BURDEN AND DETERMINANTS OF MALIGNANCY IN SOLITARY NODULE OF THYROID IN A TERTIARY CARE HOSPITAL IN CHENNAI

A Dissertation Submitted to the

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M. S. (GENERAL SURGERY)

DEPARTMENT OF GENERAL SURGERY

GOVERNMENT STANLEY MEDICAL COLLEGE

CHENNAI-1

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Place:

Date:

Dr.A.Narendrakumar M.B.B.S

Postgraduate in General Surgery,

Govt. Stanley Medical College,

Chennai-1.

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Place:

Date:

Prof.Dr.G.VENKATESH M.S.,

Professor of General Surgery,

Govt. Stanley Medical College,

Chennai-1.

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Date :

Place :

Prof.Dr.T.SIVA KUMAR M.S.,

Professor and HOD,

Department of General Surgery,

Govt. Stanley Medical College,

Chennai-1

CERTIFICATE BY THE DEAN

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Date :

Place :

Dr.R.Shanthi Malar M.D,DA

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Place:

Date:

Dr.A.Narendrakumar M.B.B.S.,

Postgraduate in General Surgery,

Govt. Stanley Medical College,

Chennai-1.

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Place:

Date:

Dr.A.Narendrakumar M.B.B.S

Postgraduate in General Surgery,

Govt. Stanley Medical College,

Chennai-1.

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DESIGNATION : PG IN MS GENERAL SURGERY
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LIST OF ABBREVIATIONS

AG	Adenomatous goiter
ATC	Anaplastic thyroid carcinoma
ECG	Electrocardiogram
FNAC	Fine needle aspiration cytology
HPE	Histopathological examination
MIT	Monoiodotyrosine
MNG	Multinodular goiter
MTC	Medullary thyroid carcinoma
NCG	Non Colloid goitre
RLN	Recurrent laryngeal nerve
SNT	Solitary nodule thyroid
T3	Tri-iodotyrosine
T4	Thyroxine
TBG	Thyroxine binding globulin
TR	Thyroid hormone receptor
USG	Ultrasonography

ABSTRACT

BACKGROUND

The concern with thyroid nodules is the possibility of malignancy. Thyroid cancers are rare, accounting for only 1.0% of all cancers in most populations and 0.5% of all cancer deaths. Nonetheless, thyroid cancers occur in approximately 5% of all thyroid nodules independent of their size. With thyroid nodules being so prevalent in the general population, it is important to have a clear strategy of assessing nodules and determining which of these will require surgery or can be managed conservatively. The main problem posed by the discovery of a thyroid nodule is distinguishing between a benign and a malignant lesion. Nowadays, this problem has largely been solved by fine-needle biopsy. When performed by an experienced cytologist, this technique allows diagnosis of the nature of thyroid nodules with great sensitivity and specificity. . But FNAC is, however not without limitations; accuracy is lower in suspicious cytology and in follicular neoplasms. Despite all the newer techniques available, histopatholgy remains the most conclusive in the evaluation of the pathology of solitary nodule of thyroid.

OBJECTIVES OF THE STUDY

To evaluate a patient with solitary nodule thyroid in terms of:

1. Clinical presentation, age & sex distribution of solitary nodule thyroid & complications.

2. To compare and correlate the findings of investigation i.e. FNAC,USG with the histopathology of resected specimen.

3. Usefulness of FNAC,USG,HPE in the management of solitary nodule thyroid.

4. Differential Diagnosis for solitary nodule thyroid.

MATERIALS AND METHODS

This is a prospective study going to be conducted in the department of General surgery, GOVERNMENT STANLEY MEDICAL COLLEGE FROM (MAY 2018 TO MAY 2019)

SOURCE OF DATA

The patients admitted in our hospital wards for management of SOLITARY NODULE OF THYROID from May 2018 to May 2019 will be taken up for the study.

Study design **:** Descriptive study

Sample size **:** Total number of eligible patients admitted during study period(May 2018 to May 2019)

Sample design **:** Purposive sampling

Study place **:** Dept. of General Surgery,STANLEY MEDICAL COLLEGE

Study period **:** May 2018 to May 2019

METHOD OF COLLECTION OF DATA

- Pre tested Questionnaire will be filled based on history given.
- Clinical examination of patient.
- Thyroid profile
- Routine investigations
- Ultrasound of the neck.
- Fine needle aspiration cytology with hypodermic needle of 21-24 gauge.
- Indirect laryngoscopy will be done to rule out a symptomatic paralysis of vocal cords & also for medico legal purpose.
- Surgery as per the diagnosis made.
- Histopathology of resected specimen.
- Age,sex distribution, Symptomatology.
- Indication for surgery and its complications will be analysed.

INCLUSION CRITERIA FOR THE STUDY

1. All the eligible patients admitted to STANLEY MEDICAL COLLEGE during the period of study will be included.

2. All the patients of age more than 13years.

3. Both sex are included.

EXCLUSION CRITERIA

1. On evaluation more than one thyroid nodule within the gland are excluded.

2. Pregnant and Lactating women.

3. Patients unfit for surgery.

RESULT

Commonest presentation of solitary thyroid nodule was asymptomatic. The Peak incidence of solitary nodule was observed in 3rd to 5th decade, constituting 58% of the cases studied. Females predominated in number over males in occurrence of solitary nodule in ratio of 1:15.67. The common causes of solitary nodule was MNG (16%), follicular adenoma (14%), adenomatous goiter (56%). 96% of cases presented in euthyroid state. Incidence of malignancy in solitary thyroid nodule was 12%. Male to female ratio in case of malignant nodule was1:6. Incidence of carcinoma in females presenting as solitary nodule was higher compared to that of males. The most common cause of malignancy was papillary carcinoma (83.33%) followed by follicular carcinoma (16.67%). .

INTERPRETATION AND CONCLUSION

Solitary nodule of thyroid is more common in females.Solitary nodule of thyroid is more common in the age group of 20-50years.Most of the patients with solitary nodule of thyroid present with swelling alone.Most of the patients with solitary nodule of thyroid are in euthyroid state.Incidence of malignancy in female patients presenting with solitary nodule thyroid is more.commonest cause of solitary nodule of thyroid is adenoma.USG can be used to detect multi-nodular goitre in patients presenting with solitary nodule thyroid. FNAC is the investigation of choice in the evaluation of solitary nodule of thyroid. It has few pitfalls. In such situations, only histopathology can confirm the exact pathology. It detects papillary carcinoma in a solitary nodule with high sensitivity and specificity.Papillary carcinoma is the most common malignancy of thyroid, followed by follicular carcinoma.

KEY WORDS Solitary nodule, Malignancy,Adenoma.

TABLE OF CONTENTS

INTRODUCTION

The solitary thyroid nodule has aroused interest of endocrinologist and multiple studies have concluded that incidence of malignancy is higher in comparison with multi nodular goitre.

Thyroid nodules are very common ,the prevalence of palpable nodules in general population is about 4-7%. Incidence of solitary nodule of thyroid is 4 times more common in women .Incidence of malignancy in SNT ranges from 10-30%.

Definition:

Solitary nodule is defined as “A palpable single clinically detected nodule in the thyroid gland that is otherwise normal.”.

Usually presents as asymptomatic mass that is discovered by either the patient or the clinician. Nodules of at least 0.5cm to 1cm can usually be detected by palpation.Difficulty in palpating such nodule is noted in patient with a thick, short neck.

AIMS AND OBJECTIVES

To evaluate a patient with solitary nodule thyroid in terms of :

1. Clinical presentation, age & sex distribution of solitary nodule thyroid & complications.

2. To compare and correlate the findings of investigation i.e. FNAC,USG with the histopathology of resected specimen.

3. Usefulness of FNAC,USG,HPE in the management of solitary nodule thyroid.

4. To determine the incidence of solitary nodule of thyroid turning out to be multinodular goiter,adenoma and carcinoma.

5.Differential Diagnosis for solitary nodule thyroid.

REVIEW OF LITERATURE

Thyroid nodules are a common problem. They are found in 4%–8% of adults by palpation and in 13%–67% when ultrasound detection is used. The prevalence of thyroid nodules increases with age and women have a higher prevalence than men. The natural history of benign nodules is unclear, but most palpable nodules probably reduce in size, with up to 38% disappearing altogether. The incidence of malignancy in solitary thyroid nodule is quite high (13.33%). So people should be educated to attend thyroid clinics for early diagnosis and adequate treatment.

Solitary nodules are innocent neoplasms, and they arise from adult tissue in the same way as a fibroadenoma forms in the breast. They range from a very cellular tumor composed of undifferentiated cells up to tumors at the other end of the scale. They show a general tendency to develop into the adult type of thyroid tissue as they grow, and are prone to early degeneration leading to the formation of cysts.

The solitary thyroid nodule was the most common form of thyroid pathology seen in the surgical section of a thyroid clinic. The cold thyroid nodule was the most frequent type of solitary nodule and half of these were unilocular cysts which were treated by aspiration and sclerotherapy.

The diagnostic tools now available are sensitive enough to establish correct diagnosis. Once the diagnosis has been established, suitable therapeutic options should be considered.

Although a thorough history and clinical examination are indispensable, FNAB is essential to decision making and is able to provide highly accurate information that will ultimately determine the management of a nodule.

False-negative FNA results are not uncommon. Among those with indeterminate biopsy results, high-risk subgroups include patients with FNA results suspicious for papillary carcinoma and follicular neoplasms <2 cm.

Females were more frequently affected than males in a ratio of' 6: 1. The incidence of malignancy in the present series was 6.8 per cent while that of toxicity was 6per cent. Drill biopsy was found to be a useful diagnostic aid with a high accuracy rate. Thyroid lymphography has not been found to be of much help.

It is important to emphasize that solitary nodules in the younger patient should be removed. Taylor (1969) in a recent survey found a 12.6 per cent incidence of malignancy in solitary thyroid nodules.

The incidence of unsuspected carcinoma in a solitary nodule in a euthyroid patient is high enough to justify exploration in all cases in which the patient is fit for surgery.630 thyrotoxic cases were treated surgically, 35 (5.6 per cent) having a solitary toxic adenoma. Thyroid lobectomy resulted in 30 (85.7 per cent) euthyroid and 5 (14.3 per cent) hypothyroid patients.

EMBRYOLOGY

Normal Development

The thyroid gland appears by the end of the third week as an epithelial thickening in the floor of the pharynx at the level of the first pharyngeal pouch. This large median thyroid anlage, may be a diverticulum or a solid bud. Cranial growth of the tongue, along with elongation of the embryo, carries the origin of the thyroid gland far cranial to the gland itself. This forms the foramen cecum of the adult tongue.

The thyroid gland remains connected to the foramen cecum by a minute, solid thyroglossal duct that passes through or anterior to the hyoid bone. By the fifth week of gestation, this duct usually becomes obliterated. In about 50 % of population, this duct can be traced distally to the pyramidal lobe of the thyroid gland .

The gland which is initially an irregular plate, develops two lateral wings connected by the isthmus. Follicles appear during the second month and increase through the fourth month. Colloid formation begin at about the eleventh week.

The paired lateral anlages, are formed from the ventral portions of the fourth and fifth branchial pouches. This is nothing but the the well-known ultimobranchial body(caudal pharyngeal pouch complex), becomes lost in the developing thyroid gland, and its cells become dispersed as the C (calcitonin) cells among the thyroid follicles.

The primary origin of the calcitonin-producing cells of the thyroid gland is the neural crest of the embryo. From the neural crest these cells migrate to the ultimobranchial body. C cells belong to a group of neural-crest derivatives known as APUD (amine precursor uptake and decarboxylation) cells.Tumors of the APUD system are collectively called as "APUDomas."

Lingual Thyroid

Here the thyroid gland is at the site of the foramen cecum.It is the result of failure of the median anlage to descend from the pharynx. The gland is usually small but normal and sometimes it is the only thyroid tissue present. Radioactive iodine scintigraphy should be done to look for thyroid tissue else where other than lingual thyroid.

Thyroglossal Duct Remnants

Remnants of the thyroglossal duct are foramen cecum of the tongue and the pyramidal lobe . Thyroglossal duct cysts constitutes about 62.8 percent among all the congenital masses of the neck.

Incidence of primary malignancy in thyroglossal duct cyst is less than 1 percent.Sistrunk procedure is the removal of all of the duct from foramen caecum and the mid portion of the hyoid bone.Failure of removal of the central portion of the hyoid bone results in about 17 percent recurrence.

Lateral Aberrant Thyroid

It is nothing but the thyroid tissue located lateral to the jugular vein. Occurs in three morphologic patterns as follows.First as as nodule attached by connective tissue to the mother gland.Second site is within the lymph nodes.Third pattern is considered congenital.Always suspect malignancy in any lateral aberrant thyroid tissue.

Struma Ovarii

Struma ovarii is nothing but an the ovarian thyroid. Ovarian thyroid tissue occurs along with dermoid cysts and teratoma.Incidence is around 0.2-1.3% of all ovarian tumors.5-6% can be bilateral.Incidence of malignancy is about 5% and is usually papillary carcinoma.

ANATOMY OF THYROID GLAND

General Topography

The thyroid gland has two lobes connected by isthmus with an ascending pyramidal lobe.Right lobe in most instances can be either absent or smaller.In 10% percent of cases the isthmus is absent and the pyramidal lobe in about 50 % of cases .

The thyroid gland extends from C5 to body of T1.The normal gland weighs about 30 g in the adult - little bit heavier in females than in males. Each lobe measures 5*3*2 cm approximately . The isthmus is about 1.2 cms thick.

Thyroid Gland Capsule

The thyroid gland has two capsules the true capsule is connective tissue and a false capsule derived from pretracheal fascia.This false capsule is thin posteriorly which allows the enlargement of gland .Posteriorly the capsule forms ligament of berry which is attached to the cricoid cartilage.

The superior parathyroid gland lies between the true capsule and false capsule where as inferior parathyroid may lie between both capsules or within the thyroid parenchyma or external to the capsule.

Vascular Supply

The superior and inferior thyroid arteries, and an inconstant thyroid ima artery, supply the thyroid gland.

Superior Thyroid Artery

The superior thyroid artery arises from the external carotid and passes downward and anteriorly to reach the superior pole of the thyroid gland. The artery parallels the external branch of the superior laryngeal nerve which supplies the cricothyroid muscle and the cricopharyngeus muscle.

It has six branches which includes - superior laryngeal ,the infrahyoid,sternocleidomastoid, inferior pharyngeal constrictor,cricothyroid and terminal branches supply the thyroid and parathyroid glands.

It gives off two branches to the thyroid namely the anterior and posterior branch — but sometimes a third called the lateral branch can be seen.

Inferior Thyroid Artery

It is a branch of thyrocervical trunk, but in about 15 percent of cases it arises directly from the subclavian artery.

It ascends behind the internal jugular vein and the carotid artery .It pierces the prevertebral fascia and divides into two or more branches while crossing the ascending recurrent laryngeal nerve (RLN). The RLN may pass anterior or posterior or between its branches .

The lowest branch supplies the lower pole of the thyroid gland and inferior parathyroid gland. The upper branch supplies the posterior surface of the gland. On the right, it is absent in about 2 percent and on the left, it is absent in about 5 percent of individuals. The artery is sometimes double.

Thyroid Ima Artery

It is unpaired and inconstant. It arises from the aortic arch or the right common carotid artery or brachiocephalic artery. Seen in only 10 percent of individuals. It may be may be a mere twig or as large as an inferior thyroid artery. Its lies anterior to the trachea and is important structure to be considered without fail during tracheostomy.

Veins

Veins draining the gland forms a plexus that lies in the substance as well as on the surface of the gland and are drained by the superior, middle, and inferior thyroid veins

Superior Thyroid Vein

It accompanies the corresponding artery. Emerges from the superior pole and passes superiorly and laterally across the common carotid artery and the omohyoid muscle to enter the internal jugular vein.

Middle Thyroid Vein

Arises on the lateral surface of the gland and crosses the common carotid artery to open into the internal jugular vein. Sometimes an extra vein is noted inferior to it; and it is referred as the "fourth" thyroid vein.

Inferior Thyroid Vein

It is the largest and most variable of all the thyroid veins.The right vein drains into the right brachiocephalic vein. The left vein drains into the left brachiocephalic vein.Sometimes the right vein may drain into the left brachiocephalic vein forming a common trunk which is called the thyroid ima vein.

Lymphatics

Several broad patterns of lymphatic drainage based on some facts have been proposed and each is correct in one way or the other.Which includes :

1.Median Superior Drainage

2.Median Inferior Drainage

3.Right and Left Lateral Drainage

4.Posterior Drainage

Nerve supply

Though innervated by the sympathetic system branches of vagus,the parasympathetic group is of importance in thyroid surgery

Recurrent Laryngeal Nerves

Normal Anatomy

The right and left recurrent laryngeal nerves both branches from vagus.Right loops around subclavian artery and left around the arch of aorta.Both passes behind inferior thyroid artery and ascends through the tracheo-esophagal groove.

Variations

In about 1 percent of patients, the right recurrent nerve arises without looping under the subclavian artery.Nerve crosses the inferior thyroid artery and may lie anterior or posterior to, or between the branches of the artery

Superior Laryngeal Nerve

The superior laryngeal nerve passes inferior and medial to the carotid artery.It divides into a large, sensory, internal laryngeal branch and a smaller, motor, external laryngeal branch.It supplies the cricothyroid muscle and the cricopharyngeus.

HISTOLOGY

Typically, cells of an endocrine gland have a cord-like arrangement and their products to be secreted are kept within the individual cells. The thyroid gland is an exception to this rule.

It is encased by a thin connective tissue capsule that enters the substance of the lobes to further subdivide the gland into irregular lobular units. Each lobule contains a cluster of follicles, which are the structural and functional units of the thyroid gland.

A follicle is surrounded by thin connective tissue stroma rich in fenestrated capillaries (along with the sympathetic nerves that innervate them) and lymphatics. Follicular epithelium is a simple epithelium consisting of low columnar, cuboidal or squamous cells depending on the level of activity of the follicle. When they are active, they appear cuboidal to low columnar, but when they are inactive the cells are squamous. These follicular (principal) cells take up the necessary amino acid precursors and iodine at its basolateral surface and release the final product into the blood

stream at its basal end. Follicular cells are responsible for producing thyroglobulin (an iodine rich, inactive form of the thyroid hormones), which is then stored as a semi-solid substance (colloid) in the lumen of the follicles.

The colloid stains pink with haematoxylin and eosin (H&E) staining, while the follicular cells have a purple appearance. The degree of activity of a follicle can also be assessed based on the amount and appearance of colloid it contains. Inactive follicular lumina are larger; colloid is abundant and appears solid. In contrast, active follicular lumina are smaller and there is little to no colloid present.

Another cell type that can be identified on histological preparations of thyroid tissue is parafollicular cells, also known as C (clear) cells. C-cells appear clear due to the fact that they are lightly stained on H&E preparation. They can be found within the basal lamina of the thyroid follicles without extending into the follicular lumen or between thyroid follicles in the inter follicular space, either singly or in the form of groups.

Parafollicular cells are a subtype of neuroendocrine cells (amine precursor uptake and decarboxylation – AUPD – system) that produce thyrocalcitonin (calcitonin). This hormone aide in the regulation of blood calcium levels by down regulating bone resorption (breakdown of bone and

subsequent release of minerals into the blood) and limiting calcium reuptake in the kidneys.

PHYSIOLOGY

Synthesis and Release of Thyroid Hormones

Hormones are produced in the colloid when atoms of the mineral iodine attach to a glycoprotein, called thyroglobulin, that is secreted into the colloid by the follicle cells. The following steps outline the hormones' assembly:

1.Binding of TSH to its receptors in the follicle cells of the thyroid gland causes the cells to actively transport iodide ions (I–) across their cell membrane, from the bloodstream into the cytosol. As a result, the concentration of iodide ions "trapped" in the follicular cells is many times higher than the concentration in the bloodstream.

2.Iodide ions then move to the lumen of the follicle cells that border the colloid. There, the ions undergo oxidation (their negatively charged electrons are removed). The oxidation of two iodide ions (2 I–) results in iodine (I2), which passes through the follicle cell membrane into the colloid.

3.In the colloid, peroxidase enzymes link the iodine to the tyrosine amino acids in thyroglobulin to produce two intermediaries: a tyrosine attached to one iodine and a tyrosine attached to two iodines. When one of each of these intermediaries is linked by covalent bonds, the resulting compound is triiodothyronine (T3), a thyroid hormone with three iodines. Much more commonly, two copies of the second intermediary bond, forming tetraiodothyronine, also known as thyroxine (T4), a thyroid hormone with four iodines.

4.These hormones remain in the colloid center of the thyroid follicles until TSH stimulates endocytosis of colloid back into the follicle cells. There, lysosomal enzymes break apart the thyroglobulin colloid, releasing free T3 and T4, which diffuse across the follicle cell membrane and enter the bloodstream.

5.In the bloodstream, less than one percent of the circulating T3 and T4 remains unbound. This free T3 and T4 can cross the lipid bilayer of cell membranes and be taken up by cells. The remaining 99 percent of circulating T3 and T4 is bound to specialized transport proteins called thyroxine-binding globulins (TBGs), to albumin, or to other plasma proteins. This “packaging” prevents their free diffusion into body cells. When blood levels of T3 and T4 begin to decline, bound T3 and T4 are released from these plasma proteins and readily cross the membrane of

target cells. T3 is more potent than T4, and many cells convert T4 to T3 through the removal of an iodine atom.

Regulation of TH Synthesis

The release of T3 and T4 from the thyroid gland is regulated by thyroid-stimulating hormone (TSH). As shown in Figure 2, low blood levels of T3 and T4 stimulate the release of thyrotropin-releasing hormone (TRH) from the hypothalamus, which triggers secretion of TSH from the anterior pituitary. In turn, TSH stimulates the thyroid gland to secrete T3 and T4. The levels of TRH, TSH, T3, and T4 are regulated by a negative feedback system in which increasing levels of T3 and T4 decrease the production and secretion of TSH.

Functions of Thyroid Hormones

The thyroid hormones, T3 and T4, are often referred to as metabolic hormones because their levels influence the body's basal metabolic rate, the amount of energy used by the body at rest. When T3 and T4 bind to intracellular receptors located on the mitochondria, they cause an increase in nutrient breakdown and the use of oxygen to produce ATP. In addition, T3 and T4 initiate the transcription of genes involved in glucose oxidation. Although these mechanisms prompt cells to produce more ATP, the process is inefficient, and an abnormally increased level of heat is released as a byproduct of these reactions. This so-called calorigenic effect (calor- "heat") raises body temperature.

Adequate levels of thyroid hormones are also required for protein synthesis and for fetal and childhood tissue development and growth. They are especially critical for normal development of the nervous system both in utero and in early childhood, and they continue to support neurological function in adults. As noted earlier, these thyroid hormones have a complex interrelationship with reproductive hormones, and deficiencies can influence libido, fertility, and other aspects of reproductive function. Finally, thyroid hormones increase the body's sensitivity to catecholamines (epinephrine and norepinephrine) from the adrenal medulla by upregulation of receptors in the blood vessels. When levels of T3 and T4 hormones are excessive, this effect accelerates the heart rate, strengthens the heartbeat, and increases blood pressure. Because thyroid hormones regulate metabolism, heat production, protein synthesis, and many other body functions, thyroid disorders can have severe and widespread consequences.

Inhibition of Thyroid Synthesis

Thionamide

This group includes propylthiouracil (PTU) and methimazole. This inhibits the organification and oxidation of inorganic iodine, as well as inhibits linkage of the initial iodotyrosine molecules MIT and DIT. PTU also inhibits the peripheral conversion of T4 to T3.Methimazole has longer activity and requires a single daily dose; it is the preferred agent in non pregnant individuals. Both drugs can cause agranulocytosis

but this occurs in less than 1% of cases. Other side effects include rash, arthralgias, neuritis, and liver dysfunction (potentially worse with PTU). Also, they can act in the periphery to inhibit the peripheral conversion of T4 to T3. This effectively lowers serum T3 levels, thus allowing steroids to be used as a rapid inhibitory agent for hyperthyroid conditions. Steroids can also lower serum TSH concentration. Patients with thyrotoxicosis have increased adrenergic stimulation. Although beta blockers do not directly inhibit thyroid hormone synthesis perse,they are valuable in controlling peripheral sensitivity to catecholamines by blocking their effects. Therefore, cardiovascular symptoms such as an increased pulse rate, tremor, and anxiety can be improved, but the hyper metabolic state can remain or progress with this treatment alone.

Iodine

Iodine,given in large doses after the administration of an antithyroid medication, can inhibit thyroid hormone release by altering the organic binding process (Wolff-Chaikoff effect). This stunning effect is transient, but iodine supplementation can be used to treat hyperactivity of the gland in preparation for surgery.

EPIDEMIOLOGY AND INCIDENCE

Solitary thyroid nodules are present in approximately 4% of individuals in the United States, whereas thyroid cancer has a much lower incidence of 40 new cases per 1 million. Therefore, it is of utmost importance to determine which patients with solitary thyroid nodule would benefit from surgery.

SEX:

Occurs in females to males ratio of 6: 1 and this is due to variations of thyroid hormone demand during female reproductive function, physiological events such as puberty, pregnancy, lactation. Incidence of solitary nodule also higher in females.But incidence of Malignancy in solitary nodule is is more in men (26%) compared to female (9%)

AGE:

Thyroid nodules occur at all ages,the reported age range from 30-69 years. Solitary nodule is rare in children.

ETIOLOGY OF THYROID MALIGNANCY

Radiation

Thyroid cancer is more common in people who had radiotherapy treatment, particularly in people treated with radiotherapy when they were children. The cancer might develop some years later.Thyroid cancer may be more common in survivors of atomic explosions or accidents. After the Chernobyl nuclear reactor accident, cases of thyroid cancer in the Ukraine rose in people exposed to radiation, particularly as children or adolescents.

People who have low levels of iodine in their body might have a higher risk of thyroid cancer after exposure to radiation than people with normal iodine levels.Research has shown that the risk of thyroid cancer is not increased in people routinely exposed to radiation through their work.

Family history

Risk for malignancy increases if a family member has a thyroid cancer. But the risk is still very small because the cancer is rare.The risk of developing thyroid cancer is estimated to be 4 times higher for people with a first degree relative with thyroid cancer, than people in the general population. A first degree relative is a parent, brother, sister, son or daughter.

Familial adenomatous polyposis

Some studies have suggested that people with FAP might have an increased risk of thyroid cancer. But more evidence is needed.

Obesity

The risk of thyroid cancer is higher in people who are overweight or obese (have a higher weight than is normal for their height).

Acromegaly

Increase in growth hormone increases the risk of thyroid cancer.

Diabetes

Some studies suggest that the risk of thyroid cancer may be higher in women with diabetes compared to women who do not have diabetes. But the evidence is mixed.An increase in risk is not seen in men who have diabetes.

Cancers elsewhere

Some studies suggest that people treated as adults for certain cancers have an increased risk of thyroid cancer. These include:

1.non Hodgkin lymphoma

2.breast cancer

3.cancer of the food pipe (esophageal cancer)

4.testicular cancer

It is not known if this is due to treatment for these cancers, common risk factors or inherited genetic changes. In the case of esophageal cancer, it may be because routine checks after treatment pick up the thyroid cancers.

Factors related to women and reproduction

Thyroid cancer is more common in women than in men, and more so during their reproductive years. Researchers have looked at the relationship between thyroid cancer and:

1. pregnancy history
2. use of oral contraceptives
3. hormone replacement therapy
4. age period starts
5. age of menopause

The results of these studies are mixed. Some studies show there might be a link with some factors, but others don't.

Systemic lupus erythematosus

Studies suggest that the risk of thyroid cancer is about 2 times higher in people with systemic lupus erythematosus than the general population.

Autoimmune (Hashimoto's) thyroiditis

Studies suggest that autoimmune thyroiditis increases the risk of papillary thyroid cancer.

PATHOLOGY

1) Colloid (adenomatoid) nodule:

Colloid nodule is due to stimulation with increased TSH.Simple goitre are more common in females than in males.Persistent growth stimulation causes diffuse hyperplasia, all lobules are composed of active follicles with uniform iodine uptake. If TSH stimulation ceases, the goitre may regress.A colloid goitre is a late stage of diffuse hyperplasia when TSH stimulation has fallen off and follicle are inactive and full of colloid.

Latter as a result of fluctuating stimulation of TSH, a mixed pattern develops with areas of active lobules and areas of inactive lobules. Active lobules become more vascular and

hyper plastic until haemorrhage occurs, causing central necrosis and leaving only a surrounding rim of active follicle. Necrotic lobules coalesce to form nodules filled either with iodine - filled colloid or mass of new but inactive follicles.

2.Adenomatous nodule

Classified into :

1.Follicular adenoma and its variants

2.Papillary adenoma

3.Atypical adenoma

a) Follicular adenoma:

Almost all thyroid adenoma show follicle formation to a varying degree; follicle adenoma are usually but may contain a variable amount of colloid; It is unknown whether follicular adenomas show transition over time. The most important clinically relevant fact about follicular adenomas is that many of these tumours cannot be reliably distinguished from follicular carcinoma on clinical, isotopic, USG or FNAC only reliable method of making distinction by careful histological for evidence of capsular or angio invasion.

According to the size of follicles and the degree of follicle formation, follicular adenomas are further classified as

1. Colloid adenoma [macro follicular adenoma]

2. Simple adenoma [normofollicular adenoma]

3. Fetal adenoma [micro follicular adenoma]

4. Hurthle cell adenoma [follicular adenoma of oxyphilic cell type]

5. Embryonal adenoma (trabecular adenoma)

6. Follicular adenoma of clear cell type a typical adenoma

7. Atypical follicular of clear cell type.

8.Toxic adenoma

b) Papillary adenoma:

Papillary adenoma is a very rare neoplasm composed of benign papillae with fibrous stroma but without capsular invasion. This tumor is often cystic and is sometimes referred to as papillary cyst-adenoma. This tumor should not be confused with an encapsulated papillary carcinoma. About 5% of papillary carcinoma are encapsulated without gross evidence of invasion.

C) Atypical adenoma

Follicular type -clearly packed follicles.

Solid type- cells in sheets or columns

Alveolar type -Organised but solid.

Focal atypical type-In diffuse cellular mass.

It is important to rule out capsular or vascular invasion to confirm benignity.

Thyroid carcinoma

Classification(Dunhill classification)

a. Differentiated—80%

1. Papillary carcinoma (60%).

2. Follicular carcinoma (17%).

3. Papillofollicular carcinoma behaves like papillary carcinoma of thyroid.

4. Hurthle cell carcinoma behaves like follicular carcinoma.

b. Undifferentiated—20% Anaplastic carcinoma (13%)

c. Medullary carcinoma (6%)

d. Malignant lymphoma (4%)

e. Secondaries in thyroid (rare)—from colon, kidney, melanoma, breast.

Incidence and Spread

Annual incidence of thyroid cancers is 3.7 per 1,00,000 population. It is common in females (3:1).

Papillary carcinoma mainly spreads through lymphatics; follicular through blood; anaplastic through lymphatics and blood.

Aetiology of Thyroid Malignancy

1.Radiation either external or radioiodine can cause papillary carcinoma thyroid. There is increased incidence of thyroid carcinoma among children following exposure to ionising radiation after the Chernobyl nuclear disaster in Ukraine in 1986; in children in Marshall island after atomic bomb testing. Earlier irradiation was practised to head and neck region to treat benign conditions like tonsillitis, adenoids, thymus enlargement, acne vulgaris, haemangiomas during first two decades of life. As a consequence papillary carcinoma of thyroid became common in these individuals. Radiotherapy received in adolescent period for Hodgkin's lymphoma may predispose to papillary carcinoma.

2.Pre-existing multi-nodular goitre. It turns into follicular carcinoma of thyroid.

3.Medullary carcinoma thyroid is often familial.

4.Hashimoto's thyroiditis may predispose to NHL/papillary carcinoma of thyroid.

5.Familial.

6.Elevated TSH is observed in papillary carcinoma of thyroid.

7.Genetic—Cowden syndrome is differentiated thyroid carcinoma, carcinoma breast, multiple hamartomas. It is due to germ cell mutation of PTEN tumour suppressor gene. Oncogenes—C myc, C erb, C fos, Ras are associated.

PAPILLARY CARCINOMA OF THYROID (PCT)

It is 70–80% common.

Common in females and younger age group.

Gross

It can be soft, firm, hard, cystic. It can be solitary or multinodular. It contains brownish black fluid.

Microscopy

It shows cystic spaces, papillary projections with psammoma bodies (50% cases), malignant cells with 'Orphan Annie eye' nuclei (intranuclear cytoplasmic inclusions), nuclear groove, nuclear pseudo inclusions. Orphan Annie eye nuclei are identified in histology (paraffin

section of formalin tissue). It is not seen in FNAC.

Orphan Annie is strip cartoon character with empty circled eyes.Tall cell type of papillary carcinoma (10% of papillary carcinomas) is very aggressive type seen in elderly, 30% show capsular and vascular invasion, with 25–30% 5–year survival rate.

Columnar type is seen only in males with near 100% mortality in 5 years.

Spread

It is a slowly progressive and less aggressive tumour. It is commonly multicentric.It spreads within the gland through intrathyroidal lymphatics to other lobe, comes out of the capsule and spreads to cervical lymph nodes. Usually there is no blood spread. Extrathyroidal disease— invasion into thyroid capsule can cause blood-borne secondaries occasionally.

Clinical Features

Soft or hard or firm, solid or cystic, solitary or multi nodular thyroid swelling.

Compression features are uncommon in papillary carcinoma thyroid.

Often discrete lymph nodes in the neck (40%) are palpable.

May present with secondaries in neck lymph nodes with occult primary.

Diagnosis

FNAC of thyroid nodule and lymph node.

Radioisotope scan shows cold nodule.

TSH level in the blood is higher.

Plain X-ray neck shows fine calcification whereas nodular goitre shows coarse—ring/rim calcification.

US neck to identify non-palpable nodes in neck and also lymph node.

MRI may be useful.

Treatment

Total or near total thyroidectomy, with central node compartment dissection (level VI).

Suppressive dose of L-thyroxine 0.3 mg OD life long. TSH level should be < 0.1 m U/L.

Lateral cervical/neck node dissection (LCND) levels IIA, III, IV and VB) or MRND (with preservation of sternocleidomastoid, IJV, spinal accessory nerve) is done depending on involvement of one side or both (if node positive on imaging or FNAC only as therapeutic).

Radioactive iodine therapy (RAIT) if tumour is multi centric, >1 cm size, presence of nodes, extra-thyroidal spread, high-risk group.

‘Berry picking’ (picking up the enlarged lymph nodes) earlier practiced is not done now.

FOLLICULAR CARCINOMA OF THYROID (FCT)

It is 10–15% common.

It is common in females.

It can occur either de novo or in a pre-existing multinodular goitre.

Thyroglobulin immunostaining is positive.

Types

Noninvasive—blood spread not common.

. Invasive—blood spread common.

Typical features: Capsular invasion and angioinvasion.

Spread

It is a more aggressive tumour.

It spreads mainly through blood into the bones, lungs, liver.

Bone secondaries are typically vascular, warm, pulsatile, localised, commonly in skull, long bones, ribs.

It can also spread to lymph nodes in the neck occasionally (10%).

Clinical Features

Swelling in the neck, firm or hard and nodular.

Tracheal compression/infiltration and stridor.

Dyspnoea, haemoptysis, chest pain when there are lung secondaries.

Recurrent laryngeal nerve involvement causes hoarseness of voice, +ve 'Berry's sign' signifies advanced malignancy (infiltration into the carotid sheath and so absence of carotid pulsation).

Well localised, non mobile, soft, fluctuant (because of colloid content) and pulsatile (as both inner and outer tables of skull bone are disrupted allowing brain pulsation to transmit) secondaries in the skull. Secondaries can also occur in long bones also.

Investigations

Most often FNAC is inconclusive, because capsular and angioinvasion, which are the main features in follicular carcinoma, cannot be detected by FNAC.

Frozen section biopsy was said to be useful earlier; but it is questionable now. In 15% cases frozen section biopsy may be inconclusive or facility for frozen section biopsy may not be available in many places, then initial hemithyroidectomy is done.

Ultrasound abdomen, chest X-ray, X-ray bones are the other investigations required, CT head, body scan.

Trucut biopsy gives tissue diagnosis, but danger of haemorrhage and injury to vital structures like trachea, recurrent laryngeal nerve, vessels are likely. It may be useful in lymphoma and anaplastic carcinoma; but it is not very well accepted.

Treatment

Total thyroidectomy is done along with central node compartment dissection (level VI).

Lateral cervical/neck node dissection (LCND) levels IIA, III, IV and VB) or MRND (with preservation of sternocleidomastoid, IJV, spinal accessory nerve) is done depending on involvement of one side or both (if node positive on imaging or FNAC only as therapeutic).

Postoperative radioactive iodine (I131) therapy with a dose of 100 mCi (3700 MBq). Patient should be kept in isolation; excreta disposal and vomitus, blood, saliva should be in separate leak proof thrash bags.

Maintenance dose of L-thyroxine 0.1 mg OD or T3 80 mg/ day is given lifelong. Immediate thyroxin supplementation is often not started following surgery to keep TSH level raised so that all extra-thyroidal tissues that take up iodine will also take up radioiodine to achieve optimum radio ablation. TSH level should be more than 30 mIU/L for this.

On table frozen section biopsy is useful in negative FNAC but doubtful cases. Definitive procedure is undertaken once frozen section report comes on table. But in frozen section biopsy itself, 15% of follicular carcinoma report may be inconclusive or negative which causes difficulty in taking decision. In such occasion, hemithyroidectomy is done and once histology report of follicular carcinoma is obtained completion thyroidectomy is done usually immediately within a week. If biopsy report is delayed, then completion thyroidectomy is done after 6–12 weeks.

ANAPLASTIC CARCINOMA OF THYROID

It is an undifferentiated very aggressive carcinoma (1%) occurs commonly in elderly females.

It is a very aggressive tumour of short duration, presents with a swelling in thyroid region which is rapidly progressive causing:

i. Stridor and hoarseness of voice due to tracheal obstruction.

ii. Dysphagia.

iii. Fixity to the skin.

iv. Positive Berry's sign—involvement of carotid sheath leads to absence of carotid pulsation.

Swelling is hard, with involvement of isthmus and lateral lobes. FNAC is

diagnostic. All anaplastic carcinomas are T4. T4a is intrathyroidal anaplastic carcinoma – surgically resectable. T4b is extra-thyroidal anaplastic carcinoma – surgically unresectable. It shows p53 and p21 positive; causes multi organ spread. Tracheostomy and isthmectomy has got a role to relieve respiratory obstruction temporarily.Treatment is external radiotherapy, as usually thyroidectomy is not possible.Adriamycin as chemotherapy.However prognosis is poor. Lifespan is counted in few weeks to months only. 5-year survival is less than 15%

MEDULLARY CARCINOMA OF THYROID (MCT)

It is uncommon (5%) type of thyroid malignancy.

It arises from the parafollicular 'C' cells which is derived from the ultimobranchial body (neural crest). C cells are more in upper pole of the thyroid gland or at junction of upper 1/3rd and lower 2/3rd.

It contains characteristic 'amyloid stroma' wherein malignant cells are dispersed. Immunohistochemistry reveals calcitonin in amyloid.

In these patients blood levels of calcitonin both basal as well as that following calcium or pentagastrin stimulation is high, a very useful tumour marker.

Tumour also secretes 5-HT (serotonin), prostaglandin, ACTH and

vasoactive intestinal polypeptide (VIP).

It spreads mainly to lymph nodes (60%).

It may be associated with MEN II syndrome and pheochromocytoma with hypertension. MCT associated with MEN type II B with phaeochromocytoma (Sipple's disease) is most aggressive.

There may be mucosal neuromas in lips, oral cavity, tongue, eyelids with marfanoid features.

MCT is not TSH dependent and does not take up radioactive iodine.

Clinical Features

Thyroid swelling often with enlargement of neck lymph node.

Diarrhoea, flushing (30%).

Hypertension, phaeochromocytomas and mucosal neuromas when associated with MEN II syndrome.

Sporadic and familial types occur in adulthood whereas cases associated with MEN syndrome II occur in younger age groups.

Paraneoplastic syndrome like Cushing's and carcinoids.

Types

1. Sporadic. Usually solitary—70%. It is unifocal; occurs in 5th / 6th decade; more in females; common in posterior part of thyroid, so

compression is common.

2. MCT with MEN II syndrome. It is more aggressive, bilateral, multifocal/multi centric, affects younger age group. MCT with MEN type IIb is most aggressive, often involves infants and children, with marfanoid features.

3. Familial MCT (20%). Commonly multicentric, autosomal dominant in chromosome no. 10. Familial non-MEN MCT is least malignant, occurs in 4th and 5th decades, shows extra and intracellular cysteine codon.

Investigations

USG neck – mass; nodal status. US abdomen to rule out pheochromocytoma.

FNAC – amyloid stroma with dispersed malignant cells and C-cell hyperplasia; calcitonin level of FNAC washout; cytology with IHC is very useful.

Serum calcitonin level – In normal individual it is <10 pg/ ml or undetectable. If its unstimulated level is >100 pg / ml then it is suggestive of MCT. Increase in stimulated calcitonin level is accurate after injection of calcium 2 mg / kg or pentagastrin 0.5 ug/kg.

Serum CEA level will be raised in >50% of MTC patients. CEA

>30 mg/ml indicates incurability by surgery; CEA >100 mg/ml suggests extensive nodal spread; raising CEA with stable calcitonin indicates dedifferentiation and poor prognosis.

CT neck, chest, abdomen should be needed for metastatic work up. CT abdomen is also done for pheochromocytoma.

Urinary metanephrine, VMA, (24 hours) should be done in suspected pheochromocytoma.

Serum, calcium and parathormone (PTH) estimation for hyperparathyroidism.

111-Indium octreotide scanning is useful in detecting MCT (70% sensitivity). It is also useful in postoperative follow up to find out residual or metastatic disease.

Genetic testing for ret mutations.

Treatment

Surgery is the main therapeutic modality.

Total thyroidectomy with bilateral central node dissection and ipsilateral lateral neck dissection if primary tumour is > 1 cm or central nodes are positive. Positivity of central nodes is 81%.

Opposite lateral neck node dissection is done if US neck shows opposite nodes or extensive ipsilateral neck nodes when present or

bilateral primary tumours (multifocal/ bilateral).

Thyroxine replacement/maintenance therapy 100ug morning before food daily, is needed.

No role of suppressive hormone therapy or radioactive iodine therapy.

External beam radiotherapy for residual tumour disease.

Somatostatin/octreotide for diarrhoea.

Adriamycin is the drug used as chemotherapy with limited results.

If there is associated phaeochromocytoma, it should be treated surgically by adrenalectomy first and later only total thyroidectomy is done.

All family members of the patient should be evaluated for serum calcitonin and if it is high they should undergo prophylactic total thyroidectomy (Can also be assessed by genetic evaluation). If there is positive RET proto-oncogene in MCT with MEN II A and familial MCT types, prophylactic total thyroidectomy is done at the age of 5 years. In positive RET proto-oncogene in MCT with MEN II B, prophylactic total thyroidectomy is done at the age of one year.

MCT with associated parathyroid hyperplasia (30%) in MEN IIA, total thyroidectomy with central nodal dissection with total parathyroidectomy and autotransplantation of half of gland in sternomastoid or non dominant

forearm brachioradialis muscle is done.

Other therapies

External RT; Somatostatin analogues; Imatinib mesylate tyrosine kinase inhibitor; Chemotherapy–less success–adriamycin, capacetabine, 5 FU, irinotecan; newer targeted therapies.

Prognosis

Sporadic MCT and MCT with MEN syndrome II are aggressive.

Familial MCT not associated with MEN II syndrome has got better prognosis.

Presence of nodal disease carries poor prognosis.

Survival is overall good -10 years – 85%; depends on type, familial nature, association for MEN syndrome; status at the time of presentation – size, nodal status, distant spread.

Incidence of recurrence is 50% in MCT.

MALIGNANT LYMPHOMA

It is NHL type. Occurs in a pre-existing Hashimoto's thyroiditis (Not proved well).

FNAC is useful to diagnose the condition (Often trucut biopsy).

Chemotherapy and radiotherapy is the main treatment.

Rarely total thyroidectomy is done to enhance the results.

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TNM definitions (AJCC 8e) for papillary, follicular, poorly differentiated, Hürthle cell, medullary, and anaplastic thyroid carcinomas	
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
T1	Tumor ≤ 2 cm in greatest dimension limited to the thyroid
T1a	Tumor ≤ 1 cm in greatest dimension limited to the thyroid
T1b	Tumor > 1 cm but ≤ 2 cm in greatest dimension limited to the thyroid
T2	Tumor > 2 cm but ≤ 4 cm in greatest dimension limited to the thyroid
T3*	Tumor > 4 cm limited to the thyroid or gross extrathyroidal extension invading only strap muscles
T3a*	Tumor > 4 cm limited to the thyroid
T3b*	Gross extrathyroidal extension invading only strap muscles (sternohyoid) from a tumor of any size
T4	Includes gross extrathyroidal extension into major neck structures
T4a	Gross extrathyroidal extension invading subcutaneous soft tissues, larynx, trachea, esophagus, or recurrent laryngeal nerve from a tumor of any size
T4b	Gross extrathyroidal extension invading prevertebral fascia or encasing carotid artery or mediastinal vessels from a tumor of any size
NX	Regional lymph nodes cannot be assessed
N0	No evidence of regional lymph nodes metastasis
N0a*	One or more cytologic or histologically confirmed benign lymph node
N0b*	No radiologic or clinical evidence of locoregional lymph node metastasis
N1*	Metastasis to regional nodes
N1a*	Metastasis to level VI or VII (pretracheal, paratracheal, or prelaryngeal/Delphian, or upper mediastinal) lymph nodes; this can be unilateral or bilateral disease
N1b*	Metastasis to unilateral, bilateral, or contralateral lateral neck lymph nodes (levels I, II, III, IV, or V) or retropharyngeal lymph nodes
M0	No distant metastasis
M1	Distant metastasis
*all categories may be subdivided as solitary tumor (s) and multifocal tumor (m) – the largest tumor determines the classification	

DEFINITIONS OF AJCC TNM

Staging guide for thyroid cancer (AJCC 8e)

Age at diagnosis	T category	N category	M category	Stage	Expected 10-yr DSS
		Differentiated thyroid cancer			
<55 years	any T	any N	M0	I	98–100%
	any T	any N	M1	II	85–95%
≥ 55 years	T1	N0/NX	M0	I	98–100%
	T1	N1	M0	II	85–95%
	T2	N0/NX	M0	I	98–100%
	T2	N1	M0	II	85–95%
	T3a/T3b	any N	M0	II	85–95%
	T4a	any N	M0	III	60–70%
	T4b	any N	M0	IVA	< 50%
	any T	any N	M1	IVB	< 50%
		Medullary thyroid cancer			
any	T1	N0	M0	I	
	T2	N0	M0	II	
	T3	N0	M0	II	
	T1-3	N1a	M0	III	
	T4a	any N	M0	IVA	
	T1-3	N1b	M0	IVA	
	T4b	any N	M0	IVB	
	any T	any N	M1	IVC	
		Anaplastic thyroid cancer			
any	T1-T3a	N0/NX	M0	IVA	
	T1-T3a	N1	M0	IVB	
	T3b	any N	M0	IVB	
	T4	any N	M0	IVB	
	any T	any N	M1	IVC	

THYROIDITIS

Types

1.Hashimoto's thyroiditis (struma lymphomatosa)

2.De-quervain's subacute granulomatous thyroiditis

3.Riedel's thyroiditis

4.Radiation-induced thyroiditis

5.Acute or infectious thyroiditis

6.Drug-induced thyroiditis

7.Silent (painless) thyroiditis

8.Postpartum thyroiditis

HASHIMOTO'S THYROIDITIS (Struma Lymphomatosa)

The river Struma arises in Bulgaria and flows into Aegean Sea. Struma means goitre. Banks of this river are endemic area for goitre.

Also called as diffuse non-goitrous thyroiditis.

It is an autoimmune thyroiditis—common in women (15 times more common).

There is hyperplasia initially, then fibrosis, eventually infiltration with plasma cells and lymphocytic cells.

Askanazy cells are typical (like Hurthle cells).

Features

Painful, diffuse, enlargement of usually both lobes of thyroid which is firm, rubbery, tender and smooth (occasionally one lobe is involved).

Initially they present with toxic features, but later, they manifest with features of hypothyroidism.

Hyperplasia → Hyperthyroid—Hashitoxicosis → Euthyroid.Fibrosis → Hypothyroid.

There may be hepatosplenomegaly.

It is often associated with other autoimmune diseases.

In 85% cases significant rise in the thyroid antibodies (microsomal, thyroglobulin, or colloid antibodies) is observed.

Common in perimenopausal females.

It can predispose to papillary carcinoma of thyroid.

Often condition may be associated with or may predispose to malignant lymphoma. It is, at present, not well-proved.

Investigations

FNAC, T3, T4, TSH.

Thyroid antibodies assay.

Usually ESR is very high (over 90 mm/hour).

Treatment

L-thyroxine therapy.

Steroid therapy often is helpful.

If goitre is large and causing discomfort, then subtotal thyroidectomy is done.

DE-QUERVAIN'S SUBACUTE GRANULOMATOUS THYROIDITIS

It is due to viral aetiology either mumps or coxsackie viruses causing inflammatory response with infiltration of lymphocytes, neutrophils, multi-nucleated giant cells.

Features

Painful diffuse, swelling in thyroid which is tender.

Commonly seen in females.

Initially there is transient hyperthyroidism with high T3 and T4 but poor radioiodine uptake.

FNAC is useful.

It is usually a self-limiting disease.

Prednisolone 20 mg for 7 days helps.

RIEDEL'S THYROIDITIS

A very rare benign entity wherein thyroid tissue is replaced by fibrous tissue which interestingly infiltrates the capsule into surrounding muscles, paratracheal tissues, carotid sheath.

('Woody Thyroiditis', 'Ligneous Thyroiditis').

It is often associated with retroperitoneal and mediastinal fibrosis and sclerosing cholangitis.

There is both intrathyroidal as well as extra-thyroidal fibrosis.

It also encroaches parathyroids and recurrent laryngeal nerves.

It may be unilateral or bilateral.

Features

Swelling with irregular surface, stony hard consistency, stridor, with positive Berry's sign (absence/impalpable carotid pulsation); small goitre; common in males.

Differential diagnosis:

Anaplastic carcinoma of thyroid.

MATERIALS AND METHODS

The present study on "**BURDEN AND DETERMINATION OF MALIGNANCY IN SOLITARY NODULE OF THYROID IN A TERTIARY CARE HOSPITAL**" has been conducted by utilising cases admitted and managed in the Department of Surgery at Stanley medical college

Prospective analysis of 50 cases of solitary nodule thyroid in the specified period done. These cases were selected by random sampling method and studied in detail clinically and recorded as per the pro forma. Routine investigations and specific investigations including FNAC of the nodule, Thyroid profile, IDL, Plain X-ray neck, USG neck were done in all cases. Radio-isotope scanning was not performed. All the patients were managed by surgery and diagnosis was confirmed by histopathological examination.The patients were grouped according to different variables like age , sex, size of the nodule, site of the nodule, functional thyroid status, FNAC reports and histopathological examination reports, then analysed and compared with the previous similar studies conducted elsewhere. Finally conclusions were drawn accordingly.

Treatment:

Surgery was done for all the patients under study

Pre-operative :

Use of anti-thyroid drugs, beta-blockers, blood transfusions or any other medications

were prescribed based on individual status and was noted

Operative:

Position of the patient, type of anaesthesia, incision, type of operation planned, per operative findings and type of operation performed were noted.

Post-operative:

Every patient was followed up post-operatively during the course of management in the hospital to note the development of and management of complications.

Follow-up:

At the time of discharge, all the patients were advised to attend the surgical OPD regularly for follow up. Any recurrences or complications were noted. Thyroid functional status was assessed, accordingly thyroxine tablets prescribed if necessary.

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RESULTS

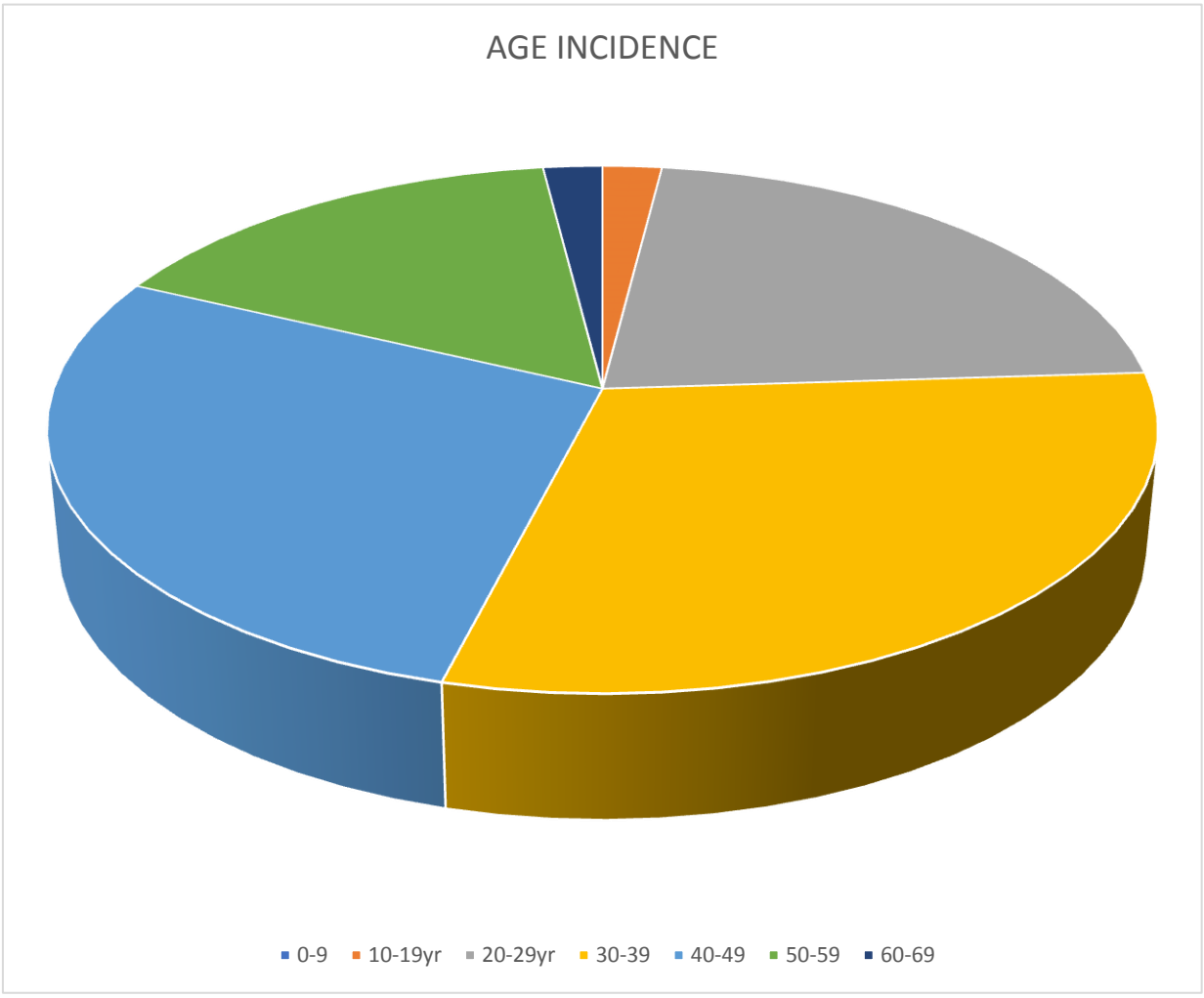
Total of 50 cases of solitary nodule of thyroid were studied and following conclusions were drawn:

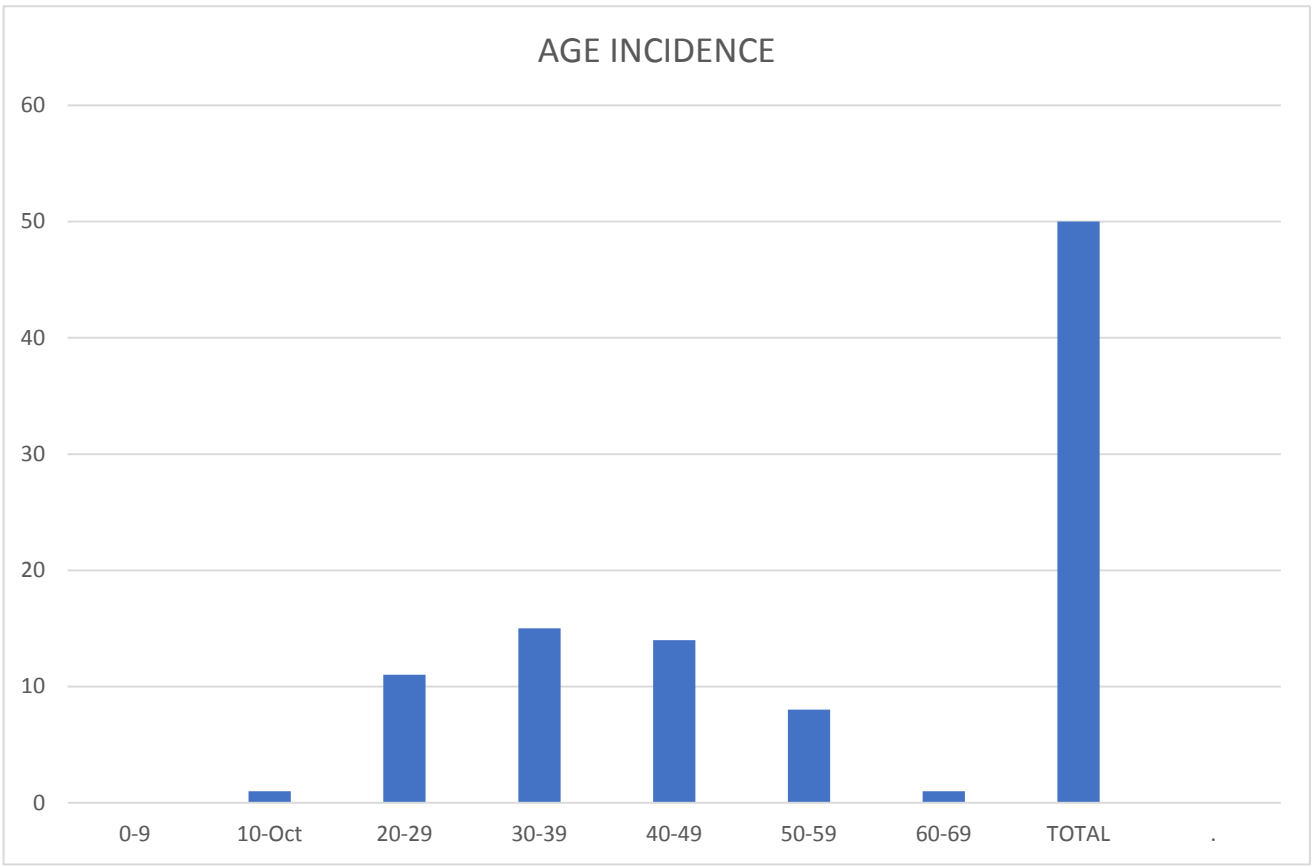
AGE INCIDENCE:

The age of the patients ranges from 17 years to 66 years, with peaks being in 3rd to 5th decades. The mean age of presentation is 38.46 years. Cases in 3rd to 5th decades constitutes 60% of the cases studied.

AGE	NO.OF CASES
0-9	0
10-10	1
20-29	11
30-39	15

40-49	14
50-59	8
60-69	1
TOTAL	50


AGE INCIDENCE
0-9
10-19yr
20-29yr
30-39
40-49
50-59
60-69


AGE INCIDENCE
60
50
40
30
20
10
0
0-9
10-Oct
20-29
30-39
40-49
50-59
60-69
TOTAL
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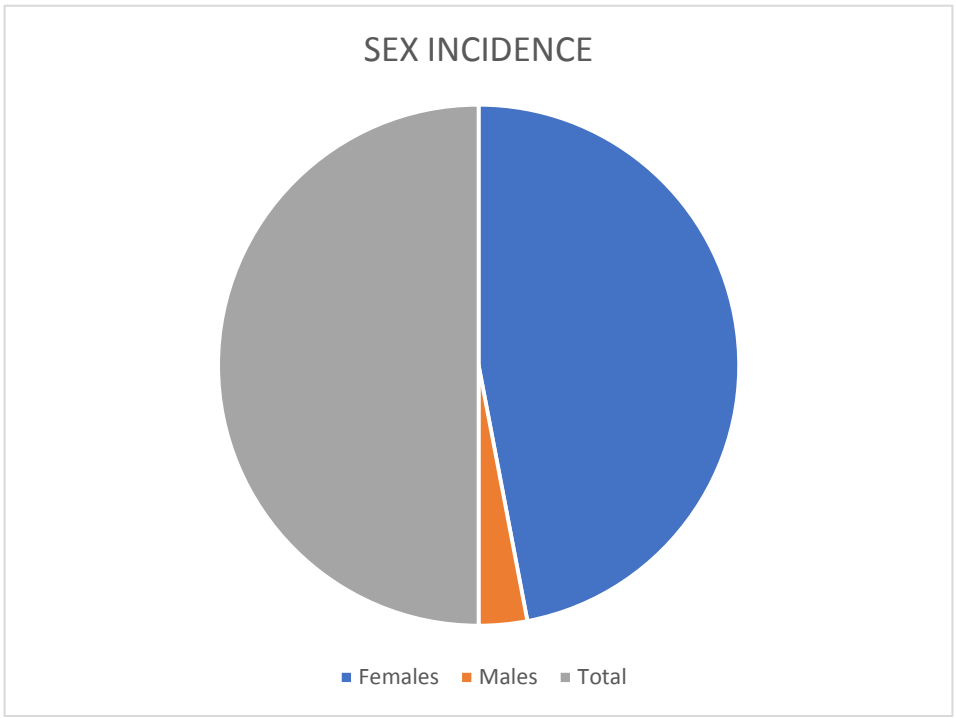
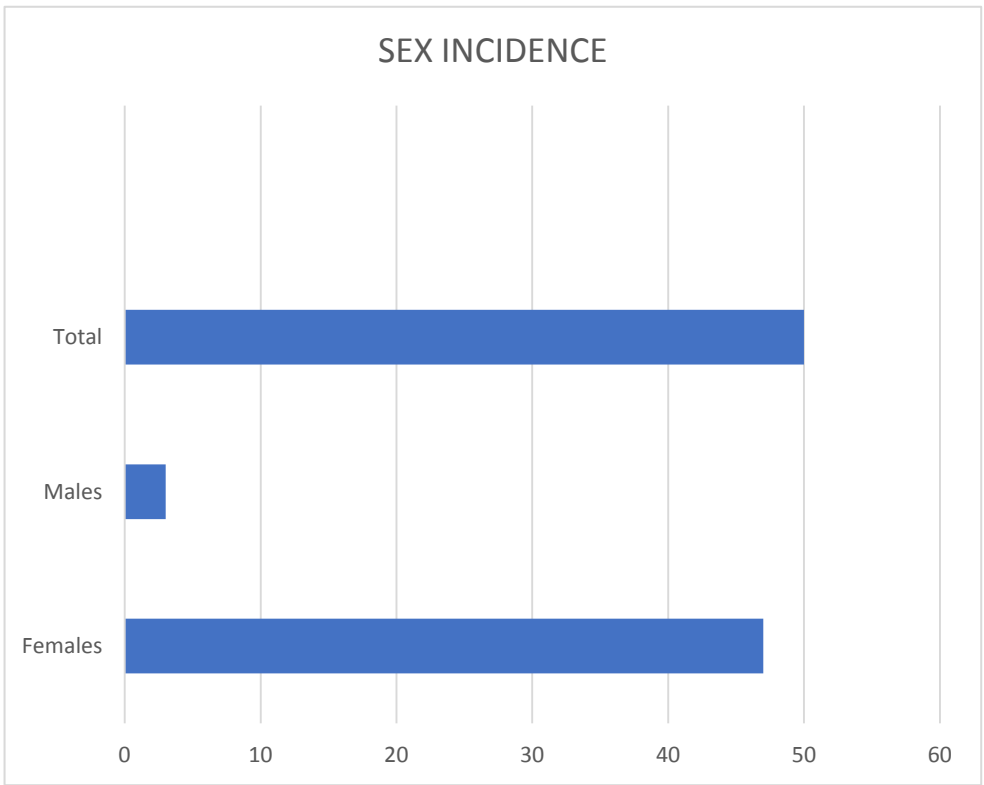
SEX INCIDENCE:

Solitary nodule of thyroid are much more common in females. Out of 50 cases studied 47 were females and 3 were males, and the ratio comes to M : F = 1 : 15.67.Among malignant cases all 6 were found in females.

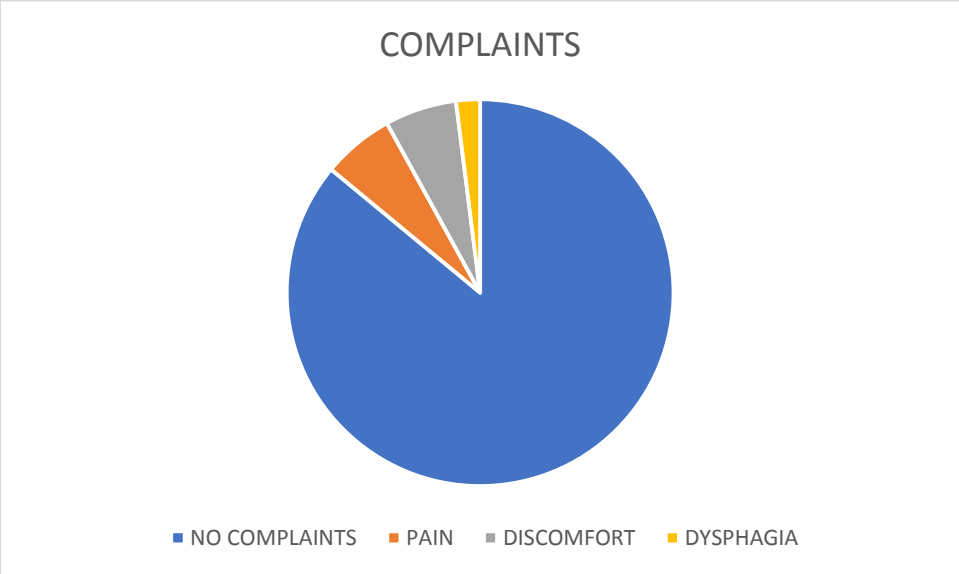
SEX	**NO.OF PATIENTS**
Females	47
Males	3
Total	50


SEX INCIDENCE
Females
Males
Total


SEX INCIDENCE
Total
Males
Females
0
10
20
30
40
50
60

CLINICAL FEATURES:

All the cases in the present study presented complaint of swelling in front of the neck. Only few patients presented with pain, discomfort and dysphagia of mild degree. Out of 50 cases, 3 cases had pain, 3 cases had discomfort and 1 had dysphagia. Also no cases had lymphadenopathy which was confirmed by ultrasonographic examination. One patient had symptoms of thyrotoxicosis, and one had features of hypothyroidism. The latter patients' thyroid profile confirmed the functional status.

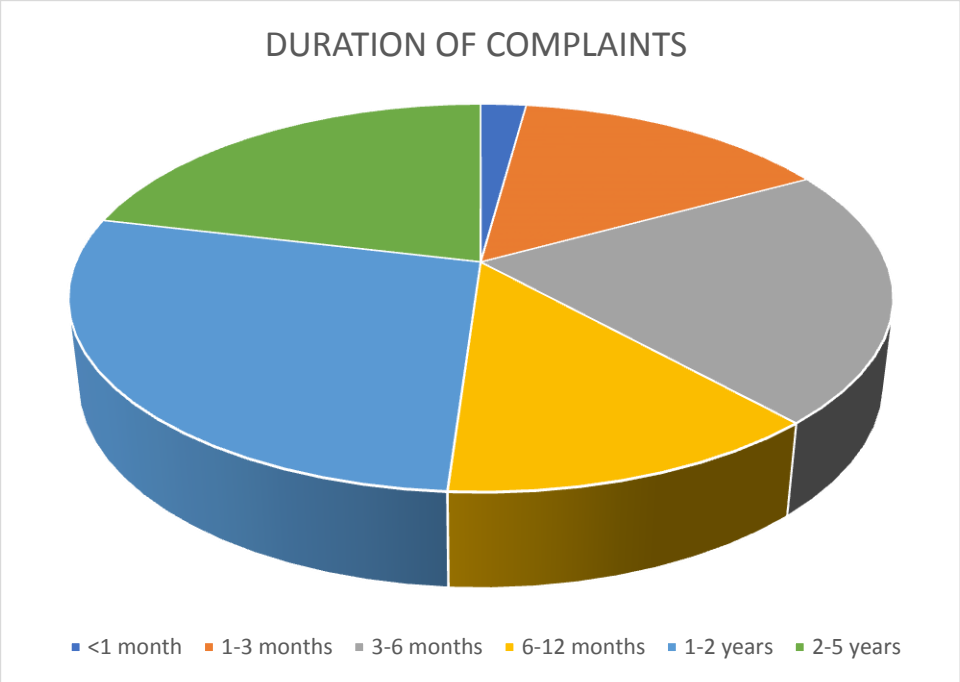


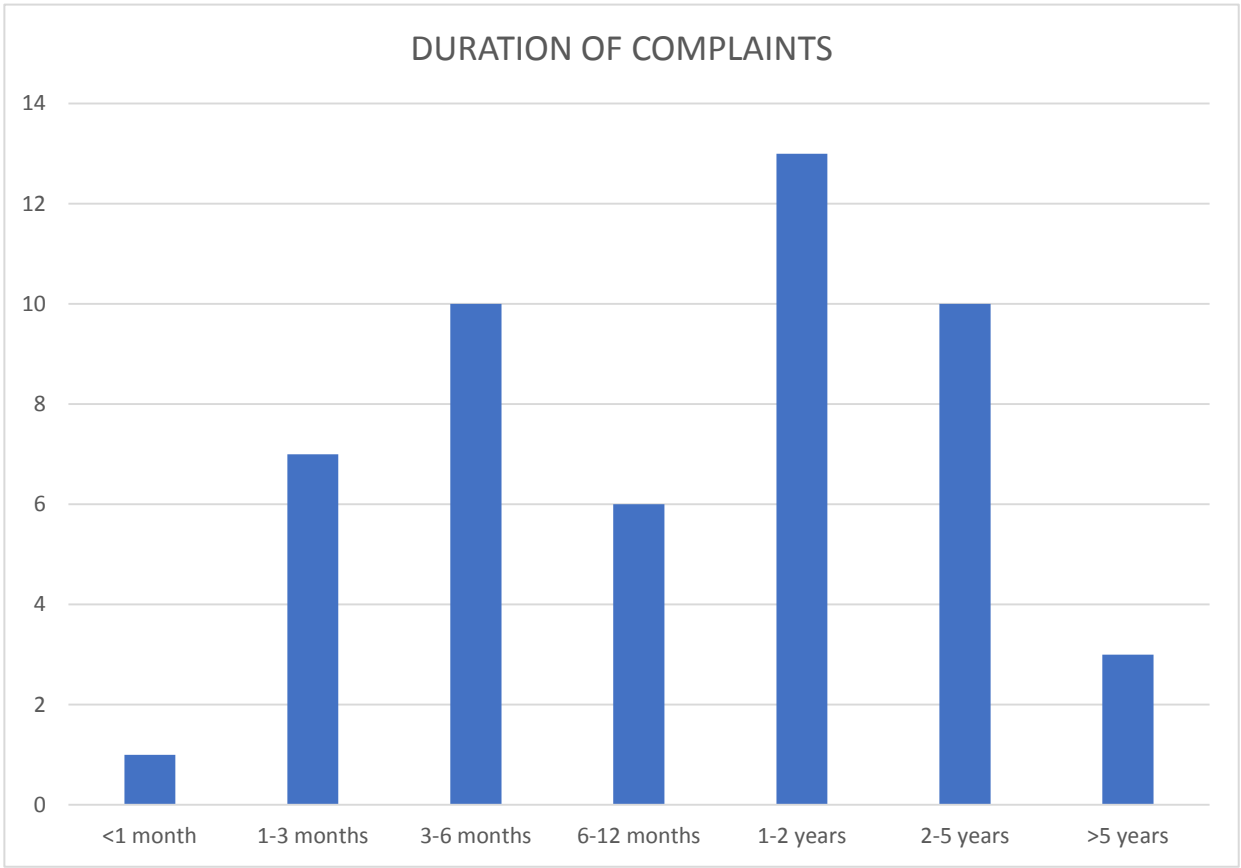
DURATION OF SYMPTOMS:

In our study, duration of onset symptoms varied from 20 days to 8 years.

Also duration of malignant nodules extend from 2-7 years.

DURATION OF SYMPTOMS	**NO.OF PATIENTS**
<1 month	1
1-3 months	7
3-6 months	10
6-12 months	6
1-2 years	13
2-5 years	10
>5 years	3


DURATION OF COMPLAINTS
<1 month
1-3 months
3-6 months
6-12 months
1-2 years
2-5 years

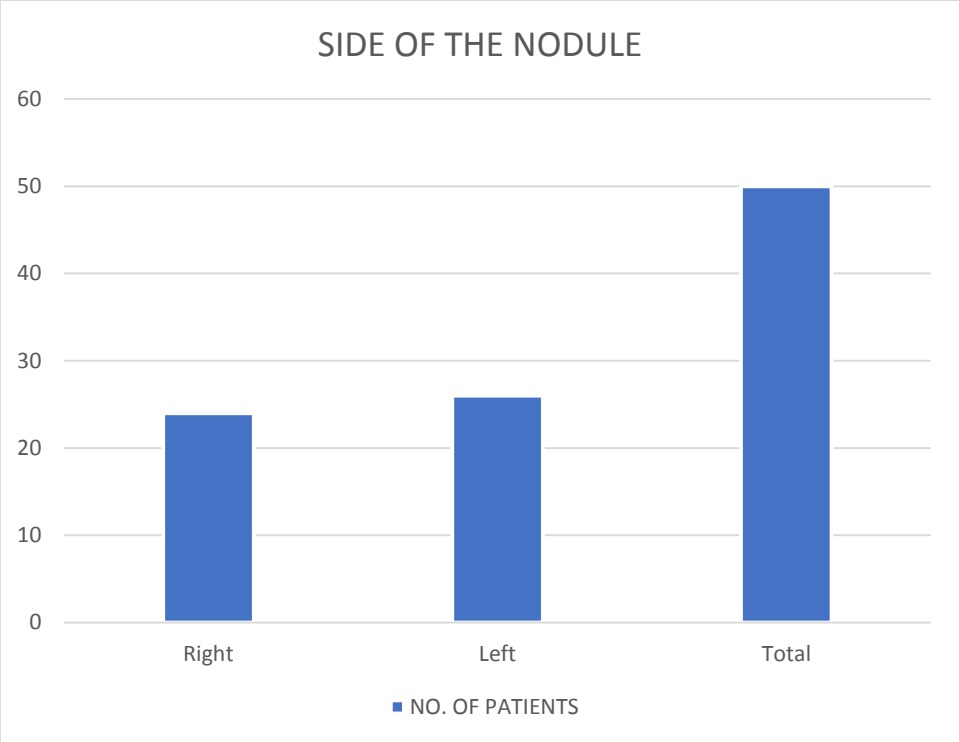

DURATION OF COMPLAINTS
14
12
10
8
6
4
2
0
<1 month
1-3 months
3-6 months
6-12 months
1-2 years
2-5 years
>5 years

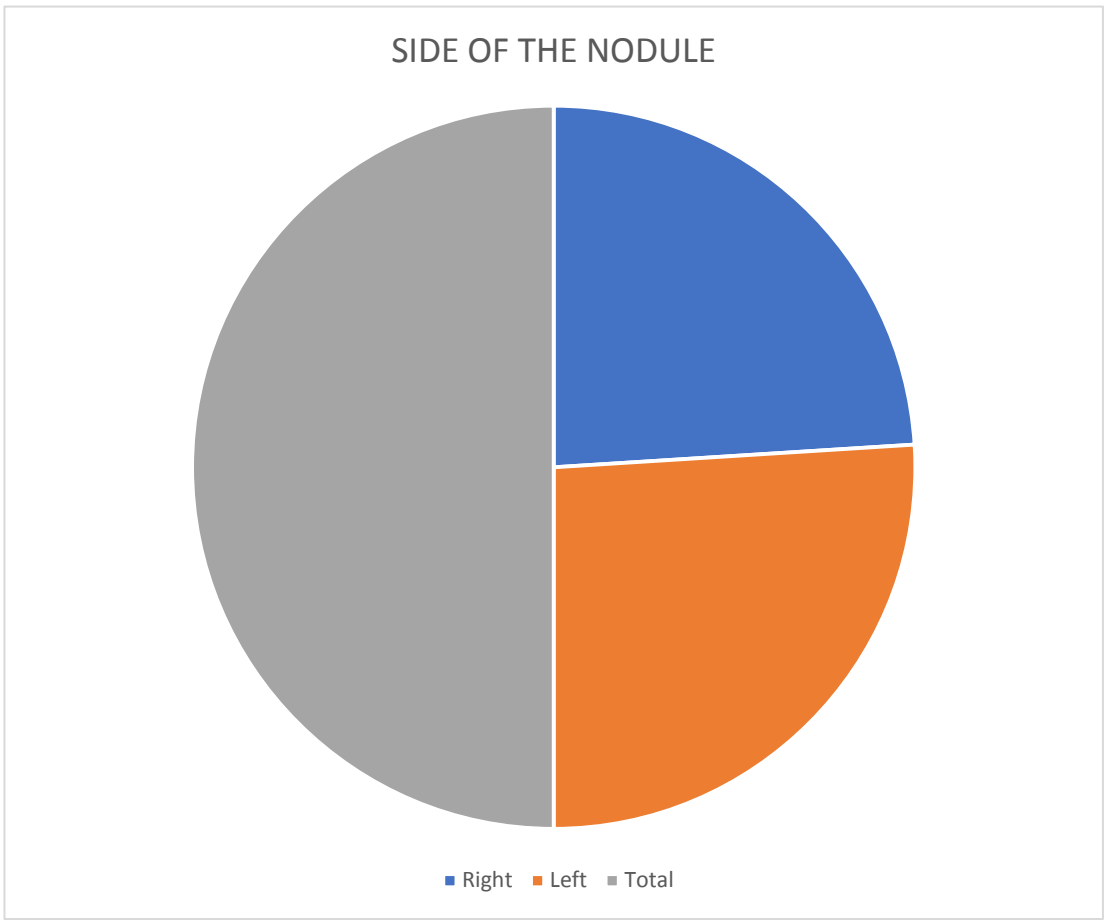
SIDE OF THE NODULE:

Out of 50 cases studied, 24 nodules were in right lobe of the thyroid gland

and 26 in the left lobe of thyroid.

SIDE OF THE NODULE	NO. OF PATIENTS
Right	24
Left	26
Total	50

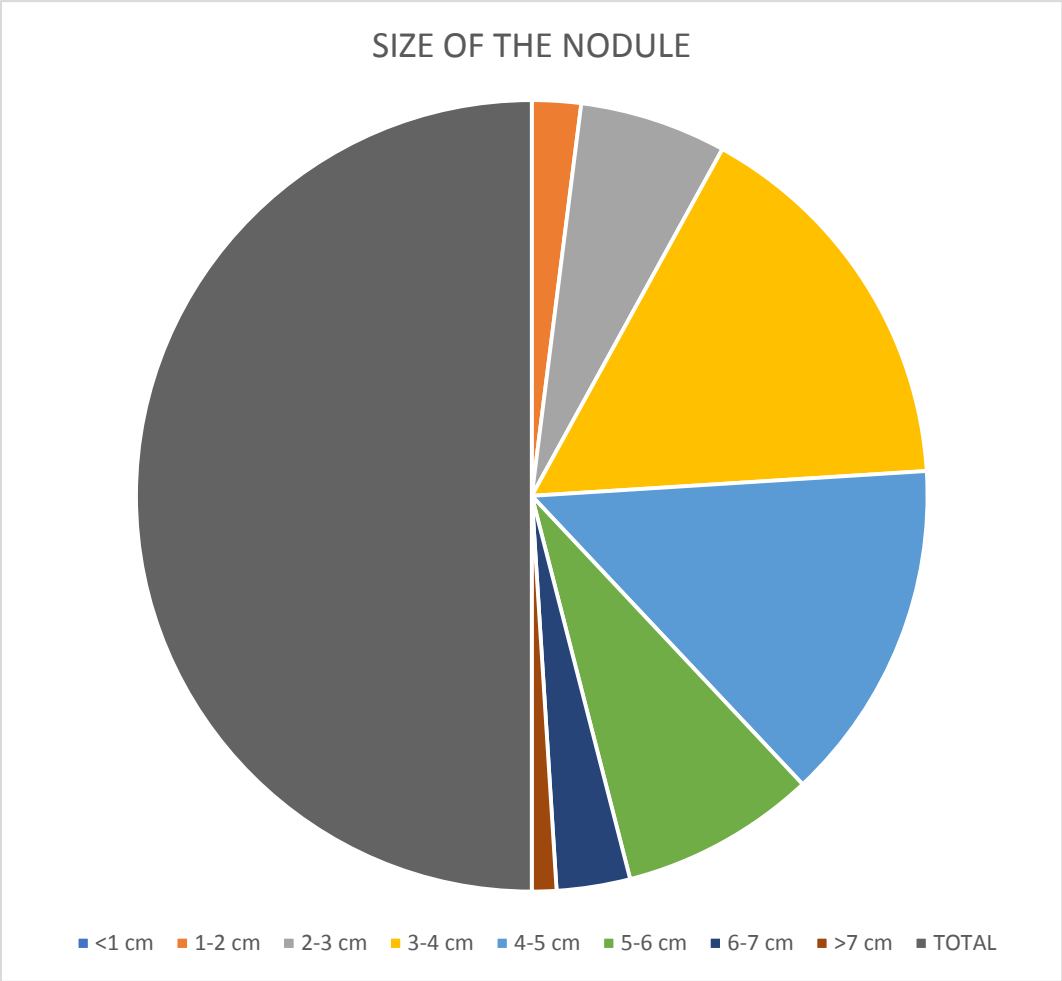



SIDE OF THE NODULE
Right
Left
Total

SIZE OF THE NODULE:

On clinical examination nodule size in its largest dimension, varies from 1cm to 11cm. Most of the patients presented with the size of about 3 to 5 cm.In the study, no correlation between the size of the nodule and the occurrence malignant nodule noted.

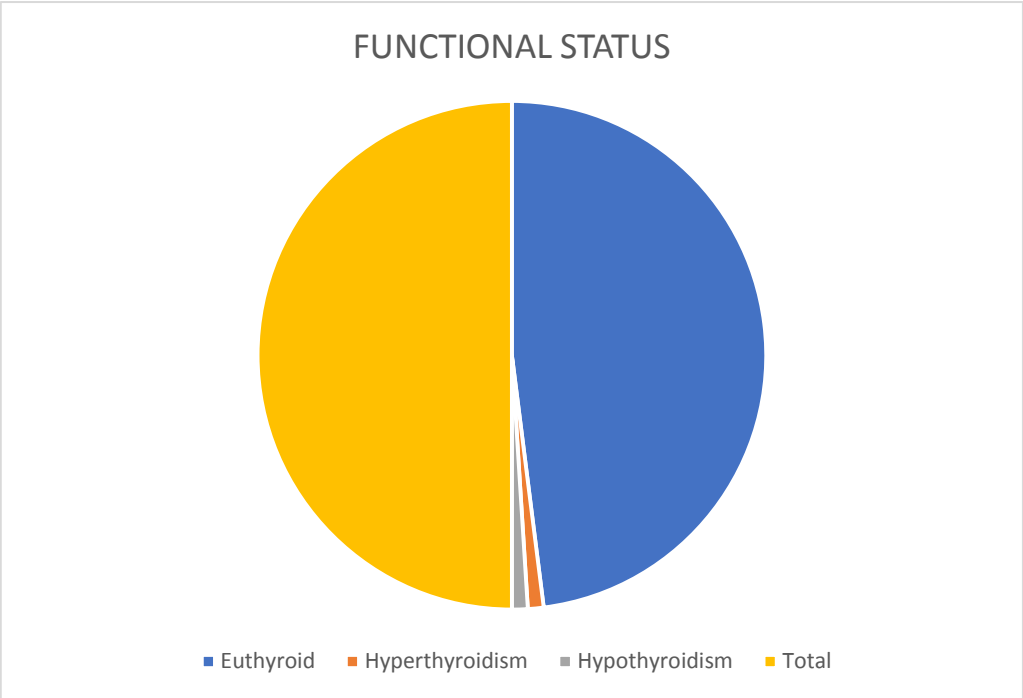
SIZE OF THE NODULE	NO OF CASES
<1 cm	0
1-2 cm	2
2-3 cm	6
3-4 cm	16
4-5 cm	14
5-6 cm	8
6-7 cm	3
>7 cm	1
TOTAL	50

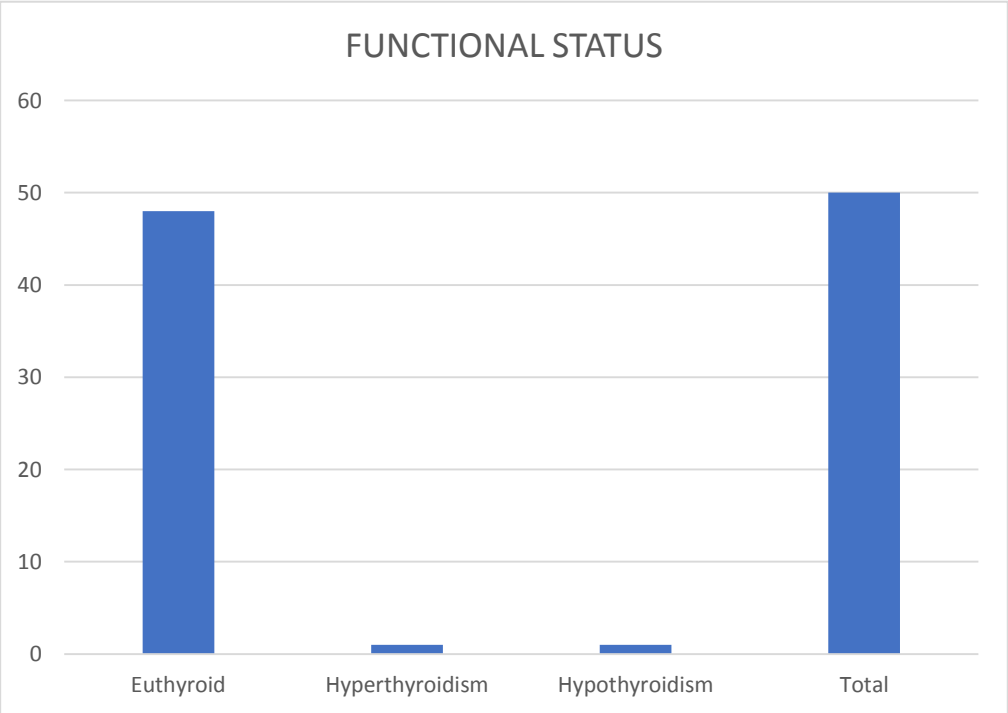

SIZE OF THE NODULE
<1 cm
1-2 cm
2-3 cm
3-4 cm
4-5 cm
5-6 cm
6-7 cm
>7 cm
TOTAL

FUNCTIONAL STATUS:

Out of 50 cases, one presented with features of thyrotoxicosis, one with hypothyroidism and rest all were in euthyroid state. Patient with thyrotoxicosis was made euthyroid using antithyroid drugs and operated.Patient with hypothyroidism was treated with thyroxine and operated.

FUNCTIONAL STATUS OF THYROID	**NO OF PATIENTS**
Euthyroid	48
Hyperthyroidism	1
Hypothyroidism	1
Total	50

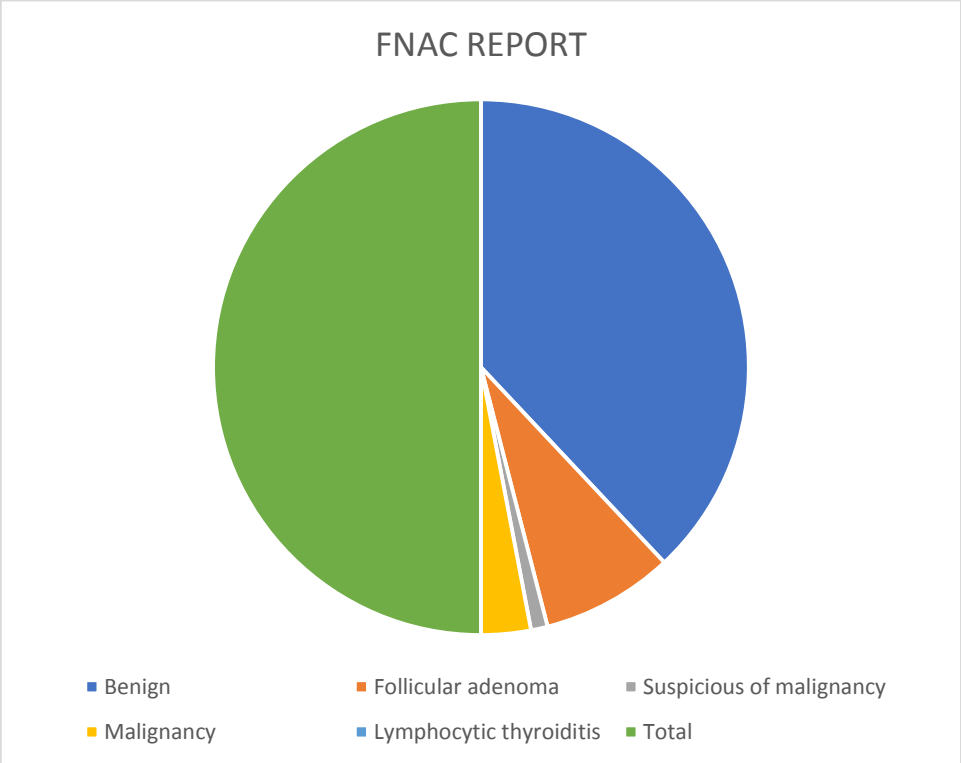

FUNCTIONAL STATUS
Euthyroid
Hyperthyroidism
Hypothyroidism
Total


FUNCTIONAL STATUS
60
50
40
30
20
10
0
Euthyroid
Hyperthyroidism
Hypothyroidism
Total

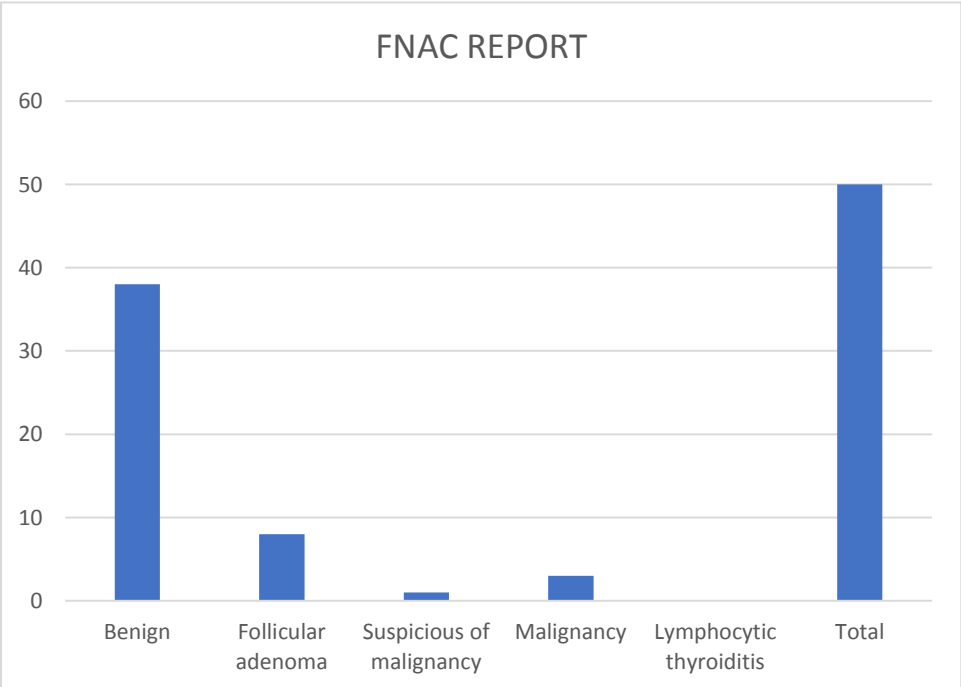
FNAC REPORTS:

All 50 cases were subjected to FNAC during the course of evaluation. Fnac reports are mainly categorised into 5 entities- Benign ,follicular neoplasm, suspicious(of malignancy), malignant, lymphocytic thyroiditis. In our study, out of 8 follicular neoplasms, 1 turned out to be follicular carcinoma. One suspicious (of papillary carcinoma) case was confirmed to be papillary carcinoma on histopathological examination.Three cases of papillary carcinoma were diagnosed pre-operatively by FNAC alone.1 case of Non colloid goitre in FNAC turned out to be Papillary carcinoma on histopathological examination.

FNAC REPORT	**NO OF CASES**
Benign	38
Follicular adenoma	8
Suspicious of malignancy	1
Malignancy	3
Lymphocytic thyroiditis	0


FNAC REPORT
Benign
Follicular adenoma
Suspicious of malignancy
Malignancy
Lymphocytic thyroiditis
Total

Total	50


FNAC REPORT
60
50
40
30
20
10
0
Benign
Follicular adenoma
Suspicious of malignancy
Malignancy
Lymphocytic thyroiditis
Total

ETIOLOGICAL INCIDENCE OF SOLITARY NODULE OF THYROID:

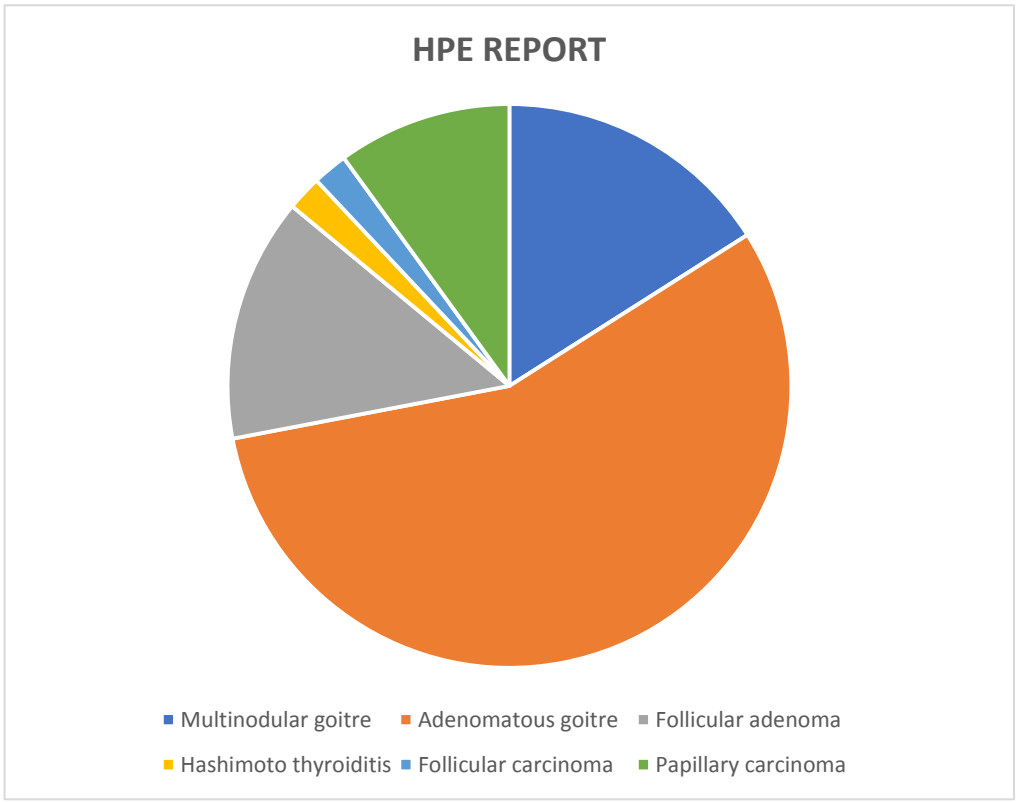
Out of 50 cases studied, common causes of solitary nodule are colloid goitre, follicular adenoma and adenomatous goitre; the most common being adenomatous goitre which constitutes about 56% of cases.

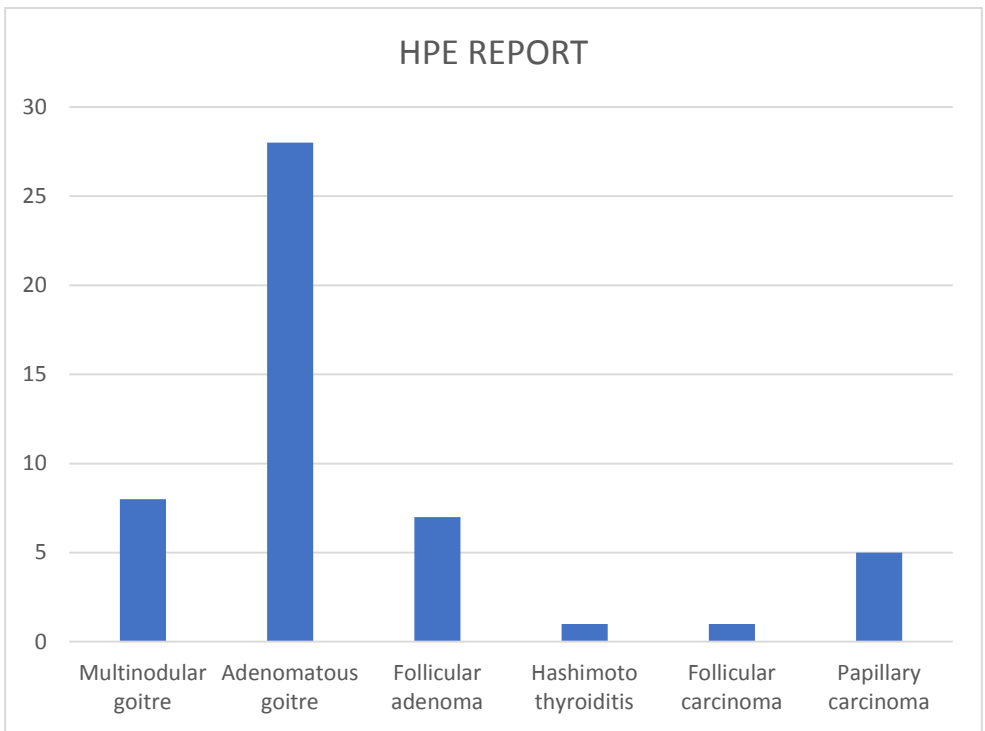
Follicular adenomas were 14% and multinodular goitres were 16%.Out of 50 cases, six were malignant-5 papillary carcinoma and 1 follicular carcinoma.

Three cases of papillary carcinoma were diagnosed with certainty by FNAC, one case was suspicious which turned out to be papillary CA on histopathological examination.

Out of eight cases follicular neoplasm, none was detected by ultrasound.

HPE REPORT	**NO.OF CASES**
Multinodular goitre	8
Adenomatous goitre	28
Follicular adenoma	7
Hashimoto thyroiditis	1
Follicular carcinoma	1
Papillary carcinoma	5

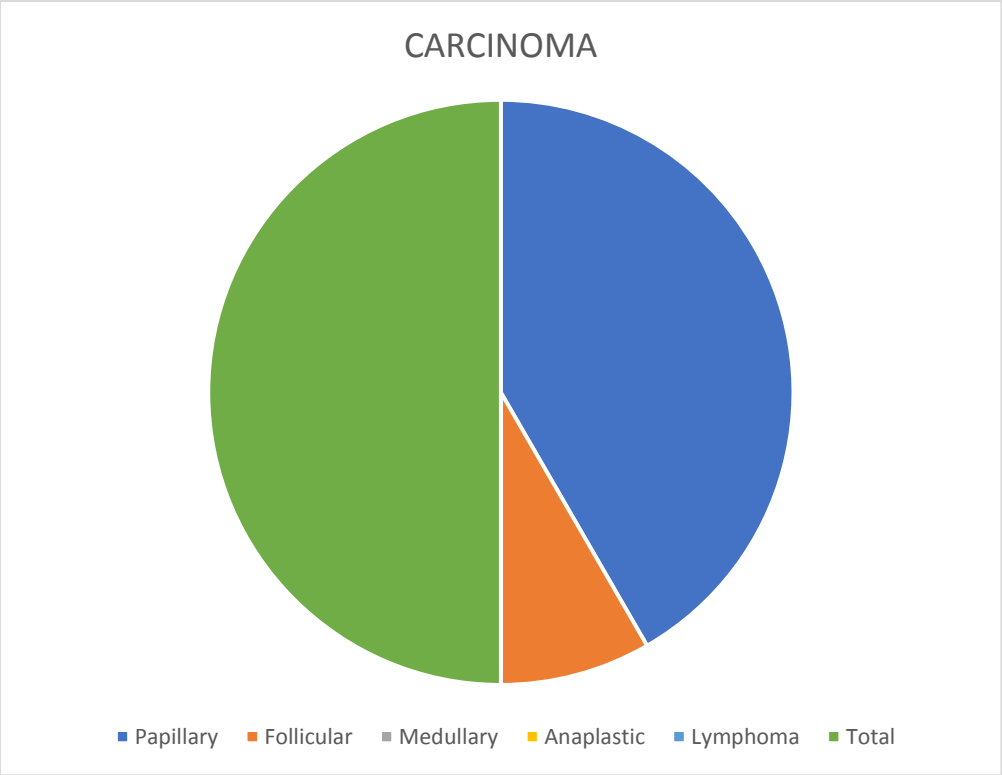

HPE REPORT
Multinodular goitre
Adenomatous goitre
Follicular adenoma
Hashimoto thyroiditis
Follicular carcinoma
Papillary carcinoma

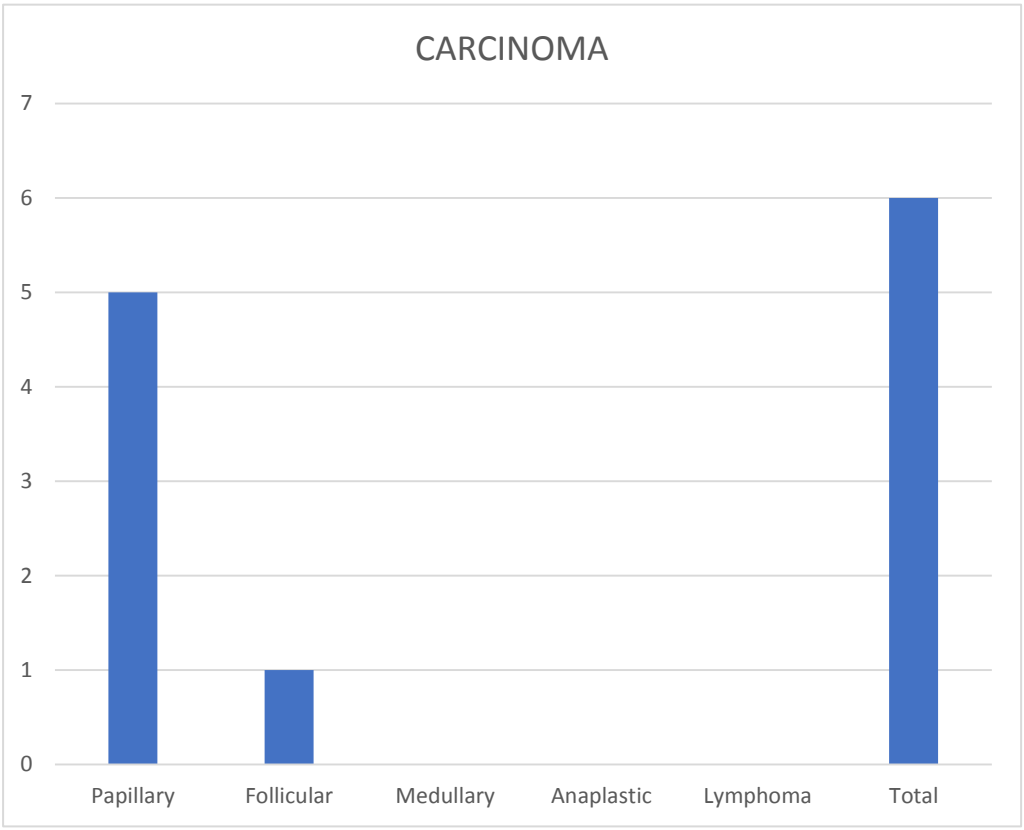

HPE REPORT
30
25
20
15
10
5
0
Multinodular goitre
Adenomatous goitre
Follicular adenoma
Hashimoto thyroiditis
Follicular carcinoma
Papillary carcinoma

TYPE OF CARCINOMA:

From the study, out of 6 carcinoma, 5 were papillary and 1 was follicular: no case of medullary or anaplastic or lymphoma was detected. Papillary carcinoma accounts to 83.33% and follicular carcinoma accounts to 16.67%.

CARCINOMA	**NO OF CASES**
Papillary	5
Follicular	1
Medullary	0
Anaplastic	0
Lymphoma	0
Total	6


CARCINOMA
Papillary
Follicular
Medullary
Anaplastic
Lymphoma
Total


CARCINOMA
7
6
5
4
3
2
1
0
Papillary
Follicular
Medullary
Anaplastic
Lymphoma
Total

SURGERY / OPERATIVE PROCEDURE DONE:

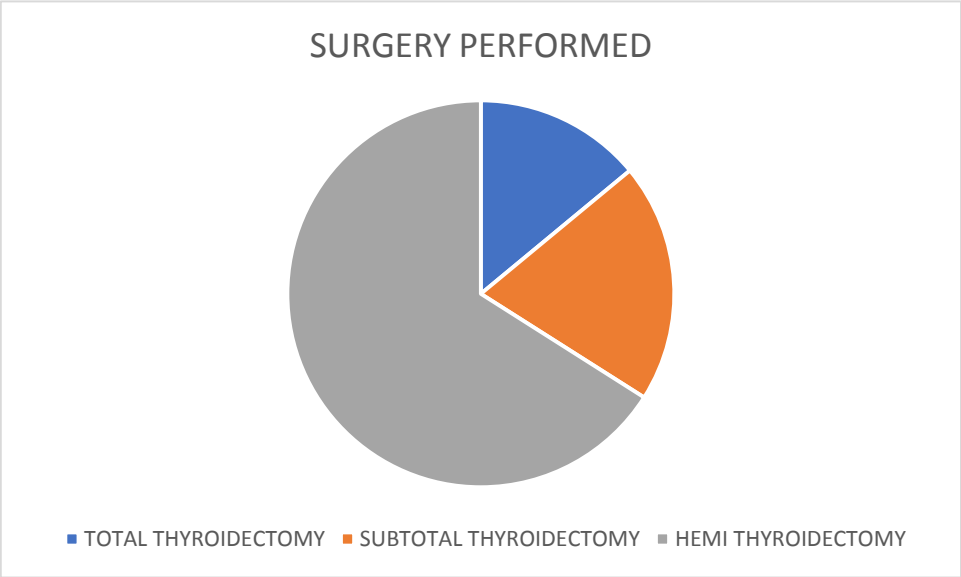
Depending upon the clinical diagnosis and FNAC features, all the 50 patients undergone surgery. Among them, 33 patients had undergone hemithyroidectomy, 10 cases undergone sub-total thyroidectomy and 7 cases undergone total thyroidectomy.

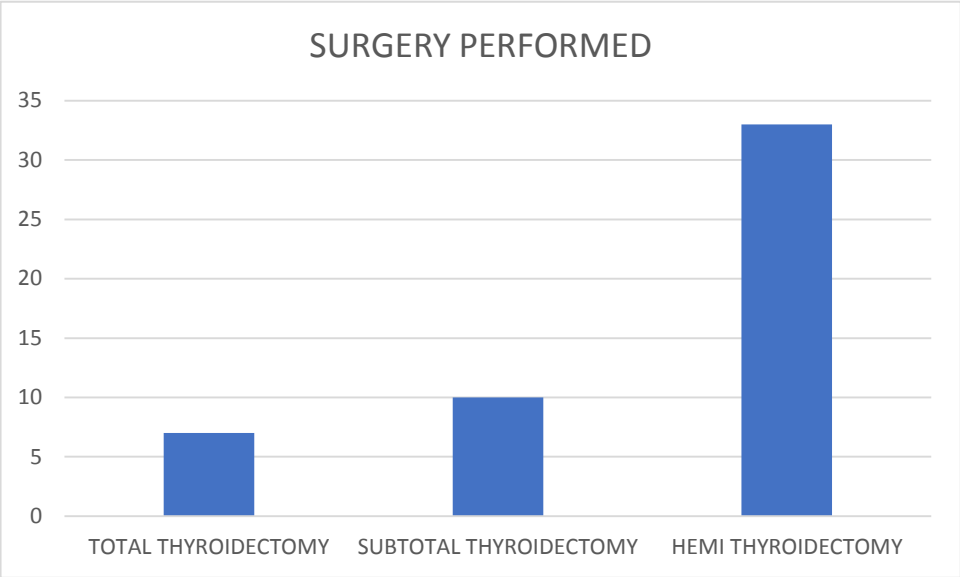
In one case, HPE after hemithyroidectomy showed follicular carcinoma, then completion thyroidectomy done.

Post-operatively, suppressive dose of thyroxine was started for patients who had undergone total thyroidectomy. 2 cases out of 7 cases of total thyroidectomy showed features of hypocalcemia on 2-4 post-operative day, hence, they are supplemented with oral calcium and vitamin D3.

All the cases were followed up for 6months, 3 cases had husky voice without any change in vocal cord movements.

SURGERY	NO OF CASES
TOTAL THYROIDECTOMY	7
SUBTOTAL THYROIDECTOMY	10
HEMI THYROIDECTOMY	33




SURGERY PERFORMED
35
30
25
20
15
10
5
0
TOTAL THYROIDECTOMY
SUBTOTAL THYROIDECTOMY
HEMI THYROIDECTOMY

DISCUSSION

The observations and results of the present study were compared with the available previous similar studies.

MEAN AGE AT PRESENTATION:

AUTHORS	MEAN AGE IN YEARS
Das DK (1999)	35
Talepoor M(2005)	38.6
Quari F. (2005)	36.7
REHMAN A.U.(2009)*	34.7
Khurshid Anwar(2012)*	37
Present study	38.46

Most of the earlier series reported peak incidence of solitary nodule thyroid in the 3rd and 4th decades. Bhansali S.K [5](1982), in his similar study , reported the peak incidence in 4th and 5th decade. In the present study, the peak incidence found to be 3rd to 5th decades, which constitutes about 58% of the cases studied.

SEX DISTRIBUTION:

AUTHORS	**SEX INCIDENCE(M:F)**
Dorairajan (1996)	1:9
Das DK(1999)	1:5.39
Gupta C(2001)	1:5
Present study	1:15.67

In the study done by Dorairajan(1996) and Das DK(1999) reported ratio of sex incidence as 1:9 and 1:5.39 respectively. In the present study, its found to be 1:11.5, which correlates with previous studies.

Because of periods of fluctuations in the demands of the hormonal requirement in female in their life cycle(puberty, menstrual cycles, pregnancy, menopause), the chances of thyroid nodule formation are very high as compared with male counterparts.

DISTRIBUTION OF NON-NEOPLASTIC AND NEOPLASTIC LESIONS DIAGNOSED BY FNAC:

Authors	**Nonneoplastic**	**Neoplastic**	**Ratio**
Sarda AK(1997)	487	59	8.25:1
Das DK(1999)	346	85	4.07:1
Gupta C(2001)	470	30	15.66:1
Karur(2002)	32	15	2.13:1
Talepoor M(2005)	325	70	4.33:1
Chao CT(2007)	276	264	1.6:1
Present study	38	12	3.16:1

.

In the present study, neoplastic conditions include adenomas and all malignant lesions. From the study, the ratio of non-neoplastic to neoplastic cases is about 3.16:1.

DISTRIBUTION OF MALIGNANCIES BY FNAC :

AUTHORS	PERCENTAGE
Sarda Ak et al(1997)	10.8
Karur K et al(2002)	18
Mundsad B et al(2006)	4.16
Present study	8.33

In the present study, among 5 cases of papillary CA, 3 were diagnosed by FNAC and the rest one was suspicious of malignancy. But the follicular CA was initially reported as follicular neoplasm. From the study, distribution of malignancy is about 8.33, which is comparable with the earlier studies.

ETIOLOGICAL INCIDENCE (IN PERCENTAGE):

From the present study, commonest cause of solitary nodule is Adenoma, which is comparable with the studies done by Fenn(1980) ,Kapur (1982). The common causes are follicular adenoma and adenomatous goitre.

Series	**MNG**	**Adenoma**	**Carcinoma**	**Others**	**Total**
Ananth Krishnan (1983)	12	47	2	2	104
Fenn(1980)	22	55	12	11	342
Kapur(1982)	28	50	11	11	221
Present study	8	35	6	1	50

INCIDENCE OF CARCINOMA:

Study	Year	Percentage
A S Fenn et al	1980	12%
Kapur et al	1982	11%
Rehman A U	2009	11.4%
Present study	2019	12%

From the literature, the incidence of malignancy in thyroid nodule ranges from 5% to 30%. From the present study, the incidence found to be 12 %, which is comparable with the study done by A S Fenn et al, Kapur et al, Rehman A U.

CONCLUSIONS

The present study is a prospective analysis of 50 cases of solitary nodule of thyroid, admitted in Govt Stanley Medical College.Though a large number of patients are required to come to better conclusions, based on the data and results obtained in the present study, the following conclusions can be drawn:

- Solitary nodule of thyroid is more common in females.
- Solitary nodule of thyroid is more common in the age group of 20-50years.
- Most of the patients with solitary nodule of thyroid present with swelling alone.
- Most of the patients with solitary nodule of thyroid are in euthyroid state.
- Incidence of malignancy in female patients presenting with solitary nodule thyroid is more.
- commonest cause of solitary nodule of thyroid is adenoma
- USG can be used to detect multi-nodular goitre in patients presenting with solitary nodule thyroid.
- FNAC is the investigation of choice in the evaluation of solitary nodule of thyroid. It has few pitfalls. In such situations, only histopathology can confirm the exact pathology. It detects papillary carcinoma in a solitary

nodule with high sensitivity and specificity.

- Papillary carcinoma is the most common malignancy of thyroid, followed by follicular carcinoma.

SUMMARY

A prospective analysis of 50 cases of solitary nodule of thyroid, admitted in Govt Stanley medical college has been made and summarised below:

- Commonest presentation of solitary nodule is swelling in front of neck.
- The peak age at presentation of solitary nodule thyroid is 3rd to 4th decade, constituting about 58% of the cases.
- Solitary nodule is more common in females with the ratio M:F = 1:15.67
- Most of the solitary nodule of thyroid are benign (88%).
- Most of patients with solitary nodule of thyroid are in euthyroid state(96%).
- After evaluation of solitary nodule thyroid,16% of all the clinically solitary nodule turned out to be multi-nodular goitre.
- Common causes of solitary nodule thyroid are adenoma(56%),MNG(16%).
- Incidence of malignancy of solitary nodule is about 12%. Male to female ratio in case of malignant nodule is 1:.6.
- The most common malignancy in solitary nodule thyroid is papillary carcinoma (83%),followed by follicular carcinoma(17%).
- FNAC is an important investigation in the evaluation of the solitary nodule of thyroid.
- Surgery has been the treatment of choice in most of the cases, either because of cosmetic reasons or toxicity or FNAC diagnosis of follicular neoplasm or

malignancy.

Transient hypocalcemia is common after total thyroidectomy for malignancies.

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ANNEXURE-1

PROFORMA FOR CLINICAL STUDY OF SOLITARY NODULE OF THYROID

Case No:

Name: Hospital:

Age: Unit:

Sex: D.O.A:

Occupation: D.O.D:

Address:

Contact No:

A.Clinical diagnosis :

B.Chief complaint and its duration:

a.Swelling

b.Pain

c. Others

C.History of presenting illness:

a.Swelling

Duration,Site, Mode of onset, Progress of the swelling , Presence of other swelling(s) ,Secondary changes

b. Pain

Duration ,Onset ,site ,Nature ,Radiation, Aggravating factors,Relieving factors

c.Pressure symptoms

Dysphagia ,Dyspnea ,Hoarseness of voice ,Voice fatigue

d. Symptoms suggestive of BMR changes

Appetite:increased/decreased/good

Weight:increased/decreased/no significant change

Sweating: increased /decreased/no significant change

Any preference to hot or cold environment

e.Toxic symptoms

i.Primary toxicity

1.Irritability

2.Insomnia

3.Anxiety

4.Fear

5.Tremors of hands

6.Prominence of eyes

7.Diarrhea

8.Swelling of lower limbs-pretibial myxoedema

ii.Secondary toxicity

1.Palpitation

2.Precordial pain

3.Dyspnea on exertion

4.Swelling of lower limbs

f.Hypothyroid symptoms

i.Dullness

ii.Lethargy

iii.Loss of hairs

iv.Behavior-hypoactivity

v.Response to surroundings

g.Menstrual history-

menorrhagia/oligomenorrhoea/amenorrhoea

i.Flow

ii.Days

iii.Frequency

h. Symptoms suggestive of malignancy

1.Rapid increase in size

2.Presence of other swelling(s) in neck lymph nodes

3.Recent onset of pressure symptoms/change in voice

4.Chest symptomscough/breathlessness/hemoptysis

5.Loss of weight and loss of appetite

Past history:

i. h/o any drug intake

ii. h/o irradiation to neck in childhood

iii. h/o diabetes/hypertension/tuberculosis/asthma/allergy

Family history :

1.h/o similar complaints in family members

2.h/o similar complaints in locality

Personal history:

Diet

Appetite:

Sleep

Bowel and bladder habits

Habits:

GENERAL PHYSICAL EXAMINATION

Appearance:

Pallor:

Icterus:

Cyanosis:

Clubbing:

Lymphadenopathy:

Look: Anxious/dull/normal

Built: thin/moderate/obese

Skin:

Hands: warm/moist/cold

Nutrition:

Tremors:

Vitals:

pulse-rate:

rhythm: volume: character:

Respiratory rate:

Temperature:

BP:

LOCAL EXAMINATION

1.Inspection

Swelling(s) number

Shape

Size

Borders

Extent

surface

skin over the swelling

secondary changes: fungation/ulceration/inflammation-pulsation

engorgedveins

trachea

any other swelling(s)-lymph nodes

2. Palpation

Local rise of temperature:-Tenderness

Number

Shape

Size

Site

Extent

Borders

Surface

Consistency

Mobility-skin fixity

-on contraction of muscle

-anatomical plane

Position of trachea

Carotids: normal/Displaced/Absent-Bruit

Dilated veins:-Regional lymph nodes

3.Percussion:

over sternum: Dull/Resonant

4. Auscultation:

Tracheal position-Bruit

5.Measurement of neck at the most prominent part:

SYSTEMIC EXAMINATION

Signs of toxicity

Primary

Secondary

1.Cardiovascular system

2.Respiratory system

3.Central nervous system

4. Per abdominal examination

CLINICAL DIAGNOSIS:

INVESTIGATIONS:

ROUTINE:

HB%:

Differential Count:

Bleeding Time:

Urine Routine:

AlbuminSugar & microscopy

Random Blood Sugar:

Serum Creatinine:

Total Count:

ESR:

Clotting Time:

ECG:

Blood Urea:

Chest x ray:

HIV1&2:

HBsAg:

SPECIFIC INVESTIGATIONS:

FNAC of nodule:

Thyroid Profile:

Indirect Laryngoscopy:

Plain X-ray Neck:

USG Neck:

TREATMENT:

Preoperative:

Surgical:

Operative findings

Post-operative

HISTOPATHOLOGICAL EXAMINATION:

Macroscopic:

Microscopic:

FOLLOWUP:

ANNEXURE- 2

CONSENT FORM

I/We _____age_____Hosp. No. _____Ward _____, in my/our full senses hereby give my/our complete consent for _____ or any other procedure deemed fit which is a diagnostic / therapeutic procedure / biopsy / transfusion / operation to be performed on me / my son / daughter under any anaesthesia deemed fit. The nature and risks involved in the procedure have been explained to me in my own language to my satisfaction. For academic and scientific purpose, the operation/ procedure may be recorded or photographed, or used for statistical measurements.

Signature/ thumb impression

Of the patient/guardian

Date:

Place:

Guardian:

Relationship:

Full address:

MASTER CHART

SERIAL NO	NAME	AGE	SEX	DURATION	SITE	SIZE	CONSISTENCY	PRESSURE SYMPTOMS	TOXIC	LYMPH NODES	USG	FNAC	SURGERY	HPE
1	Rani	40	F	6m	R	4*3	Firm	-	-	-	SNT	CG	HT	AG
2	Sunitha	24	F	1m	R	5*3	Firm	-	-	-	SNT	CG	STT	AG
3	Vasantha	42	F	6yrs	R	4*2	Firm	-	-	-	SNT	FN	HT	FA
4	Lalitha	46	F	1m	L	1.5*1	Firm	-	-	-	SNT	CG	HT	AG
5	Priya	30	F	2yrs	L	4.5*3	Cystic	-	-	-	SNT	Suspicious of malig	TT	PC
6	Dhanalakshmi	47	F	8m	L	3*2	Firm	Pain	-	-	SNT	CG	HT	AG
7	Krishnaveni	52	F	4m	R	3*1	Firm	-	-	-	SNT	CG	HT	AG
8	Durgalakshmi	31	F	7m	R	5*4	Firm	-	-	-	SNT	CG	STT	MNG
9	Vani	41	F	2yrs	L	2*2	Hard	-	Hypo	-	SNT	PC	TT	PC
10	Shruthi	24	F	1yr	L	4*3	Firm	-	-	-	SNT	FN	HT	FA
11	Vidhya	34	F	4m	R	3*3	Firm	-	-	-	SNT	CG	HT	AG
12	Periyasamy	44	M	2m	R	2*1	Firm	-	-	-	SNT	NCG	HT	AG
13	Vimala	37	F	1yr	R	5*3	Firm	-	-	-	SNT	CG	STT	MNG
14	Vinodhini	25	F	3yrs	L	6*5	Cystic	Pain	-	-	SNT	FN	STT	FA
15	Krishnavevi	43	F	1.5yrs	L	4*2	Firm	-	-	-	SNT	CG	HT	AG
16	Neelaveni	23	F	20 days	R	4*3	Firm	-	-	-	SNT	NCG	HT	MNG
17	Perazhagi	39	F	5m	R	1.5*1	Firm	-	-	-	SNT	CG	HT	AG
18	Vijaya	22	F	2m	L	3*1	Firm	-	-	-	SNT	CG	HT	AG

19	Vishali	17	F	11m	L	2*1	Firm	Discomfort	-	-	SNT	CG	HT	Hashimoto thyroiditis
20	Vijayalakshmi	47	F	2yrs	R	3*2	Firm	-	-	-	SNT	NCG	HT	AG
21	Veni	31	F	6m	R	4*2	Firm	-	-	-	SNT	CG	HT	AG
22	Chandra	52	F	3yrs	L	5*2	Hard	-	-	-	SNT	FN	STT	FA
23	Vidhya	45	F	12m	L	3.5*2	Firm	-	-	-	SNT	CG	HT	AG
24	Vijaya	57	F	6m	L	3.5*2	Firm	-	-	-	SNT	CG	HT	AG
25	Aruna	32	F	2yrs	L	4*3	Firm	-	-	-	SNT	CG	HT	MNG
26	Jothi	44	F	2m	R	4*2	Firm	-	-	-	SNT	NCG	HT	AG
27	Rani	24	F	3.5yrs	R	6*3	Cystic	-	Hyper	-	SNT	FN	STT	FA
28	Salammal	66	F	5m	R	3*3	Firm	Dysphagia	-	-	SNT	CG	TT	AG
29	Rakkamal	58	F	3m	R	3*2	Firm	-	-	-	SNT	CG	HT	AG
30	Munian	41	M	1.5yrs	L	5*4	Firm	-	-	-	SNT	NCG	STT	MNG
31	Jothilakshmi	51	F	3yrs	L	4*3	Firm	-	-	-	SNT	CG	HT	AG
32	Anitha	39	F	4m	L	3*2	Firm	-	-	-	SNT	CG	HT	AG
33	Aishwarya	24	F	1yr	R	3*3	Firm	-	-	-	SNT	CG	HT	AG
34	Priyanka	37	F	4yrs	L	4*1	Hard	-	-	-	SNT	PC	TT	PC
35	Maragatham	38	F	1yr	R	3.5*2	Firm	-	-	-	SNT	CG	HT	AG
36	Sasi	42	F	5m	L	4*2	Firm	-	-	-	SNT	CG	HT	AG
37	Anushya	33	F	1.5yr	R	3.5*2	Firm	Discomfort	-	-	SNT	NCG	HT	AG
38	Shobana	25	F	4yrs	L	5*3	Firm	-	-	-	SNT	CG	STT	AG
39	Evangeline	36	F	2yrs	R	3.5*2	Firm	-	-	-	SNT	CG	HT	AG
40	Shivani	22	F	3m	R	4*2	Firm	-	-	-	SNT	CG	HT	MNG
41	Shanmathi	49	F	7yrs	R	6*4	Firm	Pain	-	-	SNT	FN	TT	FC

42	Fathima	35	F	3.5yrs	L	3*2	Firm	-	-	-	SNT	NCG	HT	AG
43	Gayathri	37	F	3.5yrs	L	5*4	Hard	-	-	-	SNT	PC	TT	PC
44	Nithya	26	F	4m	R	3*1	Firm	-	-	-	SNT	CG	HT	MNG
45	Vijayan	30	M	2yrs	L	4*3	Firm	-	-	-	SNT	FN	STT	FA
46	Maragatham	55	F	1.5yrs	R	2*2	Firm	-	-	-	SNT	NCG	HT	AG
47	Kanmani	28	F	5m	L	3*2	Cystic	-	-	-	SNT	CG	HT	AG
48	Kalaiselvi	56	F	3yrs	R	5*3	Firm	Discomfort	-	-	SNT	NCG	TT	PC
49	Aruna	54	F	8yrs	R	11*4	Firm	-	-	-	SNT	FN	STT	FA
50	Vani	48	F	1yr	L	1*1.5	Firm	-	-	-	SNT	CG	HT	AG

KEY TO MASTER

AG	Adenomatous goitre
B	Benign
CA	Carcinoma
CG	Colloid goitre
F	Female
FA	Follicular adenoma
FC	Follicular carcinoma
FN	Follicular neoplasm
HT	Hemithyroidectomy
L	Left
MNG	Multinodular goitre
M	Male
NCG	Nodular colloid goitre
NTT	Near total thyroidectomy
PC	Papillary carcinoma
R	Right
SC	Simple cyst of thyroid
SNT	Solitary nodule thyroid
STT	SubTotal thyroidectomy
TT	Total thyroidectomy