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Original Research Article

A hospital based clinical study of 100 patients of solitary thyroid nodule

Mayank Chakraborty, Anuradha Dnyanmote*, Sree Ganesh Balasubramanian, Mahendra Bendre

Department of General Surgery, Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune, Maharashtra, India

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***Correspondence:**
Dr. Anuradha Dnyanmote,
E-mail: adnyanmote@gmail.com

ABSTRACT

Background: Thyroid nodules present as a challenge in their diagnosis, evaluation and management. Often these lumps are large in size and develop at the edge of thyroid gland so that they are felt or seen as a lump in front of the neck. The prevalence of these nodules in a given population depends on number of factors like age, sex, diet, iodine deficiency and even therapeutic and environmental radiation exposure. Prevalence increases with age with spontaneous nodules occurring at a rate of 0-0.8% per year, beginning early in life and extending till the eighth decade. In this study, the basic aim is to depict the various clinical presentations of solitary thyroid nodule and thereby find out the best diagnostic modality so as to plan out the most effective treatment strategy for such lesions.
Methods: A hospital based prospective study was done with 100 patients to assess the various clinical presentations of solitary thyroid nodule and thereby find out the best diagnostic modality so as to plan out the most effective treatment strategy for such lesions.
Results: Thyroid nodules are common in females of age group 31-40 years. Commonest presenting complaint is swelling in the front of lower neck. Most of the patients presented between 6 months to 3 years of onset of swelling.
Conclusions: In present study, the sensitivity and specificity of FNAC was 85.71% and 100% respectively. All malignant lesions on FNAC were confirmed by histopathology indicating its excellence. Therefore, FNAC helps in planning the correct management and avoids second surgery.

Keywords: Neck swelling, Solitary nodule, Thyroid, Thyroid neoplasm

INTRODUCTION

The thyroid gland is an endocrine gland situated in the lower part of front and the sides of the neck. Its main function is regulation of the basal metabolic rate, stimulates somatic and psychic growth and plays important role in calcium metabolism. The term thyroid is derived from Greek, which means shield (Thyros - shield, eidos - form).

Any enlargement of the thyroid gland is called goiter. A solitary nodule is a goiter which, on clinical examination appears to be a single nodule in one lobe of the thyroid with no palpable abnormality elsewhere in the gland.[1] The incidence of solitary nodule in general population in India is 9%.[2]

Solitary nodule in thyroid has aroused interest since 1949, when Warren H Cole in his study concluded that incidence of malignancy is higher in solitary nodule when compared with Multi-nodular goiter (MNG).[3] Thyroid nodules are very common with estimated prevalence that ranges from 4% by palpation to 67% by ultrasonography.[4] Autopsy studies reveal that 50% of adults had nodules, the majority of which are

impalpable.[5] Thyroid nodules are 4 times more common in females than in men.[6]

A solitary nodule is a clinical diagnosis and not a pathological diagnosis. Almost all conditions of the thyroid may present clinically as a solitary nodule. Diagnostic possibilities in case of solitary nodules are adenoma, carcinoma, thyroid cyst and palpable nodule in an evolving multinodular colloid goitre. Other rare causes of solitary nodules include inflammatory thyroid lesions and developmental abnormalities such as dermoid cyst, teratoma etc.

Solitary nodule of the thyroid has aroused interest because of its varied etiology and diverse clinical presentations. Majority of the solitary nodules are benign and thyroid carcinoma is comparatively rare.

Clinically, solitary nodules fall into two categories. In the first, are those in which there is a certainty or grave suspicion of malignancy and in the second and far larger category, there is a smooth, firm, mobile nodule which is probably benign but carries a small but significant risk of being malignant.

Growths or lumps in the thyroid gland present as swellings in front of the neck moving with deglutition. Prevalence of these lumps depends on various factors like age, sex, diet, iodine deficiency, endemic areas, fluorosis belt and radiation exposure.

There is a high risk of malignancy in STN than in multiple nodules. Because of this reason, Solitary thyroid nodules have to be treated with high degree of suspicion and plan treatment in a systematic manner. Solitary thyroid nodules (STN) occur in 4-7% of the adult population. They are more common in females (6.4%) as compared to males (1.5%). Papillary and follicular cancer comprises the vast majority (90%) of all thyroid cancer. Further, thyroid cancers are aggressive if in children with early metastasis to the surrounding structures and to regional lymph nodes and distant sites including lungs and bones.

Benign nodules are classified as adenomas, colloid nodules, cysts, infectious nodules, lymphocytic or granulomatous, hyperplastic nodules, thyroiditis, and congenital anomalies.[7] Malignant nodules can be classified into differentiated (papillary and follicular carcinomas), medullary carcinoma, undifferentiated (small cell, giant cell, carcinosarcoma) and miscellaneous like lymphoma, sarcoma, squamous cell carcinoma, fibrosarcoma, mucoepidermoid carcinoma and metastatic tumour.

The critical issue is to determine whether the nodule is benign or malignant. Fine needle aspiration cytology has become the mainstay in the initial evaluation of thyroid nodule followed by ultrasound scan and thyroid profile.

It is therefore crucial to have a clear diagnostic approach to ensure patients, presenting with thyroid nodules, are managed appropriately and are not over or under-treated.

Hence the present study was done at the tertiary care centre to assess the various clinical presentations of solitary thyroid nodule and thereby find out the best diagnostic modality so as to plan out the most effective treatment strategy for such lesions.

Aims and objectives

- To determine the demographics of thyroid nodules in the general population in relation to age and sex.
- To determine the clinical presentation of solitary thyroid nodules.
- To compare the results of investigation modalities done in cases of solitary thyroid nodules.
- To determine the frequency of malignant nodules during presentation.

METHODS

A hospital based prospective study was done with 100 patients to assess the various clinical presentations of solitary thyroid nodule and thereby find out the best diagnostic modality so as to plan out the most effective treatment strategy for such lesions.

Place of study was done at Dr. D.Y. Patil Medical College, Pune, Maharashtra. The period of study for 2 years, from July 2015 to July 2017. Total 100 patients were taken in the study.

Considering a confidence level of 95% and confidence interval of 10 the number of patients in present study to achieve statistical significance is 96. This was calculated by Survey System. The Survey System ignores the population size when it is large or unknown. Population size is only likely to be a factor when you work with a relatively small and known group of people (e.g., the members of an association). Hence a sample size of 100 was considered adequate for present study.

Inclusion criteria

All cases presenting with a clinically palpable thyroid nodule at Dr. D. Y. Patil Medical College, Pune between the age of 15-70 were taken up for the study.

Exclusion criteria

- Patients with diffuse enlargement of thyroid.
- Patients presenting with MNG clinically.
- Patients coming with recurrence.
- Patients with pregnancy.
- Patients with primary thyrotoxicosis-Grave's disease
- Patients previously operated for thyroid swelling.

Data collection was done for all patients with solitary thyroid nodule by meticulous history taking and clinical examination, appropriate laboratory and radiological investigations, operative findings and histopathological reports.

History was taken, and special emphases were laid on duration of the swelling, pressure symptoms, toxic symptoms, associated illness, previous exposure to neck irradiation, history of antithyroid drug use and positive family history. The primary reason for presentation was evaluated as in whether the patient has hypothyroid symptoms, hyperthyroid symptoms or has come just for cosmetic issues. Thorough clinical examination was done.

All patients underwent the following investigations

- Routine Haemogram
- Thyroid Function tests
- USG of the neck/ USG elastosonography
- FNAC of the Swelling
- X-Ray Neck
- Indirect Laryngoscopy

USG was used to detect the nodule size, structure as cystic, solid or mixed, presence of macrocalcifications inside the nodule, nodular location and cervical lymphadenopathy and to rule out MNG.

Cytological results (Bethesda classification) were evaluated and classified as:

- Thy 0 - No thyroid follicular cells
- Thy 1 - Presence of an insufficient number of follicular cells
- Thy 2 - Benign thyroid cells
- Thy 3 - Hyperplastic thyroid cells/follicular adenoma
- Thy 4 - Cells suspicious of malignancy
- Thy 5 - Malignant cells

Post-operative histopathological diagnosis. For all patients the following data were recorded; Age, gender, history of radiation exposure, family history of thyroid disease, and the thyroid hormone profile. The operative procedure was based on the different parameters like age of the patients, clinical examination, fine-needle aspiration cytology (FNAC) findings, USG interpretation, and indirect laryngoscopy. The decision for surgery was based on individual patient's examination and investigation findings.

In most of the patients, the plan of surgery was decided beforehand. If it was a STN, diagnosed clinically as well as ultrasonographically, hemi-thyroidectomy of the involved side was done, and the specimen was sent either for frozen section or for routine histopathological examination (HPE). In the event of a malignant frozen section report, completion thyroidectomy was done in the same sitting, whereas in inconclusive frozen section, author preferred to wait till the final histopathology report. The decision for other procedures like total thyroidectomy, total thyroidectomy with central neck dissection, total thyroidectomy with selective neck dissection, total thyroidectomy with modified radical neck dissection was based on the clinical, radiological, FNAC and histopathology findings.

Statistical analysis

Quantitative data is presented with the help of mean and standard deviation. Comparison among the study groups is done with the help of unpaired t test as per results of normality test. Qualitative data is presented with the help of frequency and percentage table. Association among the study groups is assessed with the help of Fisher test, student 't' test and Chi-Square test. 'p' value less than 0.05 is taken as significant**.**

Appropriate statistical software, including but not restricted to MS Excel, SPSS ver. 20 will be used for statistical analysis.

RESULTS

A hospital based prospective study was done with 100 patients to assess the various clinical presentations of solitary thyroid nodule and thereby find out the best diagnostic modality so as to plan out the most effective treatment strategy for such lesions.

Majority of the patients (39%) were from the age group of 31-40 years followed by 30% from the age group of 21-30 years, 12% from the age group of 41-50 years, 9% from the age group of 51-60 years, 6% from the age group of 15-20 years and 4% from the age group of 61-70 years. The mean age of the patients was 35.93±11.99 years. It also shows there was female preponderance (70%) while male patients constituted 30% of the study group (Table 1).

Table 1: Age and sex distribution of patients.

Age (years)	Male		Female		Total
	N	%	N	%	
15-20	2	2%	4	4%	6
21-30	8	8%	22	22%	30
31-40	14	14%	25	25%	39
41-50	2	2%	10	10%	12
51-60	3	3%	6	6%	9
61-70	1	1%	3	3%	4
Total	30	100%	70	100%	100

All patients presented with swelling in front of lower neck (100%) while 25% and 10% patients presented with mild pain in the swelling and lymphadenopathy respectively (Table 2). Duration of complaints ranged from 20 days to 6 years. Majority of the patients (75%)

presented between >6 months to 3 years of onset of swelling (Table 3).

Table 2: Distribution of patients according to symptoms.

Symptoms	N	%
Swelling in front of lower neck	100	100%
Mild pain in the swelling	25	25%
Lymphadenopathy	10	10%
Dyspnoea	4	4%
Loss of weight	3	3%
Dysphagia	2	2%
Hoarseness of voice	1	1%

The FNAC diagnosis showed that 60% of nodules were benign and 14% were malignant. 26 (26%) and 17 (17%) of benign lesion were colloid nodule and nodular goitre respectively while 13 (13%) and 4 (4%) were benign cystic lesion and chronic lymphocytic thyroiditis respectively. Of the 14% malignant lesions, 9 (9%) were papillary carcinoma while 4 (4%) and 1 (1%) of malignant lesion were medullary carcinoma and anaplastic carcinoma respectively (Table 4).

Table 3: Distribution of patients according to duration of symptoms.

Duration	N	Percentage
<3 months	5	5%
3-6 months	10	10%
>6 months - 3 years	75	75%
>3 years	10	10%
Total	100	100%

Table 4: FNAC diagnosis.

Category	Classification	FNAC diagnosis	N	%
Thy 1	Inadequate aspirate		5	5%
Thy 2	Benign (n=60)	Colloid nodule	26	26%
		Nodular goitre	17	17%
		Benign cystic lesion	13	13%
		Chronic lymphocytic thyroiditis	4	4%
Thy 3	Follicular (n=16)	Follicular neoplasia	16	16%
Thy 4	Suspicious (n=5)	Suspicious of malignant papillary neoplasm	5	5%
Thy 5	Malignant (n=14)	Papillary carcinoma	9	9%
		Medullary carcinoma	4	4%
		Anaplastic carcinoma	1	1%

Table 5: USG diagnosis.

Classification	USG diagnosis	N	%
Benign (n=70)	Cystic	11	11%
	Hyperechoic nodule	45	45%
	MNG	14	14%
Suspicious (n=5)	Suspicious MNG	3	3%
	Suspicious mixed echogenic	2	2%
Malignant (n=25)	Mixed, hypoechoic	25	25%

Ultrasonography showed 70 (70%) of nodules as benign and 25 (25%) as malignant nodules (Table 5).

Seventy seven percentage of clinically diagnosed solitary nodules were benign and 23% of nodules were malignant. The most common benign nodule was benign follicular adenoma (29%) followed by colloid nodule (24%) and benign cyst (10%). The most common malignant nodule was papillary carcinoma (15%) followed by medullary carcinoma (3%) and anaplastic carcinoma (1%) (Table 6). FNAC was found to have 82.4% sensitivity, 100% specificity in the detection of malignant and benign lesions, while PPV and NPV were 100% and 95% respectively (Table 9).

Five out of 70 benign lesions on USG diagnosis were malignant on HPE. Out of 25 malignant lesions on USG diagnosis, only 16 were malignant lesions while remaining 9 were benign lesions (Table 10).

Table 6: Histopathological (HPE) diagnosis.

HPE diagnosis	N	%
Benign follicular adenoma	29	29%
Colloid nodule	24	24%
Benign cyst	10	10%
Hyperplastic nodule	2	2%
MNG	8	8%
Chronic lymphocytic thyroiditis	4	4%
Follicular carcinoma	4	4%
Papillary carcinoma	14	14%
Medullary carcinoma	4	4%
Anaplastic carcinoma	1	1%

Table 7: Correlation of histopathology and FNAC.

Category	FNAC diagnosis	HPE diagnosis	N	%
Thy 1 (n=5)	Inadequate aspirate (n=5)	Benign follicular adenoma	3	3%
		Colloid nodule	2	2%
Thy 2 Benign (n=60)	Colloid nodule (n=26)	Colloid nodule	21	21%
		MNG	5	5%
	Nodular goitre (n=17)	Benign follicular Adenoma	12	12%
		MNG	3	3%
		Hyperplastic nodule	2	2%
	Benign cystic lesion (n=13)	Benign cyst	10	10%
		Papillary carcinoma	3	3%
	Lymphocytic thyroiditis (n=4)	Lymphocytic thyroiditis	4	4%
Thy 3 (n=16)	Follicular neoplasia (n=16)	Benign follicular adenoma	12	12%
		Follicular carcinoma	4	4%
Thy 4 (n=5)	Suspicious of malignant papillary neoplasm (n=5)	Benign follicular adenoma	2	2%
		Colloid nodule	1	1%
		Papillary carcinoma	2	2%
Thy 5 (n=14)	Papillary carcinoma (n=9)	Papillary carcinoma	9	9%
	Medullary carcinoma (n=4)	Medullary carcinoma	4	4%
	Anaplastic carcinoma (n=1)	Anaplastic carcinoma	1	1%

Table 8: Comparison of histopathological diagnosis with FNAC.

Histopathological diagnosis	FNAC diagnosis					Total
	Inadequate	Benign	Follicular	Suspicious	Malignant	
Benign	5	57 (TN)	12	3	0 (FP)	77
Malignant	0	3 (FN)	4	2	14 (TP)	23
Total	5	60	16	5	14	100

Table 9: Sensitivity, specificity, PPV and NPV of FNAC.

Statistical data of FNAC diagnosis	
Sensitivity (%)	82.4%
Specificity (%)	100%
PPV (%)	100%
NPV (%)	95%

USG was found to have 76.2% sensitivity, 87.8% specificity in the detection of malignant and benign lesions, while PPV and NPV were 64% and 92.9% respectively (Table 12).

Most commonly performed surgery was lobectomy (69%) in all benign lesion of size <4cm. Subtotal thyroidectomy was performed in benign nodule of larger size (size >4cm). All patients diagnosed as malignant (14) or suspicious of malignancy (2) in FNAC went for total thyroidectomy followed by central or functional neck dissection. Central neck dissection was performed in all patients with total thyroidectomy but functional dissection only in case of radiological or clinical evidence of enlarged cervical lymph nodes (Table 13).

DISCUSSION

A hospital based prospective study was done with 100 patients to assess the various clinical presentations of solitary thyroid nodule and thereby find out the best diagnostic modality so as to plan out the most effective treatment strategy for such lesions. The normal thyroid is impalpable. The term goitre is used to describe generalized enlargement of the thyroid gland. A discrete swelling (nodule) in one lobe with no palpable abnormality elsewhere is termed an isolated (or solitary) swelling. Discrete swelling with evidence of abnormality elsewhere in the gland is termed dominant.

According to literature, STN has a higher risk of malignancy than multiple nodules.[8] Because of this reason, surgeons tend to treat them with high degree of suspicion. Thyroid nodule refers to a distinct lesion within the thyroid gland that is palpably or radiologically distinct from the surrounding thyroid parenchyma.[9] It is recommended that all thyroid nodules >1cm in size should undergo evaluation. This includes both palpable and nonpalpable nodules, detected by imaging.[9] The majority of STNs are malignant.[10,11] Preliminary investigation should include careful history and thorough clinical examination and thyroid function tests.[12]

In the present study, majority of the patients (39%) were from the age group of 31-40 years followed by 30% from the age group of 21-30 years. The mean age of the patients was 35.93±11.99 years. There was female preponderance (70%) while male patients constituted 30% of the study group.

Table 10: Correlation of histopathological and USG diagnosis.

Classification	USG diagnosis	HPE diagnosis	N	%
Benign (n=70)	Cystic (n=11)	Benign cyst	5	5%
		Benign follicular adenoma	6	6%
	Hyperechoic nodule (n=45)	Benign follicular adenoma	22	22%
		Colloid nodule	21	21%
		Hyperplastic nodule	2	2%
	MNG (n=14)	MNG	8	8%
		Papillary carcinoma	5	5%
		Benign follicular adenoma	1	1%
Suspicious (n=5)	Suspicious MNG (n=3)	Benign cyst	3	3%
	Suspicious mixed echogenic (n=2)	Papillary carcinoma	2	2%
Malignant (n=25)	Mixed echogenic and hypoechoic nodule (n=25)	Papillary carcinoma	7	7%
		Follicular carcinoma	4	4%
		Medullary carcinoma	4	4%
		Anaplastic carcinoma	1	1%
		Lymphocytic thyroiditis	4	4%
		Colloid nodule	3	3%
		Benign cyst	2	2%

Table 11: Comparison of histopathological diagnosis with USG.

Histopathological diagnosis	USG diagnosis			Total
	Benign	Suspicious	Malignant	
Benign	65 (TN)	3	9 (FP)	77
Malignant	5 (FN)	2	16 (TP)	23
Total	70	5	25	100

Table 12: Sensitivity, specificity, PPV and NPV of USG.

Statistical data of USG diagnosis	
Sensitivity (%)	76.2%
Specificity (%)	87.8%
PPV (%)	64%
NPV (%)	92.9%

Table 13: Surgery performed on basis of FNAC.

Type of surgery	N	%
Lobectomy	69	69%
Subtotal or near total thyroidectomy	8	8%
Total thyroidectomy (n=23)		
Total thyroidectomy with Neck dissection	16	16%

Majority of the Male patients (14%) were from the age group of 31-40 years followed by 8% from the age group of 21-30 years. Majority of the Female patients (25%) were from the age group of 31-40 years followed by 22% from the age group of 21-30 years.

All patients presented with swelling in front of lower neck (100%) while 25% and 10% patients presented with mild pain in the swelling and lymphadenopathy respectively. The other symptoms were dyspnoea (4%), loss of weight (3%), dysphagia (2%) and hoarseness of voice (1%).

The study of lida F et al reported dyspnea, dysphagia and hoarseness of voice were the pressure symptoms, usually present in malignancy but it may be found in very large nodule.[13] The pain associated with recent increase in size of the nodule indicated haemorrhage into an adenoma.[14]

The duration of complaints in present study ranged from 20 days to 6 years. Majority of the patients (75%) presented between >6 months to 3 years of onset of swelling. It was found not much difference between natures of the lesion as regards the duration of symptoms varying from a few days to several years.[15] In the present study longest duration was 12 years in one patient which proved to be colloid nodule. Another patient having same duration was proved to be papillary carcinoma.

The FNAC diagnosis showed that 60% of nodules were benign and 14% were malignant. 26 (26%) and 17 (17%) of benign lesion were colloid nodule and nodular goitre respectively while 13 (13%) and 4 (4%) were benign cystic lesion and chronic lymphocytic thyroiditis respectively. Of the 14% malignant lesions, 9 (9%) were papillary carcinoma while 4 (4%) and 1 (1%) of malignant lesion were medullary carcinoma and anaplastic carcinoma respectively.

It was observed that all inadequate FNAC were benign on Histopathological diagnosis. Out of 60 benign lesions on FNAC, only 3 (3%) were malignant on HPE whereas out of 16 follicular neoplasia, 4 were malignant [follicular carcinoma] in HPE diagnosis. 2 out of 5 reported suspicious lesions were malignant on HPE. All malignant lesions on FNAC were malignant in HPE also (100%).

FNAC was found to have 82.4% sensitivity, 100% specificity in the detection of malignant and benign lesions, while PPV and NPV were 100% and 95% respectively. 5 of 70 benign lesions on USG diagnosis were malignant on HPE. Out of 25 malignant lesions on USG diagnosis, only 16 were malignant lesions while remaining 9 were benign lesions.

Most commonly performed surgery in present study was lobectomy (69%) in all benign lesion of size <4cm. Subtotal thyroidectomy was performed in benign nodule of larger size (size >4cm). All patients diagnosed as malignant (14) or suspicious of malignancy (2) in FNAC went for total thyroidectomy followed by central or functional neck dissection. Central neck dissection was performed in all patients with total thyroidectomy but functional dissection only in case of radiological or clinical evidence of enlarged cervical lymph nodes.

CONCLUSION

Thyroid nodules are common in females of age group 31-40 years. Commonest presenting complaint is swelling in the front of lower neck. Most of the patients presented between 6 months to 3 years of onset of swelling. In present study, the sensitivity and specificity of FNAC was 85.71% and 100% respectively. All malignant lesions on FNAC were confirmed by histopathology indicating its excellence. Therefore, FNAC helps in planning the correct management and avoids second surgery. In present study, the sensitivity and specificity of USG was 78.94 % and 85.33% respectively. Therefore, use of ultrasound along with FNAC will improve the diagnostic accuracy to higher level and help in better management Minimal surgery is lobectomy. This was undertaken in all cases, which help in establishing the histopathological diagnosis and in comparing the efficacy of above investigations.

The ideal test should have a sensitivity and specificity of 100%. The closest method to ideal test is, thus, FNAC which has high sensitivity and specificity. However, a combination of both FNAC and ultrasound will give optimal results and avoid mismanagement.

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