

A Study on Malignancy in Solitary Nodule Thyroid A Clinico-Radio-Pathological Evaluation

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ABSTRACT

BACKGROUND

Around 8% of the adult population have clinically palpable nodules of thyroid. Today, with advanced diagnostic and prognostic techniques, the detection has increased substantially. In south India, the prevalence of solitary nodule of thyroid is 12.2%. The incidence of malignancy in these nodule is 1%. Studies show that solitary nodule of thyroid has more propensity to become cancerous than multinodular goiter.

AIM AND OBJECTIVE

This study aimed to do a clinical study of solitary nodule of thyroid for assessing the potential for malignancy. The study focussed on finding the incidence of malignancy in solitary nodule of thyroid; assess the clinical features, radiological attributes and pathological confirmation of solitary nodule of thyroid.

MATERIAL AND METHODS

From December 2018 to October 2020, a prospective comparative study was done among 50 cases of solitary nodule thyroid. All data were recorded in structured questionnaires, coded and entered in Microsoft Excel. The data was then cleaned, checked for inconsistencies, missing values and prepared for analysis using SPSS v23. The data was then analysed for descriptive statistics and inferential statistics. The tests for significance were run to statistically validate the data. One sample t-test was used. The results were then tabulated and visualized in Microsoft word.

RESULTS AND CONCLUSIONS

The mean age of the participants is 41.7 years with a standard deviation of 14.6 years. Among the participants, there were 44 males (88%) and 6 females (12%).

Majority of them had right side solitary nodule with size less than 4 mm. The consistency was firm and hard in majority of cases and majority of them did not have lymphadenopathy. Out of 50 patients, 30 of them had <4 mm. Out of 50 nodules, 19 of them (38%) were hard in consistency. Out of 50 nodules, 12 of them (24%) were cystic in consistency. Out of 50 patients, 37 of did not have hypoechoogenicity. Out of 50 patients, 27 of did not have increased vascularity. Out of 50 patients, 29 of did not have calcification. Fine needle and aspiration cytology showed that; Out of 50 patients, 29 (58%) of them had a benign nodule. Out of 50 patients, 21 (42%) of them had a malignant nodule. Mann-Whitney U test shows that these two groups do not have any statistically significant difference ($p>0.05$). Comparison of gender with pathological findings shows that these two groups have statistically significant difference ($p<0.05$). Comparison of side of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$). Comparison of size of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$).

Comparison of consistency with pathological findings revealed statistically significant results ($p<0.05$).

Comparison of lymphadenopathy with pathological findings revealed statistically significant results ($p<0.05$).

There is more hypoechoogenicity ($n=13$) among malignant cases which is statistically significant ($p<0.005$).

There is more increased vascularity ($n=17$) among malignant cases which is statistically significant ($p<0.005$).

There is more calcification among malignant cases which is statistically significant ($p<0.005$).

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I. Introduction

A palpable discrete swelling in a normal gland is a solitary thyroid nodule. It is usually benign and has a lifetime malignancy risk of <5%. Around 8% of the adult population have clinically palpable nodules of

thyroid. Today, with advanced diagnostic and prognostic techniques, the detection has increased substantially¹⁻⁶. In south India, the prevalence of solitary nodule of thyroid is 12.2%⁷. The incidence of malignancy in these nodule is 1%. Studies show that solitary nodule of thyroid has more propensity to become cancerous than multinodular goiters^{8,9}.

It can be evident on inspection or may be an incidental finding on palpation or radiological examination. When they are incidentally found on radiological examination like ultrasonogram, CT scan and MRI, it warrants further evaluation only when the size exceeds >1cm or palpable or both. Further evaluation involves;

1. Physical examination
2. Biochemical evaluation
3. Ultrasound
4. Thyroid scanning
5. Fine needle aspiration cytology (FNAC)

The FNAC is simple, cost-effective, sensitive and conclusive. This helps to establish an early differentiation between benign and malignant. It can either be classified as a suspicious case or indeterminate nodules. In case of doubt, repeat FNAC must be done or thyroid scanning is preferred. Hot nodules are usually benign and are requires treatment for hyperthyroidism. The state of thyroid is found out by doing a TSH assay. This dictates the management of the solitary nodule.

Following are high risk factors

- a) Association with male gender
- b) Extreme age
- c) Nodule >4 cm
- d) Presence of pressure symptoms
- e) History of neck irradiation

Literature shows the higher incidence of malignancy in solitary nodule which is why surgeons treat solitary nodule with utmost suspicion. Tai et al in 2012 reported a high incidence of cancer in solitary nodule of thyroid¹⁰. Sometimes, it is present in around 50% of the elderly population with a majority being malignant. A complete history with clinical evaluation forms the baseline management. This is followed by thyroid function tests¹¹.

Thyroid nodules are common in females¹². However, the incidence of malignant thyroid nodules is higher among men¹³. Size of the nodule has no relationship with malignancy. But the risk of rare thyroid malignancies and follicular carcinomas increases with the enlargement of the nodules¹⁴. The most cost effective imaging procedure is the ultrasound. It has a high sensitivity and can be used to establish the number and size of the nodule. Following patterns are noted in ultrasound that points to malignancy;

- a) Irregular shape
- b) Ill-defined borders
- c) Hypoechogenicity / solid texture
- d) Vascularity
- e) Microcalcification
- f) Heterogeneous internal echoes
- g) Absence of halo
- h) Infiltration of adjacent structures
- i) Regional lymph node enlargement
- j) Ratio of anteroposterior to transverse diameter >1

A Nigerian study described a malignancy rate of 7.6% in solitary nodule of goiter¹⁵. In ultrasound, when there is Microcalcification, it is suggestive of malignancy. Also, hypoechogenicity has an increased correlation with malignancy. Lymphadenopathy is associated with malignancy too.

Rago et al in 2007¹⁶ reported that malignancy was predicted using spot micro calcification at ultrasound and atypia at cytology. In this study, single nodule, normal thyroid volume, male gender, increased size, nodular hypoechogenicity and blurred margins were associated with malignancy. The use of ultrasound in solitary nodule has been suggested by Panini et al in 2002¹⁷. They suggested that ultrasound guided FNAC is mandatory on all cases that are;

- a) 8-15 mm hypoechoic nodules
- b) Irregular margins
- c) Intranodular vascular spots
- d) Microcalcification

FNAC is simple, cost-effective and highly sensitive too. FNAC along with ultrasound increases the diagnostic accuracy. Ultrasound guided FNAC reduces the incidence of non-diagnostic smears^{18,19}. If the cytology is

suggestive of benign lesion, repeat ultrasound can be used for follow-up than repeat FNACs²⁰. However, standard guidelines differ from this²¹.

A study by Amitabh Jena in 2015 among 162 cases revealed the following findings²²;

- a) Sample size was 162 cases collected over 5-years
- b) It was done retrospectively
- c) 58 cases showed malignancy in postoperative histopathology
- d) Males had a higher preponderance for malignancy
- e) Solitary nodule had higher association with malignancy ($p < 0.005$)
- f) Microcalcification and lymphadenopathy was more pronounced in malignant cases
- g) Hypoechoogenicity was another factor that correlated with malignancy

This study aimed to do a clinical study of solitary nodule of thyroid for assessing the potential for malignancy. The study focussed on finding the incidence of malignancy in solitary nodule of thyroid; assess the clinical features, radiological attributes and pathological confirmation of solitary nodule of thyroid.

AIM OF THE STUDY

To do a clinical study of solitary nodule of thyroid for assessing the potential for malignancy

OBJECTIVES OF THE STUDY

Primary Objective

To do a clinical study of solitary nodule of thyroid for assessing the potential for malignancy

Secondary Objective

- To find the incidence of malignancy in solitary nodule of thyroid
- To assess the clinical features of solitary nodule of thyroid
- To assess the radiological features of solitary nodule of thyroid
- To assess the pathological features of solitary nodule of thyroid
- To find the correlation between malignancy and clinical features
- To find the correlation between malignancy and radiological features

II. Materials And Methods

STUDY DESIGN

A Prospective Observational Study

STUDY POPULATION

This prospective study comprised of 50 cases of solitary nodule thyroid and evaluation in the basis of clinico-radio-pathology in prospective of malignancy

STUDY PERIOD

From DECEMBER 2019 TO OCTOBER 2021

SAMPLE SIZE

This study includes 50 patients presenting with solitary nodule thyroid

INCLUSION CRITERIA

Patients with clinical support for the diagnosis and willingness for surgical management of solitary nodule in thyroid

- Patients with primary solitary nodule in thyroid
- Patients aged above 20 yrs

EXCLUSION CRITERIA

- Patients below 20 yrs
- Patients with chronic pain problems
- Patients with psychiatric problems, pregnancy, DM
- Patients with bleeding disorders and on anticoagulant treatment, hypersensitive to local anaesthesia drugs

METHODOLOGY

- 1) The cases admitted in all the surgical ward of the Department of General Surgery who are diagnosed to have solitary nodule of thyroid were included in the study.
- 2) A detailed history is taken and examination is done to diagnose solitary nodule thyroid.
- 3) Systemic examination and basic investigations done.
- 4) The following data was extracted from the patient's history, clinical examination, operative notes and during follow up:

- 5) The patient's Age
Sex
Duration of symptoms
Laboratory findings
- 6) Definitive procedure as per case notes were entered into the data collection sheet.
- 7) The following data was extracted from the patient's history, clinical examination, operative notes and during follow
 1. Loss of work day
 2. Duration of stay in the hospital.
 3. Early ambulance of the patient
 4. Patient satisfaction

PRIVACY/CONFIDENTIALITY OF STUDY SUBJECTS:

Privacy of the subjects shall be maintained.

STATISTICAL ANALYSIS

All data were recorded in structured questionnaires, coded and entered in Microsoft Excel. The data was then cleaned, checked for inconsistencies, missing values and prepared for analysis using SPSS v23. The data was then analyzed for descriptive statistics and inferential statistics. The tests for significance were run to statistically validate the data. One sample t-test was used. The results were then tabulated and visualized in Microsoft word.

III. Results

The mean age of the participants is 41.7 years with a standard deviation of 14.6 years. It ranges between 18-70 years. The median age of the sample is 40 years. Among the participants, there were 44 males (88%) and 6 females (12%).

Majority of them had right side solitary nodule with size less than 4 mm. The consistency was firm to hard in majority of cases and majority of them did not have lymphadenopathy. Out of 50 patients, 30 of them had <4 mm. This constituted 60% of the sample. Remaining 20 of them had >4mm size. This constituted 40% of the sample. Out of 50 nodules, 19 of them (38%) were hard in consistency. Out of 50 nodules, 19 of them (38%) were firm in consistency. Out of 50 nodules, 12 of them (24%) were cystic in consistency. Out of 50 patients, 37 of did not have lymphadenopathy. This constituted 74% of the sample. Remaining 13 of them had lymphadenopathy. This constituted 26% of the sample.

Out of 50 patients, 37 of did not have hypoechogenicity. Remaining 13 of them had hypoechogenicity. Out of 50 patients, 27 of did not have increased vascularity. Remaining 23 of them had increased vascularity. Out of 50 patients, 29 of did not have calcification. Remaining 21 of them had calcification.

Fine needle and aspiration cytology showed that;

Out of 50 patients, 29 (58%) of them had a benign nodule

Out of 50 patients, 21 (42%) of them had a malignant nodule

Mann-Whitney U test shows that these two groups do not have any statistically significant difference ($p>0.05$). Comparison of gender with pathological findings shows that these two groups have statistically significant difference ($p<0.05$). Comparison of side of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$). Comparison of size of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$).

Comparison of consistency with pathological findings revealed statistically significant results ($p<0.05$). Comparison of lymphadenopathy with pathological findings revealed statistically significant results ($p<0.05$). There is more hypoechogenicity ($n=13$) among malignant cases which is statistically significant ($p<0.005$). There is more increased vascularity ($n=17$) among malignant cases which is statistically significant ($p<0.005$). There is more calcification among malignant cases which is statistically significant ($p<0.005$).

SOCIODEMOGRAPHIC CHARACTERISTIC

AGE DISTRIBUTION

The mean age of the participants is 41.7 years with a standard deviation of 14.6 years. It ranges between 18-70 years. The median age of the sample is 40 years. The following table and figure shows the age distribution of the participants.

S.No	Parameters for SNG	Age (in years)
1	Mean	41.780
2	Median	40.000
3	Mode	40.0
4	Std. Deviation	14.6
5	Minimum	18.0
6	Maximum	70.0

Table 1: Age Distribution

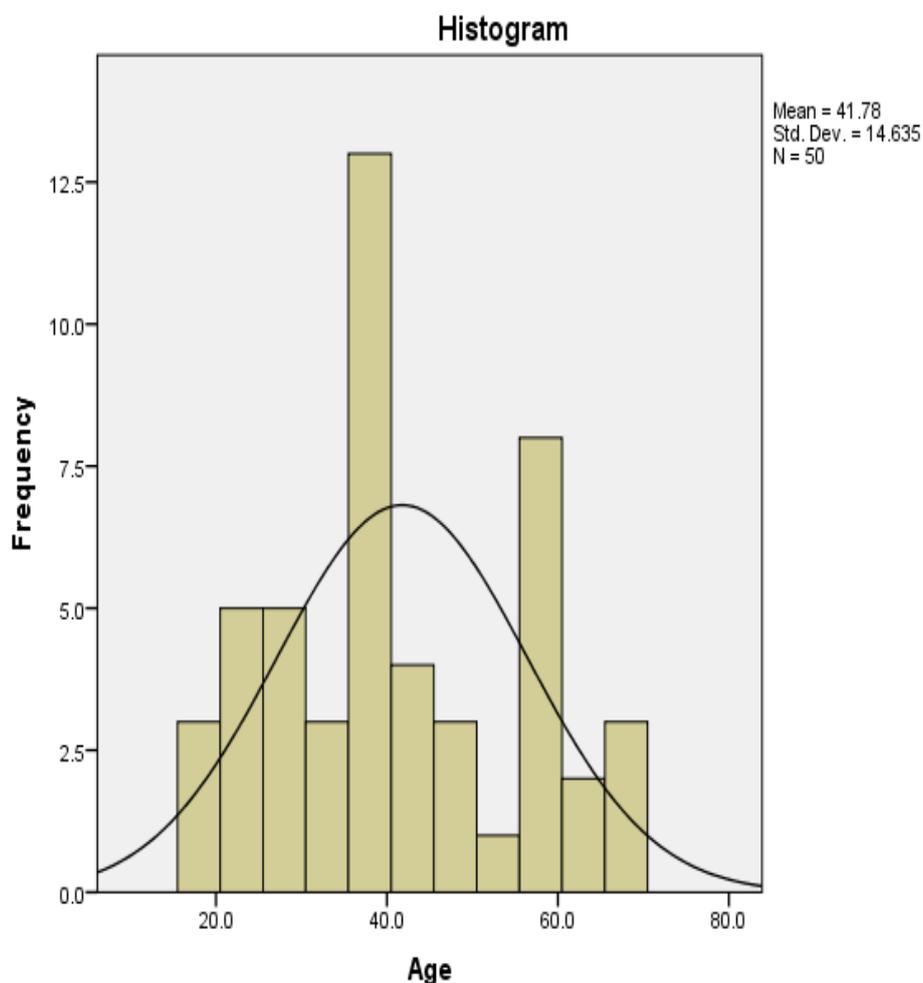


Figure 1: Age Distribution

GENDER DISTRIBUTION

Among the participants, there were 44 females (88%) and 6 males (12%) . The following table shows the gender distribution.

S.No	Gender	Frequency	Percentage
1	Female	44	88
2	Male	6	12
	Total	50	100

Table 2: Gender distribution

The following figure shows the gender distribution.

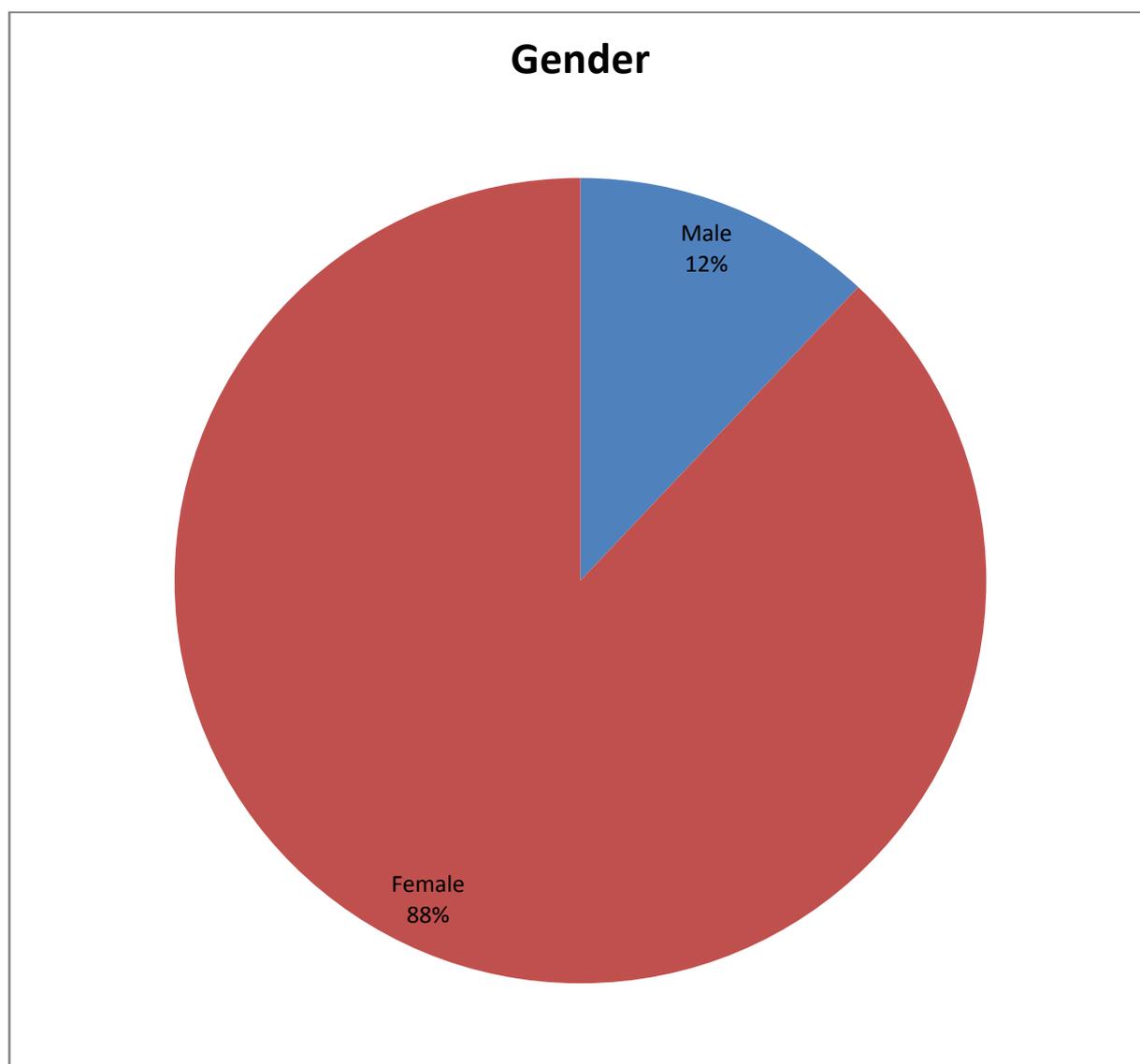


Figure 2: Gender distribution

CLINICAL FINDINGS

This section deals with the clinical findings of the patients. The following clinical findings were documented and analysed for the study;

- a) Side of the solitary nodule
- b) Size of the nodule
- c) Consistency
- d) Lymphadenopathy

Majority of them had right side solitary nodule with size less than 4 mm. The consistency was firm and hard in majority of cases and majority of them did not have lymphadenopathy. Out of 50 patients, 30 of them had <4 mm. This constituted 60% of the sample. Remaining 20 of them had >4mm size. This constituted 40% of the sample. Out of 50 nodules, 19 of them (38%) were hard in consistency. Out of 50 nodules, 19 of them (38%) were firm in consistency. Out of 50 nodules, 12 of them (24%) were cystic in consistency. Out of 50 patients, 37 of did not have lymphadenopathy. This constituted 74% of the sample. Remaining 13 of them had lymphadenopathy. This constituted 26% of the sample.

SIDE OF THE NODULE

Out of 50 patients, 32 of them had right sided solitary nodule. This constituted 64% of the sample. Remaining 18 of them had left sided solitary nodule. This constituted 36% of the sample.

The following table shows the side of the nodule

S.No	Side	Frequency	Percentage
1	Right	32	64
2	Left	18	36
	Total	50	100

Table 3: Side of the nodule

The following figure shows the side of the nodule

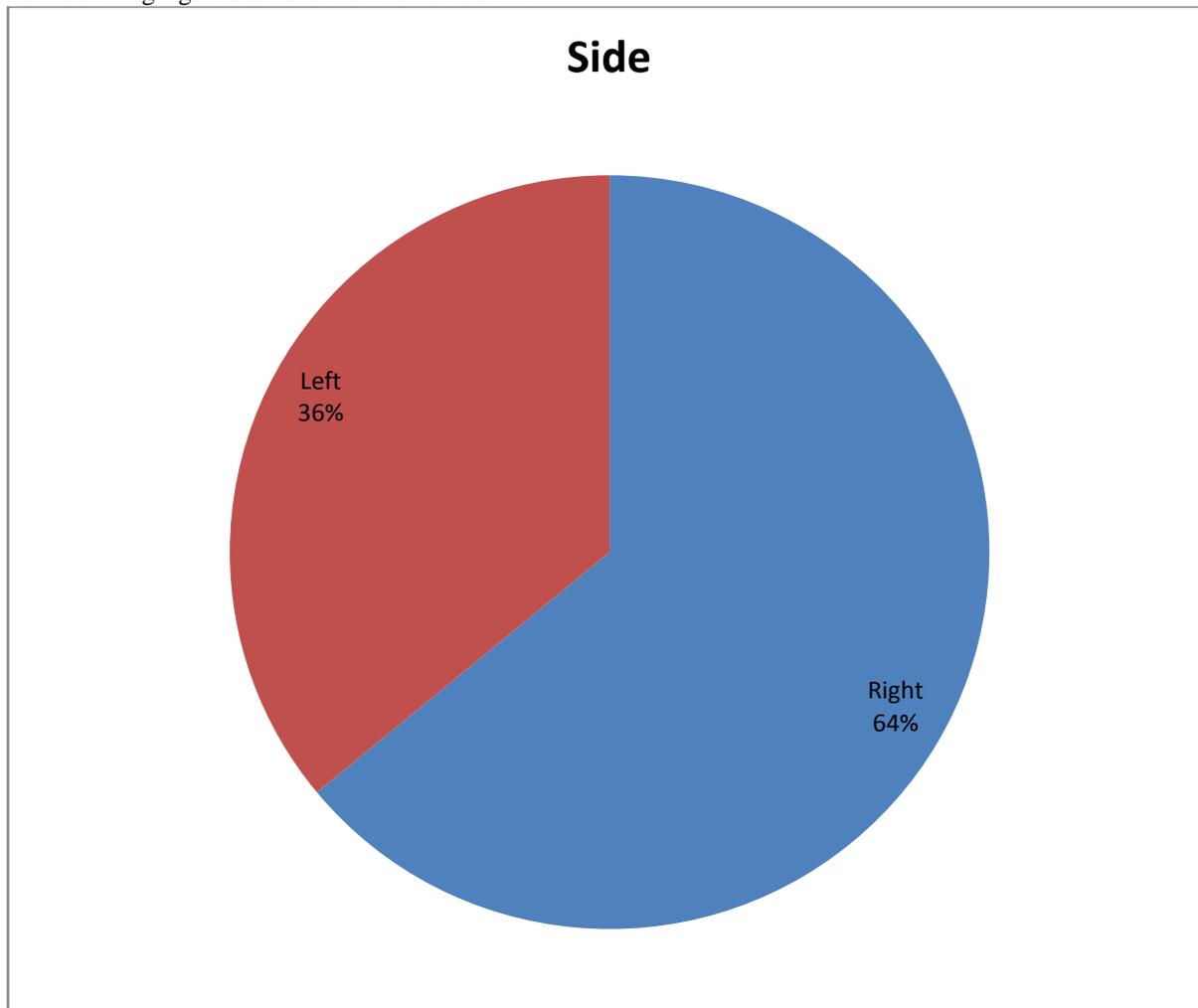


Figure 3: Side of the nodule

SIZE OF THE NODULE

Out of 50 patients, 30 of them had <4 mm. This constituted 60% of the sample. Remaining 20 of them had >4mm size. This constituted 40% of the sample.

The following table shows the size of the nodule

S.No	Size	Frequency	Percentage
1	<4mm	30	60.0
2	>4mm	20	40.0
	Total	50	100

Table 4: Size of the nodule

The following figure shows the size of the nodule

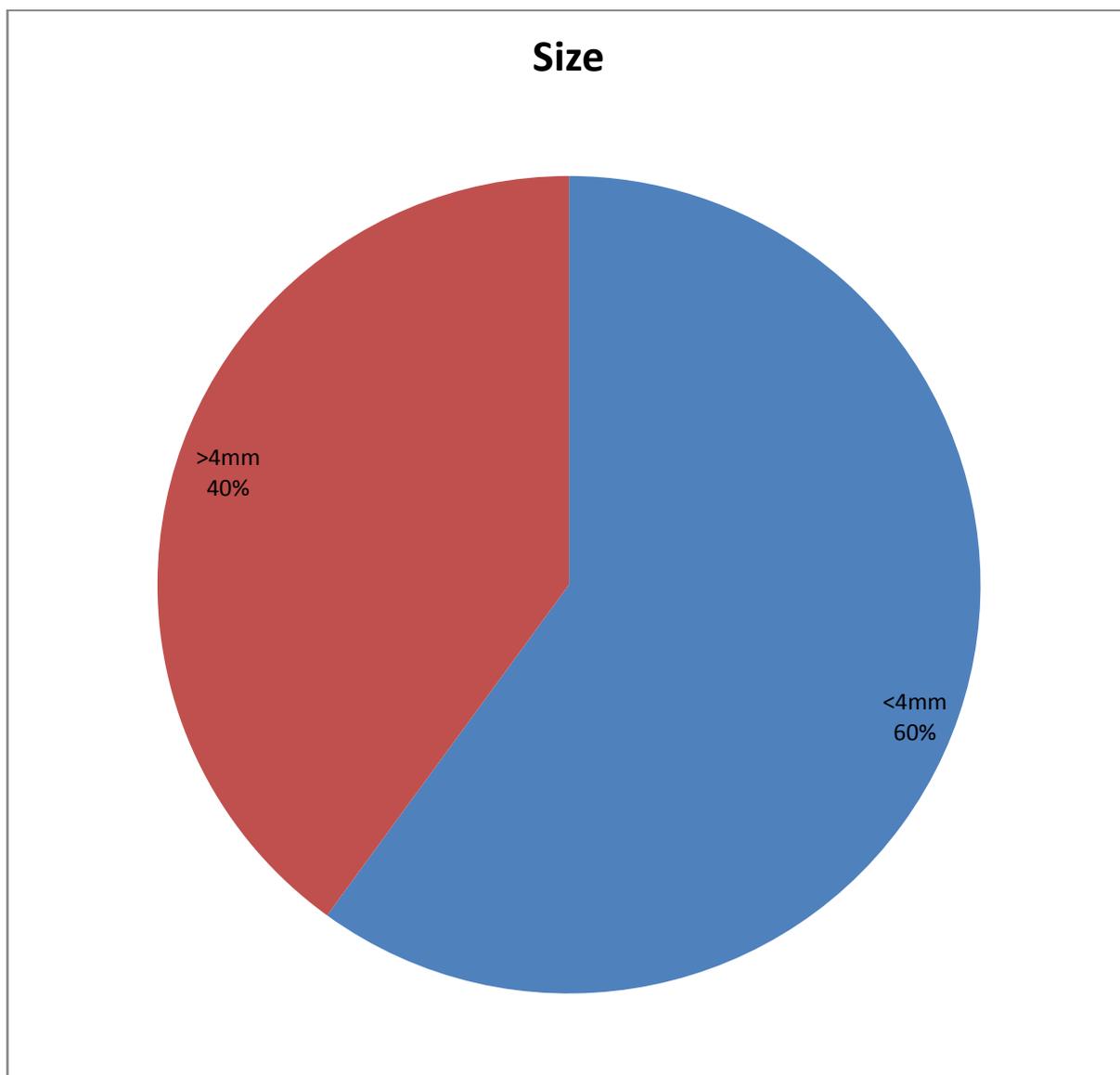


Figure 4: Size of the nodule

CONSISTENCY OF THE NODULE

The following table shows the consistency of the nodule

Out of 50 nodules, 19 of them (38%) were hard in consistency

Out of 50 nodules, 19 of them (38%) were firm in consistency

Out of 50 nodules, 12 of them (24%) were cystic in consistency

S.No	Consistency	Frequency	Percentage
1	Cystic	12	24.0
2	Firm	19	38.0
3	Hard	19	38.0
	Total	50	100

Table 5: Consistency of the nodule

The following figure shows the consistency of the nodule

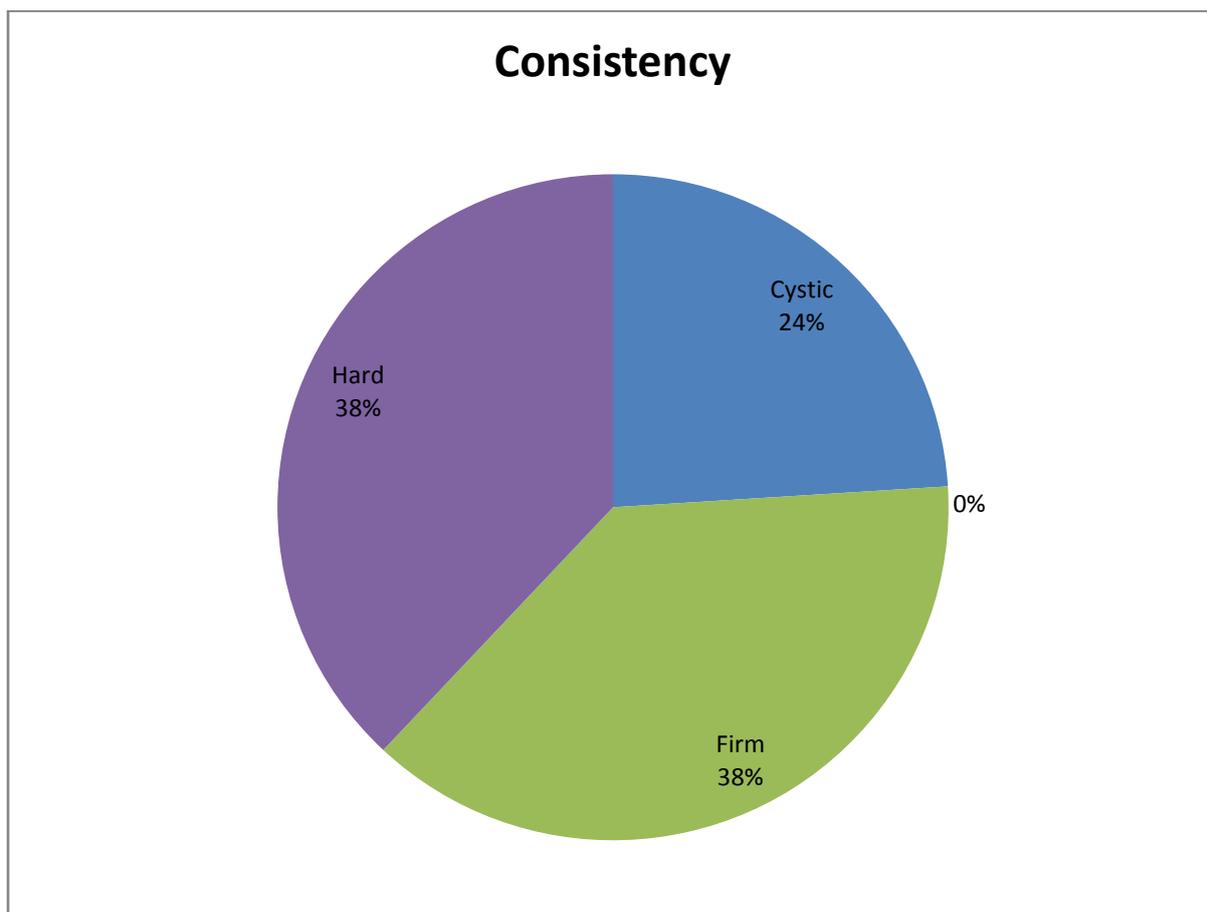


Figure 5: Consistency of the nodule

LYMPHADENOPATHY

Out of 50 patients, 37 of did not have lymphadenopathy. This constituted 74% of the sample.

Remaining 13 of them had lymphadenopathy. This constituted 26% of the sample.

The following table shows lymphadenopathy incidence.

S.No	Lymphadenopathy	Frequency	Percentage
1	Yes	13	26
2	No	37	74
	Total	50	100

Table 6: Lymphadenopathy

The following figure shows lymphadenopathy incidence in the sample.

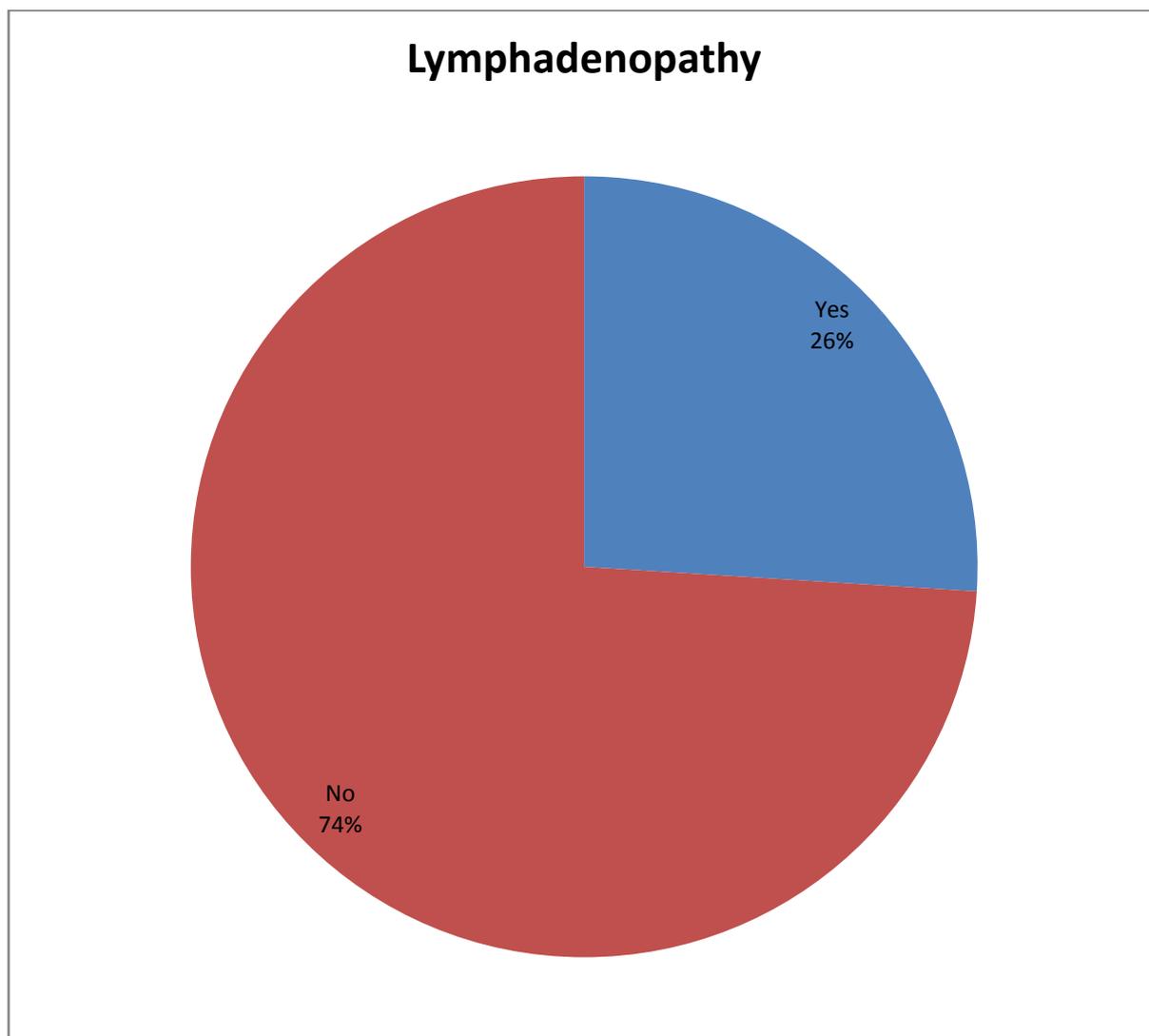


Figure 6: Lymphadenopathy

ULTRASOUND FINDINGS

This following section deals with the findings of ultrasound.

Out of 50 patients, 37 of did not have hypoechogenicity. This constituted 74% of the sample.

Remaining 13 of them had hypoechogenicity. This constituted 26% of the sample.

Out of 50 patients, 27 of did not have increased vascularity. This constituted 54% of the sample.

Remaining 23 of them had increased vascularity. This constituted 46% of the sample.

Out of 50 patients, 29 of did not have calcification. This constituted 58% of the sample.

Remaining 21 of them had calcification. This constituted 42% of the sample.

HYPOECHOGENICITY

Out of 50 patients, 37 of did not have hypoechogenicity. This constituted 74% of the sample.

Remaining 13 of them had hypoechogenicity. This constituted 26% of the sample.

The following table shows hypoechogenicity.

S.No	Hypoechogenicity	Frequency	Percentage
1	Yes	13	26
2	No	37	74
	Total	50	100

Table 7: Hypoechogenicity

The following figure shows hypoechogenicity.

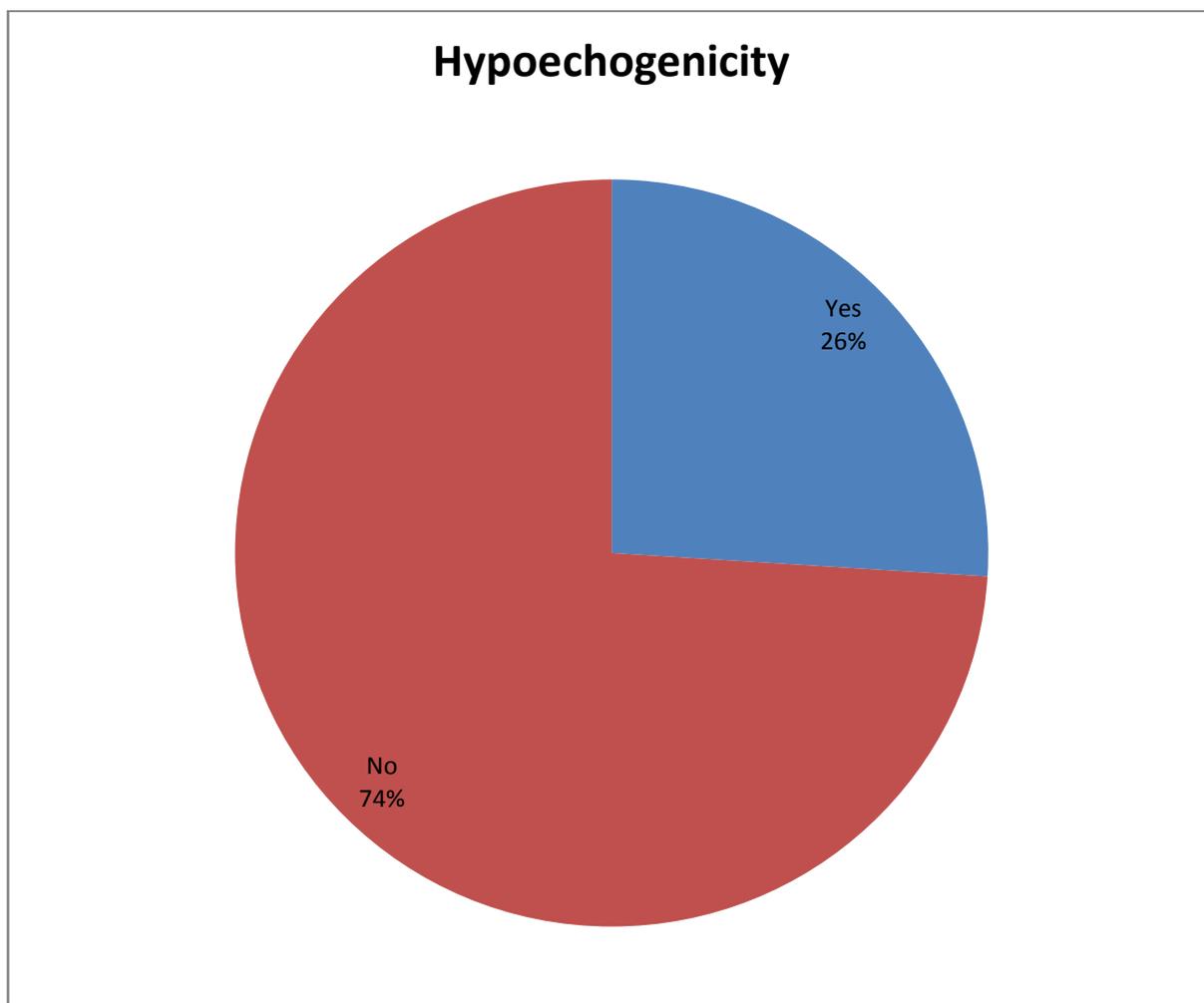


Figure 7: Hypoechogenicity

INCREASED VASCULARITY

Out of 50 patients, 27 of did not have increased vascularity. This constituted 54% of the sample.

Remaining 23 of them had increased vascularity. This constituted 46% of the sample.

The following table shows increased vascularity.

S.No	Increased Vascularity	Frequency	Percentage
1	Yes	23	46
2	No	27	54
	Total	50	100

Table 8: Increased vascularity

The following figure shows increased vascularity.

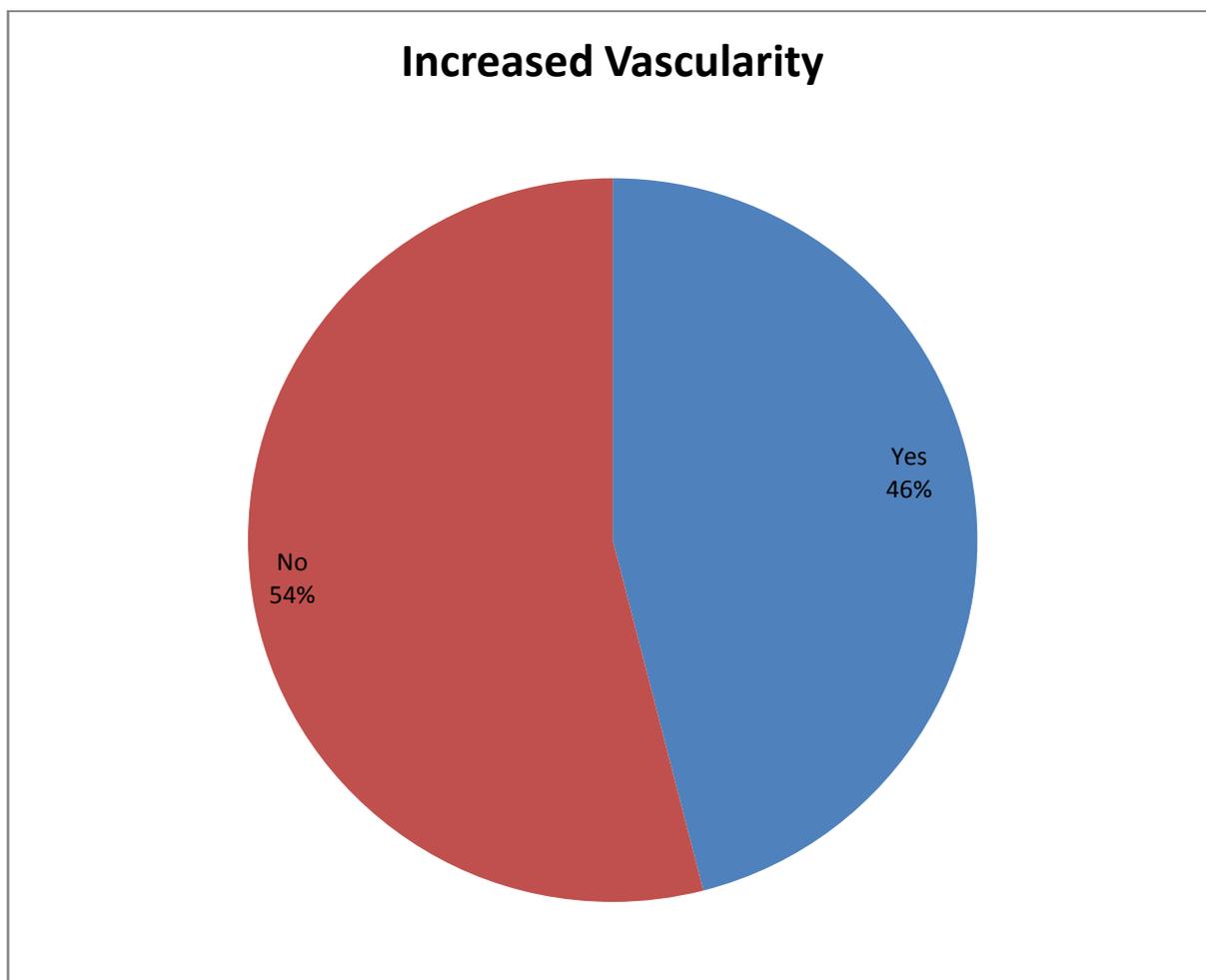


Figure 8: Increased vascularity

CALCIFICATION

Out of 50 patients, 29 of did not have calcification. This constituted 58% of the sample.

Remaining 21 of them had calcification. This constituted 42% of the sample.

The following table shows calcification.

S.No	Calcification	Frequency	Percentage
1	Yes	21	42
2	No	29	58
	Total	50	100

Table 9: Calcification

The following figure shows calcification.

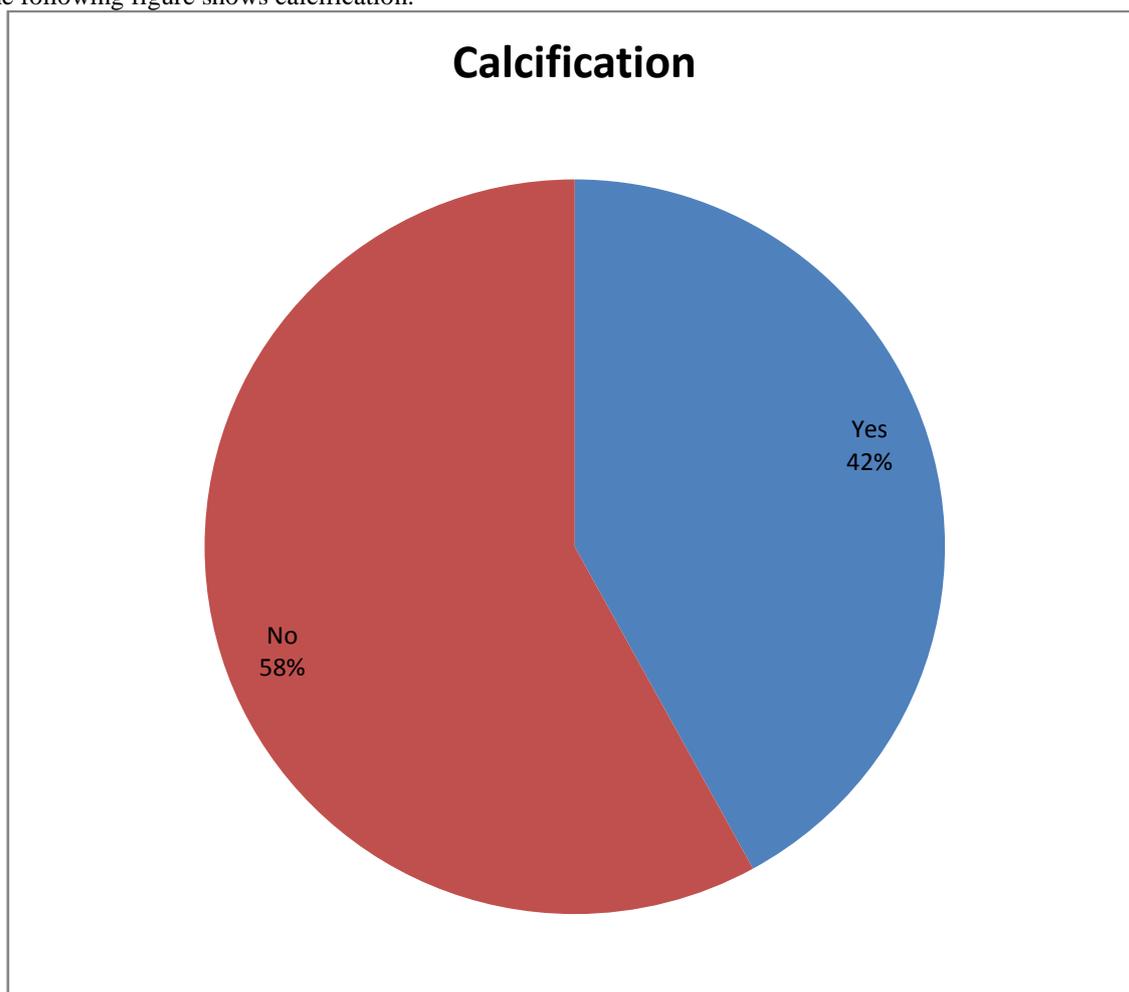


Figure 9: Calcification

PATHOLOGICAL FINDINGS

This section deals with the pathological findings of the solitary nodule.

FNAC FINDINGS

Fine needle and aspiration cytology showed that;

Out of 50 patients, 29 (58%) of them had a benign nodule

Out of 50 patients, 21 (42%) of them had a malignant nodule

This table shows the FNAC findings.

S.No	FNAC	Frequency	Percentage
1	Benign	29	58.0
2	Malignant	21	42.0
	Total	50	100

Table 10: FNAC findings

This figure shows the FNAC findings.

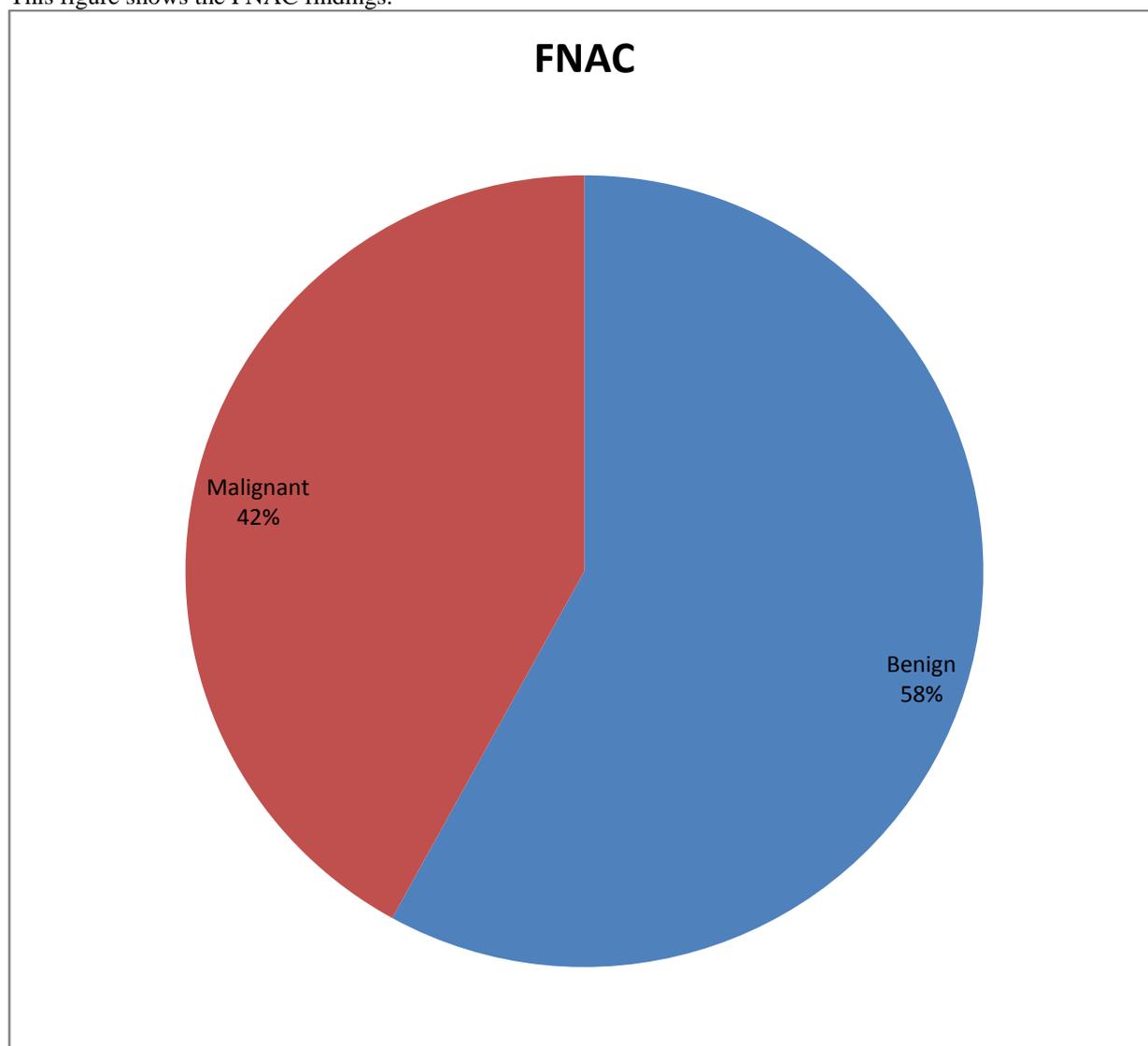


Figure 10: FNAC findings

The following table shows the HPE findings;

HPE	Frequency	Percent
Adenomatous Goitre	1	2.0
Adenomatous Hyperplasia	1	2.0
Colloid Cyst	1	2.0
Colloid Cyst with Degenerative changes	1	2.0
Colloid goitre	1	2.0
Colloid Goitre with Degenerative changes	1	2.0
Colloid Nodule	1	2.0
Encapsulated Follicular Variant of Papillary Carcinoma	1	2.0
Follicular Adenocarcinoma	8	16.0
Follicular Adenoma	2	4.0
Lymphocytic thyroiditis	1	2.0
SNG with Cystic Degeneration	1	2.0
Nodular Colloid Goitre	9	18.0
Nodular Colloid Goitre with Cystic Degeneration	1	2.0
Nodular Colloid Goitre with Degenerative Changes	2	4.0
Nodular Goitre	3	6.0
Nodular Goitre with Degenerative Changes	1	2.0
Papillary Carcinoma Thyroid	14	28.0
Total	50	100.0

Table 11: HPE findings

MANAGEMENT

Out of 50 patients,

- a) 54% (n=27) had total thyroidectomy
- b) 38% (n=19) had Hemithyroidectomy
- c) 2% (n=1) had subtotal thyroidectomy
- d) 6% (n=3) had conservative management

The following table shows the treatment done

S.No	Treatment	Frequency	Percentage
1	Conservative	3	6.0
2	Left Hemithyroidectomy	7	14.0
3	Right Hemithyroidectomy	12	24.0
4	Subtotal Thyroidectomy	1	2.0
5	Total Thyroidectomy	27	54.0
	Total	50	100

Table 12: Treatment

The following figure shows the treatment done

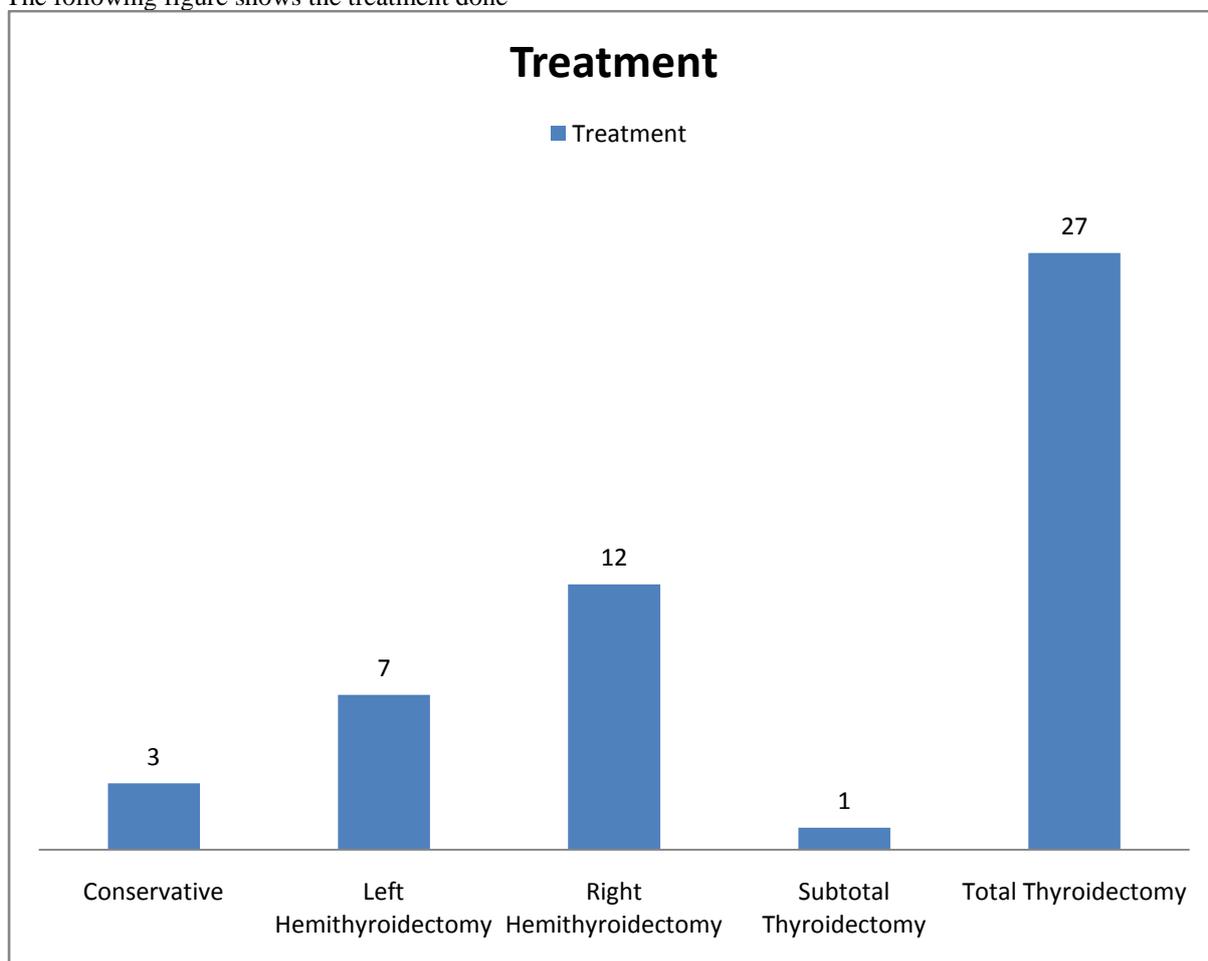


Figure 11: Treatment

INFERENCE STATISTICS

This section deals with the findings of comparison of pathological findings with sociodemographic features, ultrasound findings and clinical features.

The mean age in the benign group was 23.26 years while the mean age in the malignant group is 28.6 years. Mann-Whitney U test shows that these two groups do not have any statistically significant difference ($p > 0.05$). Comparison of gender with pathological findings shows that these two groups have statistically significant difference ($p < 0.05$).

Comparison of side of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$). Comparison of size of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$).

Comparison of consistency with pathological findings revealed statistically significant results ($p<0.05$). Comparison of lymphadenopathy with pathological findings revealed statistically significant results ($p<0.05$).

There is more hypoechogenicity ($n=13$) among malignant cases which is statistically significant ($p<0.005$). There is more increased vascularity ($n=17$) among malignant cases which is statistically significant ($p<0.005$). There is more calcification among malignant cases which is statistically significant ($p<0.005$).

Comparison of sociodemographic features with pathological findings

Age and gender was compared between the benign and malignant conditions.

Comparison of age with pathological findings

The mean age in the benign group was 23.26 years while the mean age in the malignant group is 28.6 years. Mann-Whitney U test shows that these two groups do not have any statistically significant difference ($p>0.05$).

	FNAC	N	Mean Rank	Sum of Ranks
Age	Benign	29	23.26	674.50
	Malignant	21	28.60	600.50
	Total	50		

Table 13: Comparison of age with pathological findings

	Age
Mann-Whitney U	239.500
Wilcoxon W	674.500
Z	-1.279
Asymp. Sig. (2-tailed)	.201

Table 14: Mann-Whitney U test for comparison of age

Comparison of gender with pathological findings

Comparison of gender with pathological findings show that these two groups have statistically significant difference ($p<0.05$)

Gender		FNAC		Total
		Benign	Malignant	
Female		26	18	44
	Male	3	3	6
Total		29	21	50

Table 15: Comparison of gender with pathological findings

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.179 ^a	1	.674		
Continuity Correction ^b	.000	1	1.000		
Likelihood Ratio	.177	1	.674		
Fisher's Exact Test				.686	.499
N of Valid Cases	50				

Table 16: Chi-Square test for comparison of age

Comparison of clinical features with pathological findings

Pathological findings were compared with clinical features.

Comparison of side of lesion with pathological findings

Comparison of side of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$).

SIDE		FNAC		Total
		Benign	Malignant	
Left SNG		9	9	18
	Right SNG	20	12	32
Total		29	21	50

Table 17: Comparison of side of lesion with pathological findings

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.763 ^a	2	.683
Likelihood Ratio	.761	2	.684
N of Valid Cases	50		

Table 18: Chi-Square test for comparison of side of lesion with pathological findings

Comparison of size of lesion with pathological findings

Comparison of size of lesion with pathological findings did not reveal any statistically significant results (p>0.05).

		FNAC		Total
		Benign	Malignant	
SIZE	<4mm	29	1	30
	>4mm	0	20	20
Total		29	21	50

Table 19: Comparison of side of lesion with pathological findings

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	46.032 ^a	1	.000
Likelihood Ratio	59.261	1	.000
N of Valid Cases	50		

Table 20: Chi-Square test for comparison of size of lesion with pathological findings

Comparison of consistency of lesion with pathological findings

Comparison of consistency with pathological findings revealed statistically significant results (p<0.05).

		FNAC		Total
		Benign	Malignant	
CONSISTENCY	Cystic	12	0	12
	Firm	16	3	19
	Hard	1	18	19
Total		29	21	50

Table 21: Comparison of consistency of lesion with pathological findings

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.740 ^a	2	.000
Likelihood Ratio	43.620	2	.000
N of Valid Cases	50		

Table 22: Chi-Square test for comparison of consistency of lesion with pathological findings

Comparison of lymphadenopathy with pathological findings

Comparison of lymphadenopathy with pathological findings revealed statistically significant results (p<0.05).

		FNAC		Total
		Benign	Malignant	
LYMPHADENOPATHY	--	29	8	37
	++	0	13	13
Total		29	21	50

Table 23: Comparison of lymphadenopathy with pathological findings

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.260 ^a	1	.000
Likelihood Ratio	29.395	1	.000
N of Valid Cases	50		

Table 24: Chi-Square test for comparison of lymphadenopathy with pathological findings

Comparison of ultrasound features with pathological findings

Pathological findings were compared with Ultrasound findings

Comparison of hypoechoogenicity with benign/malignant

There is more hypoechoogenicity (n=13) among malignant cases which is statistically significant (p<0.005).

		FNAC		Total
		Benign	Malignant	
HYPOECHOGENICITY	No	29	8	37
	Yes	0	13	13
Total		29	21	50

Table 25: Comparison of hypoechoogenicity with benign/malignant

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.260 ^a	1	.000
Likelihood Ratio	29.395	1	.000
N of Valid Cases	50		

Table 26: Chi-Square test for comparison of hypoechoogenicity with pathological findings

Comparison of increased vascularity with benign/malignant

There is more increased vascularity (n=17) among malignant cases which is statistically significant (p<0.005).

		FNAC		Total
		Benign	Malignant	
INCREASED VASCULARITY	No	23	4	27
	Yes	6	17	23
Total		29	21	50

Table 27: Comparison of increased vascularity with benign/malignant

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.807 ^a	1	.000
Likelihood Ratio	18.975	1	.000
N of Valid Cases	50		

Table 28: Chi-Square test for comparison of increased vascularity with pathological findings

Comparison of calcification with benign/malignant

There is more calcification among malignant cases which is statistically significant (p<0.005).

		FNAC		Total
		Benign	Malignant	
CALCIFICATION	No	23	6	29
	Yes	6	15	21
Total		29	21	50

Table 29: Comparison of calcification with benign/malignant

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.872 ^a	1	.000
Likelihood Ratio	13.333	1	.000
N of Valid Cases	50		

Table 30: Chi-Square test for comparison of calcification with pathological findings

IV. Discussion

This study aimed to do a clinical study of solitary nodule of thyroid for assessing the potential for malignancy. The study focussed on finding the incidence of malignancy in solitary nodule of thyroid; assess the clinical features, radiological attributes and pathological confirmation of solitary nodule of thyroid. Statistical tests were done to find the correlation between malignancy and clinical/ radiological features.

A palpable discrete swelling in a normal gland is a solitary thyroid nodule. It is usually benign and has a lifetime malignancy risk of <5%.

Around 8% of the adult population have clinically palpable nodules of thyroid. Today, with advanced diagnostic and prognostic techniques, the detection has increased substantially¹⁻⁶. In south India, the prevalence of solitary nodule of thyroid is 12.2%⁷. The incidence of malignancy in these nodules is 1%. Studies show that solitary nodules of thyroid has more propensity to become cancerous than multinodular goiters^{8,9}.

It can be evident on inspection or may be an incidental finding on palpation or radiological examination. When they are incidentally found on radiological examination like x-rays, CT scan and MRI, it warrants further evaluation only when the size exceeds >1cm or palpable or both.

The FNAC is simple, cost-effective, sensitive and conclusive.

This helps to establish an early differentiation between benign and malignant. It can either be classified as a suspicious case or indeterminate nodules. In case of doubt, repeat FNAC must be done or thyroid scanning

is preferred. Hot nodules are usually benign and are requires treatment for hyperthyroidism. The state of thyroid is found out by doing a TSH assay.

This study aimed to do a clinical study of solitary nodule of thyroid for assessing the potential for malignancy. The study focussed on finding the incidence of malignancy in solitary nodule of thyroid; assess the clinical features, radiological attributes and pathological confirmation of solitary nodule of thyroid.

The mean age of the participants is 41.7 years with a standard deviation of 14.6 years. It ranges between 18-70 years. The median age of the sample is 40 years. Among the participants, there were 44 males (88%) and 6 females (12%).

Majority of them had right side solitary nodule with size less than 4 mm. The consistency was firm and hard in majority of cases and majority of them did not have lymphadenopathy. Out of 50 patients, 30 of them had <4 mm. This constituted 60% of the sample. Remaining 20 of them had >4mm size. This constituted 40% of the sample. Out of 50 nodules, 19 of them (38%) were hard in consistency. Out of 50 nodules, 19 of them (38%) were firm in consistency. Out of 50 nodules, 12 of them (24%) were cystic in consistency. Out of 50 patients, 37 of did not have lymphadenopathy. This constituted 74% of the sample. Remaining 13 of them had lymphadenopathy. This constituted 26% of the sample.

Out of 50 patients, 37 of did not have hypoechogenicity. Remaining 13 of them had hypoechogenicity. Out of 50 patients, 27 of did not have increased vascularity. Remaining 23 of them had increased vascularity. Out of 50 patients, 29 of did not have calcification. Remaining 21 of them had calcification.

Fine needle and aspiration cytology showed that;

Out of 50 patients, 29 (58%) of them had a benign nodule

Out of 50 patients, 21 (42%) of them had a malignant nodule

Mann-Whitney U test shows that these two groups do not have any statistically significant difference ($p>0.05$). Comparison of gender with pathological findings shows that these two groups have statistically significant difference ($p<0.05$). Comparison of side of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$). Comparison of size of lesion with pathological findings did not reveal any statistically significant results ($p>0.05$).

Comparison of consistency with pathological findings revealed statistically significant results ($p<0.05$). Comparison of lymphadenopathy with pathological findings revealed statistically significant results ($p<0.05$). There is more hypoechogenicity ($n=13$) among malignant cases which is statistically significant ($p<0.005$). There is more increased vascularity ($n=17$) among malignant cases which is statistically significant ($p<0.005$). There is more calcification among malignant cases which is statistically significant ($p<0.005$).

Literature shows the higher incidence of malignancy in solitary nodules which is why surgeons treat solitary nodules with utmost suspicion. Tai et al in 2012 reported a high incidence of cancer in solitary nodule of thyroid¹⁰. Sometimes, it is present in around 50% of the elderly population with a majority being malignant. A complete history with clinical evaluation forms the baseline management. This is followed by thyroid function tests¹¹.

Thyroid nodules are common in females¹². However, the incidence of malignant thyroid nodules is higher among men¹³. Size of the nodule has no relationship with malignancy. But the risk of rare thyroid malignancies and follicular carcinomas increases with the enlargement of the nodules¹⁴. The most cost effective imaging procedure is the ultrasound. It has a high sensitivity and can be used to establish the number and size of the nodule. Following patterns are noted in ultrasound that points to malignancy;

- 1.Irregular shape
- 2.Ill-defined borders
- 3.Hypoechogenicity/solid texture
- 4.vascularity
- 5.Microcalcification
- 6.Heterogenous internal echoes
- 7.Absence of halo
- 8.Infiltration of regional structures
- 9.Regional lymph node enlargement
- 10.Ratio of anteroposterior to transverse diameter >1

A Nigerian study described a malignancy rate of 7.6% in solitary nodule of goiter¹⁵. In ultrasound, when there is Microcalcification, it is suggestive of malignancy. Also, hypoechogenicity has an increased correlation with malignancy. Lymphadenopathy is associated with malignancy too.

Rago et al in 2007¹⁶ reported that malignancy was predicted using spot micro calcification at ultrasound and atypia at cytology. In this study, single nodules, normal thyroid volume, male gender, increased size, nodular hypoechogenicity and blurred margins were associated with malignancy. The use of ultrasound in

solitary nodule has been suggested by Papini et al in 2002¹⁷. They suggested that ultrasound guided FNAC is mandatory on all cases that are;

- e) 8-15 mm hypoechoic nodules
- f) Irregular margins
- g) Intranodular vascular spots
- h) Microcalcification

FNAC is simple, cost-effective and highly sensitive too. FNAC along with ultrasound increases the diagnostic accuracy. Ultrasound guided FNAC reduces the incidence of non-diagnostic smears^{18,19}. If the cytology is suggestive of benign lesion, repeat ultrasound can be used for follow-up than repeat FNACs²⁰. However, standard guidelines differ from this²¹.

A study by Amitabh Jena in 2015 among 162 cases revealed the following findings²²;

- h) Sample size was 162 cases collected over 5-years
- i) It was done retrospectively
- j) 58 cases showed malignancy in postoperative histopathology
- k) Males had a higher preponderance for malignancy
- l) Solitary nodule had higher association with malignancy ($p < 0.005$)
- m) Microcalcification and lymphadenopathy was more pronounced in malignant cases
- n) Hypoechogenicity was another factor that correlated with malignancy

Findings from the present study correlate with the existing literature.

V. Summary And Conclusions

This study aimed to do a clinical study of solitary nodule of thyroid for assessing the potential for malignancy. The study focussed on finding the incidence of malignancy in solitary nodule of thyroid; assess the clinical features, radiological attributes and pathological confirmation of solitary nodule of thyroid.

The mean age of the participants is 41.7 years with a standard deviation of 14.6 years. It ranges between 18-70 years. The median age of the sample is 40 years. Among the participants, there were 44 males (88%) and 6 females (12%).

Majority of them had right side solitary nodule with size less than 4 mm. The consistency was firm and hard in majority of cases and majority of them did not have lymphadenopathy. Out of 50 patients, 30 of them had <4 mm. This constituted 60% of the sample. Remaining 20 of them had >4mm size. This constituted 40% of the sample. Out of 50 nodules, 19 of them (38%) were hard in consistency. Out of 50 nodules, 19 of them (38%) were firm in consistency. Out of 50 nodules, 12 of them (24%) were cystic in consistency. Out of 50 patients, 37 of did not have lymphadenopathy. This constituted 74% of the sample. Remaining 13 of them had lymphadenopathy. This constituted 26% of the sample.

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VI. Limitations

Following are the limitations of the study;

- a) The study is a single centric study
- b) Findings may be biased due to non-random sampling
- c) Smaller sample size affects the generalizability of the findings

VII. Future Recommendations

Following are the future directions;

- a) Multicentric studies must be conducted to help get a better perspective
- b) Larger sample size must be recruited to better generalizability of findings
- c) Random sampling to be used to avoid bias
- d) The findings should be correlated with biomarkers

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