable state of Hashimoto's thyroiditis is always low and delayed due to substantial gland destruction.[9]

Adenomas of thyroid

Five cases of toxic adenomas were studied by us, out of which 4 cases were associated with thyrotoxicosis. This is substantiated by literature which according to Ingbar's classification states that toxic adenoma is a common cause of thyrotoxicosis associated with hyperthyroidism.[10]

Ultrasound

On ultrasound, 5 cases were presented as solitary nodules with ultrasound pattern, 3 cases (60%) were hypoechoic, 1 hyperechoic and 1 case with solitary nodule with cystic degeneration / necrosis with ecogenic foci within it. The peripheral halo sign were seen in only 3 cases (60%).

Though the study sample was smaller, however the ultrasound findings seen are quite similar to those reviewed in the literature. In one series of 79 patients, 64 (81%) patients showed a decreased echogenecity relative to normal thyroid gland. A halo representing vasculature was seen in 43 (54%) patients.[8]

In one series of 7 cases, a sonolucent rim or halo was seen in 5 (71%) and various degrees cystic changes were seen in 6 cases (85%).[2]

In our study cystic changes is found in only 1 patient (20%). The cause of discrepancy could be because of different groups of patients we have. But in our study also sonolucent rim or halo was found to be in 3 cases (60%).

Radionuclide findings

Out of 5 cases, 1 case presented as functional solitary hot nodules with discard activity by the rest of the gland.

In 3 cases, we got diffused uptake pattern of one lobe which has suppressed the functional status of contralateral lobe. These are decompensatory type of toxic adenoma.

This finding corresponds with reported literature which states that adenomas can present as hyperfunctioning hot nodules on technetium scans with the rest of the gland having decreased uptake pattern.[11,12]

In one case, we got non-functioning cold nodule which was diagnosed in histopathology as follicular adenoma.

The findings correspond with a literature which states that the follicular adenoma can also present as a cold (non-functioning) nodule on Tc^{99m} scans. This is the most frequent presentation.

Ectopic /Thyroid gland

One case of sublingual ectopic thyroid were studied in our group of patients. According to the literature sublingual thyroid is a very common site for thyroid ectopia.

Ultrasound

Ultrasound showed absence of thyroid gland in normal position. However, ultrasound was unable to detect the ectopic site.

Radionuclide scanning

Tc^{99} scan was done in its patient. There was evidence of uptake of the traces in the sublingual region thereby identifying the exact location of the ectopic thyroid tissue.

The findings highlight the advantages of radioisotope scanning over ultrasound in the evaluation and localization of ectopic thyroid tissue. These findings are consistent with those reviewed in the literature which states the inability of ultrasound in localizing ectopia and the accumulation of traces in the ectopic tissue.[13,14]

In another case with clinically having pain of pricking in nature at the neck region, ultrasonography showed normal thyroid gland, while radionuclide study showed mild thyroid tissue involving the area just below the mandible in the midline while the thyroid gland shows average size and functioning of both lobes.

Scintigraphy was more preferable for the assessment of atypical position of the thyroid and function of its different parts but ultrasound was better for the detection of the nodular, diffuse and other structural changes.[17]

The findings again highlight the advantage of radioisotope scanning over USG in evaluating exactly the location of any accessory thyroid tissue.

THYROID CARCINOMAS

A. Papillary Carcinoma:

Out of total of 4 cases of thyroid carcinoma, papillary carcinoma constituted 2 cases (50%). Both cases detected were females. These findings are consistent with the reported incidence and sex predominance in the population which states that papillary and predominantly papillary (mixed papillary and follicular) thyroid carcinoma is the most common thyroid malignancy accounting for about 70% of the cases with female to male preponderance is about 3:1.[16]

Ultrasound

Both the cases showed solitary nodules on ultrasound. One case showed hypoechoic nodule with the cystic degeneration and the other case showed heterogeneous nodule with highly reflective foci of microcalcification with minimal cystic areas. The ultrasound features studied by us are in accordance with the literature findings in different series. In one series 401 patients were studied out of which 77 cases of papillary carcinoma were studied, the most common ultrasound findings was the presence of solid hypoechoic nodules with cystic degeneration seen in 66 (77%) of the cases.[17]

The presence of microcalcification has recently been established as reliable sign of malignancy. These are highly reflective foci often as small as 2 mm in diameter. In one series of 8 papillary carcinoma, microcalcification was seen in 5 (62.5%).[18]

Ultra sound proved highly effective for detection, localization and delineation enlarge lymph nodes of neck. Cervical lymph node metastasis according to literature was present in about 20% of the patients at the time of presentation.[19]

In our series these were seen in one case (50%).

Radionuclide scanning

Both the cases showed solitary cold nodules in radionuclide study.

B. Follicular Carcinoma

In a total of 4 cases, only 1 case was diagnosed as follicular carcinoma by histopathological examination.

Ultrasound

Ultrasound showed solid hypoechoic pattern with no cystic component within it with irregular margins. The features studied by us is in accordance with the literature findings. In a gross study conducted, 87 patients who are clinically and pathologically proven underwent scintiscan and ultrasound, of the 4 follicular carcinoma, thus studied a solid hypoechoic nature of the lesion was found in all the 4 cases with no cystic component.[20]

Radionuclide

Radionuclide study shows cold nodule in the case studied by us. This is consistent with the study in which of the 3 follicular carcinomas, all presented as cold nodules. It showed distant metastasis to the skull. This is consistent with literature which states that follicular carcinoma are more commonly associated with distant metastasis with the sites being lung and bone (skull) which are most common.[21]

C. Medullary Carcinoma

In our study 1 case is diagnosed by histopathology as medullary carcinoma.

USG shows a solid isoechoic lesion with microcalcifications and posterior acoustic shadowing. The lesion shows irregular margins and no peripheral halo around it. In a series of study, a total of 9 cases with 9 nodules were histopathologically proved to be the cases of medullary carcinomas.

A solid isoechoic lesion was seen in 3 (33%) of the 9 cases. All the 9 nodules had irregular margins and none had peripheral halo around it.[22]

In another study of in 6 patients who had undergone thyroidectomy, the primary tumor mass by ultrasound was identified, bright echogenic foci with acoustic shadowing were seen in 5 patients. The conclusion of the study was the association of medullary carcinoma with calcification which could be found in both primary and metastatic variants.

Radionuclide study showed cold nodule. Patient was operated and after 8 months patient came for follow-up scan and the scan was performed with Tc^{99} DMSA and a small hot nodule was detected. It was diagnosed as a recurrence of the medullary thyroid carcinoma. The most striking findings on radionuclide scanning was the presence of hot/cold nodules. This is reviewed in literature in various series which states that radionuclide scanning provides vital information regarding thyroid cell function.[23]

The ability of ultrasound to detect small nodules makes it the procedure of choice in evaluating suspected instrinsic thyroid abnormalities compared to other modality like computed tomography.[24]The high-resolution sonography is the most accurate method of examination for demonstrating changes in the thyroid. Evaluation of the sonography is superior to all other kinds of investigations.[25]

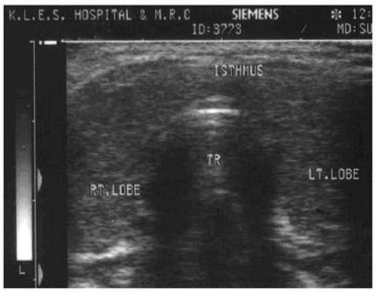


Figure A : Showing the normal homogenous echotexture of the thyroid gland with trachea in the center.

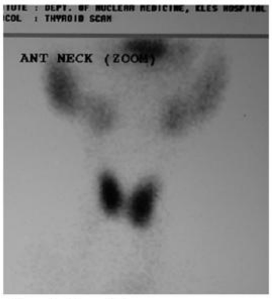


Fig B : Normal thyroid scan

99mTc pertecnetate static thyroid scan shows averages size both lobes of thyroid with uniform distribution of tracer uptake pattern.
Normal salivary gland uptake pattern is seen.

Fig A : Right lobe of the thyroid showing cystic degenerative changes of adenomatous nodules with surrounding heterogeneous solid part of the nodule.

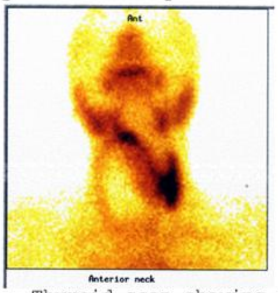


Figure B : Thyroid scan showing solitary cold nodule in the right lobe of thyroid. It was diagnosed as non-functional adenoma in the right lobe of the thyroid.

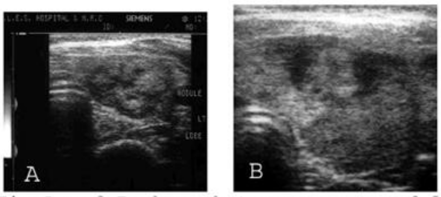


Fig A and B shows heterogeneous nodule on the left lobe

Fig C Right lobe shows multiple nodules

Fig D : A case of multinodular goiter showing increased uptake in the left upper lobe and lower lobe and the right upper lobe and the size of the right lobe is larger than the left lobe.

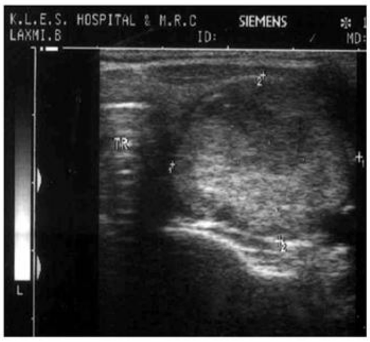


Fig A : Right lobe of the thyroid showing solid hyperechoic nodule,USG diagnosed multinodular goiter.

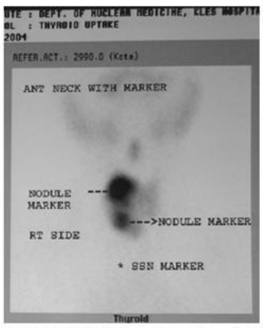


Figure B : A thyroid gland showing enlarged right lobe with well circumscribed area of increased uptake pattern in the upper lobe. Left lobe average size normal uptake pattern.It has been diagnosed as compensated toxic adenoma right upper pole.

Fig A : Right lobe showing a cyst with bright echogenic foci within it suggestive of microcalcification.

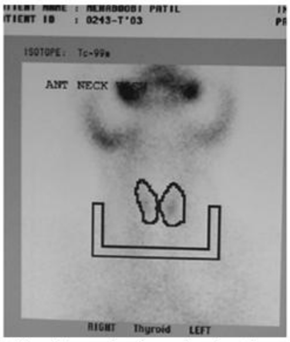


Fig B: Thyroid scan showing reduced uptake pattern, it has been diagnosed as a hypothyroid. FNAC report report showed ADENOMA COLLOID CYST.

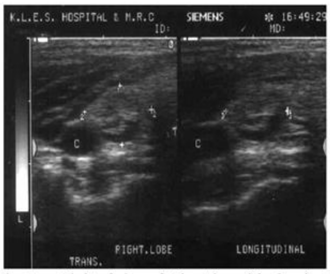


Fig A : Right lobe of the thyroid showing heterogeneous echotexture with few echogenic foci and cystic area within it, the right lobe of the gland shows small in size. FNAC report turned to be papillary carcinoma.

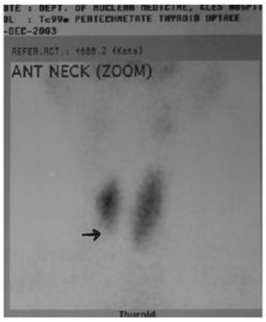


Fig B : A case diagnosed as a grade I diffuse goiter showing left lobe is larger than the right lobe and FNAC proved it as a papillary carcinoma.

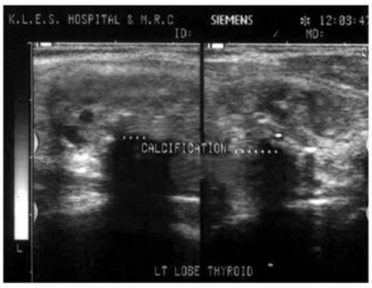
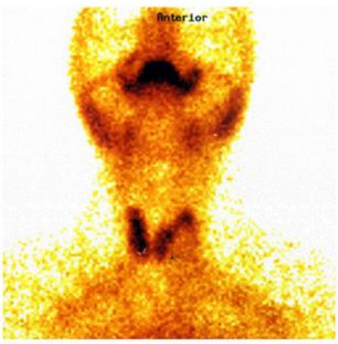


Fig A:Left lobe of thyroid showing a solid isoechoic lesion with microcalcifications and acoustic shadowing, the lesion shows irregular margins with no peripheral halo around it.



Thyroid scan of the above patient shows cold nodule in the left lobe of the thyroid and FNAC showed meddulary carcinoma.

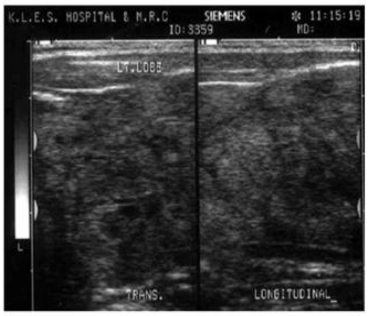


Fig A : Both lobes show hypoechoic and grossly enlarged in size. FNAC report showed Hashimoto's thyroiditis.

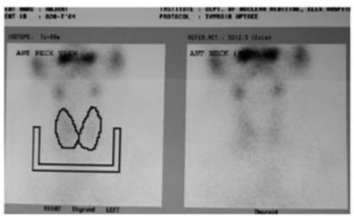


Figure B : 99Tc pertechnetate static scan shows severe reduced uptake pattern involving both lobes of the thyroid. It has been diagnosed as chronic thyroiditis.

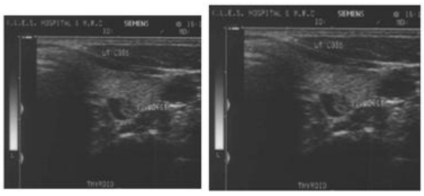


Fig A and B shows nodules with cystic lesion involving both the lobes.

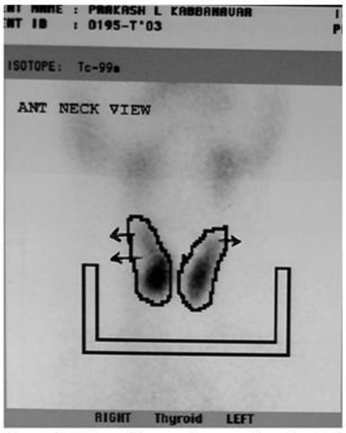


Figure B : Thyroid scan shows reduced uptake pattern in both the upper pole and lateral sides of both the lobes of the thyroid.
FNAC report comes as multinodular goiter.

Fig A shows multiple isoechoic nodules on both lobe of the thyroid.

Figure B : A case diagnosed as a grade I diffuse goiter with euthyroid pattern showing diffuse enlargement of both lobes of thyroid, left is more than the right with almost uniform distribution of the tracer uptake pattern.

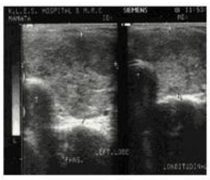


Fig A shows a single nodule

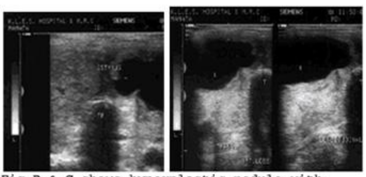
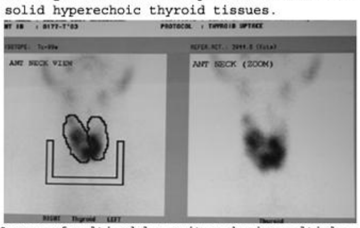


Fig B & C shows hyperplastic nodule with degenerative changes involving the isthmus and right lobe of the thyroid with surrounding solid hyperechoic thyroid tissues.



A case of multinodular goiter showing multiple areas of reduced uptake pattern (cold area) involving the middle and inferiolateral path of the right lobe of the thyroid and in the middle aspects of left lobe. There are also 2 to 3 focal areas of increased uptake (hot area) is visualized involving the left lobe.

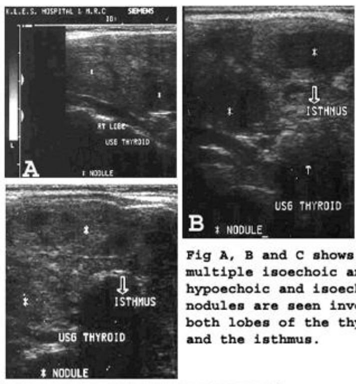


Fig A, B and C shows multiple isoechoic and hypoechoic and isoechoic nodules are seen involving both lobes of the thyroid and the isthmus.

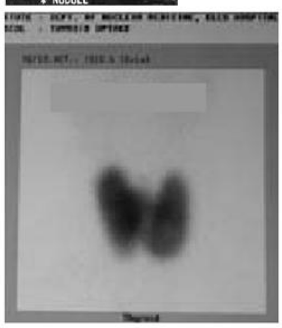


Figure D : Thyroid scan of the above patient shows irregular uptake pattern with increase in both the size, it has been diagnosed as multinodular goiter.

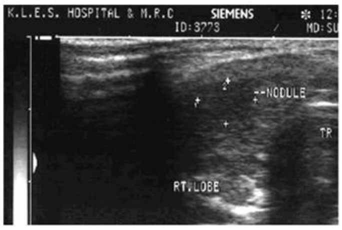


Figure showing single solitary nodule on the right lobe

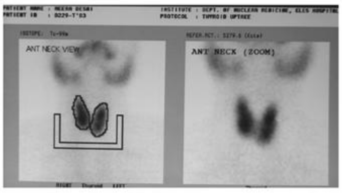
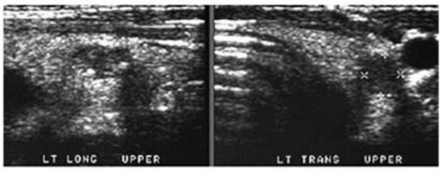
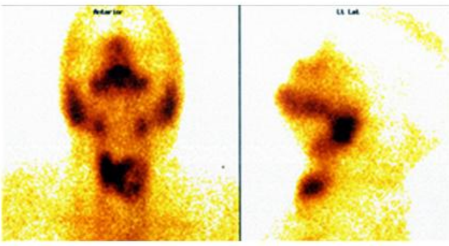


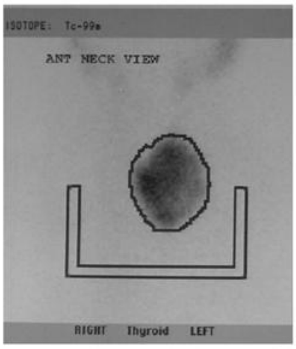
Figure B : Thyroid scan of the above patient showing increased uptake pattern in the right lobe of the thyroid. It has been diagnosed as a diffused goiter with euthyroid and FNAC report showed colloid goiter.



USG of the thyroid showing solitary hypoechoic nodule on the left lobe of the thyroid.



Thyroid scan of the above patient showing cold nodule in the left lobe of the thyroid and FNAC report shows follicular carcinoma.



Thyroid scan showing increased uptake in the left lobe of the thyroid with complete reduced uptake in the right lobe. Hyperfunctioning decompensatory adenoma of left lobe.

Thyroid scan showing increased uptake in the right lobe of the thyroid with near complete reduced uptake in the left lobe.Hyperfunctioning adenoma of right lobe.

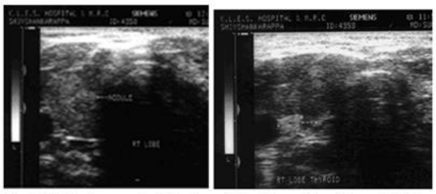
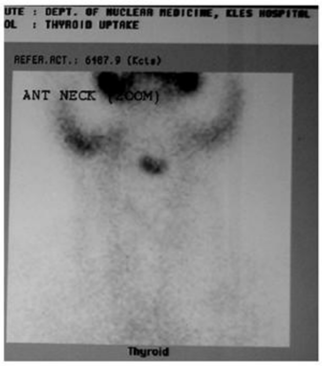


Fig A & B shows right lobe of the thyroid with multiple hyperechoic nodules.
FNAC reports shows hyperplastic adenomatous.



Thyroid scan shows no uptake at the region of the thyroid but uptake shows at the lingual region diagnosed as a ECTOPIC LINGUAL THYROID.

CONCLUSION

Ultrasound in our study of 30 patients was found to be the gold standard for assessing the morphological structure of the gland along with the gland size.

Ultrasound was successful in predicting multinodularity in 8 cases which were thought to be solitary nodule on palpation. The importance of this findings lies in the fact that the incidence of malignancy in solitary nodules is about 20-30% and falls to 1-6% in multinodular glands.

Ultrasound was able to predict micro calcifications in malignancies and the presence of macrocalcifications in benign nodules. This findings was of considerable importance for predicting malignancy in the nodules. Ultrasound was able to detect lymph node involvement in malignancies.

Ultrasound able to detect cystic degeneration in 33.33% of cases. Though ultrasound could not predict with certainty, the presence of malignant or benign nodule. It was specific in predicting malignancies based on solitary nodules, echotexture, calcification and lymph node involvement in 75% of cases.

Ultrasound was able to predict with certainty the presence of a peripheral hypoechoic halo in both the cases of benign follicular adenoma studied in our series. In both cases of thyroiditis, ultrasound showed a hypoechoic diffuse gland with no evidence of a focal mass lesion.

Radionuclide scanning was the gold standard in the assessment of functional status of the nodules and could predict the presence of hot or cold nodules.

Radionuclide was the modality of choice in the detection of ectopic thyroid tissue situated in the sublingual region and it could detect with certainty, the presence of accessory thyroid tissues.

Radionuclide scanning could predict functional autonomous thyroid nodules with decreased activity by the rest of the gland.

Radionuclide scanning was specific in detecting delayed uptake in both cases of thyroiditis.

Both ultrasound and radionuclide scanning were found to be complimentary to each other in the detection of thyroid abnormalities.

However, overall diagnostic efficacy of ultrasound is more than radionuclide scanning.

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