A Dissertation on
"CLINICAL PROFILE OF SOLITARY NODULE GOITRE"

Submitted to

The Tamil Nadu Dr. M.G.R. Medical University

In fulfillment of regulations for the award of degree of

M.S., DEGREE EXAMINATION
BRANCH –I M.S., (GENERAL SURGERY)

REG NO:221711204

THANJAVUR MEDICAL COLLEGE, THANJAVUR-4.

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI – 10

MAY – 2020

CERTIFICATE

This is to certify that the dissertation titled "CLINICAL PROFILE OF SOLITARY NODULE GOITRE" is the bonafide work done by **Dr.N.Jagadeesan Reg.No.221711204** Post Graduate student (2017-2020) in the Department of General Surgery, Thanjavur Medical College and Hospital, Thanjavur under my direct guidance and supervision, in partial fulfillment of the regulations of TheTamilnadu Dr.M.G.R. Medical University, Chennai for M.S. degree (General Surgery) branch - 1, examination to be held in May 2020.

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This is to certify that the dissertation entitled, **"CLINICAL PROFILE OF SOLITARY NODULE GOITRE"** submitted by the candidate **DR.N.JAGADEESAN** partial fulfillment for the award of the degree of MASTER OF SURGERY by The Tamilnadu Dr.M.G.R. Medical University, Chennai is a record of original work done by him under my guidance and supervision in the Department of General Surgery, Thanjavur Medical College, Thanjavur during the academic year 2017-2020.

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This is to certify that The Research Proposal / Project titled

CLINICAL PROFILE OF SOLITARY NODULE OF THYROID

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was approved by the Ethical Committee.

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DECLARATION

I, **Dr. N. JAGADEESAN**, solemnly declare that this dissertation titled **"CLINICAL PROFILE OF SOLITARY NODULE GOITRE"** is a bonafide work done by me in the Department of General Surgery, Thanjavur Medical College under the guidance and supervision of my unit chief. **Prof. Dr. S. JEGATHESAN, M.S., D.ORTHO.,** Professor of General Surgery, Department of General Surgery, Thanjavur Medical College and Hospital. This dissertation is submitted to The Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the university regulations for the award of M.S., Degree (General Surgery) Branch - I, Examination to be held in May 2020.

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ACKNOWLEDGEMENT

It gives me immense pleasure to thank everyone who has helped me during the course of my study and in preparing this dissertation.

My sincere thanks to **Prof. Dr. KumudhaLingaraj, M.D.(Anaes), D.A.,** the Dean, Thanjavur Medical College for permitting me to conduct the study and use the resources of the college.

I am very thankful to the Chairman of Ethical Committee and members of Ethical Committee, Thanjavur Medical College and Hospital for their guidance and help in getting the ethical clearance for this work.

I consider it a privilege to have done this study under the supervision of my beloved Professor of Surgery **Prof. Dr. K. Sathyabama. M.S.,** who has been a constant source of inspiration and encouragement to accomplish this work.

I express my deepest sense of thankfulness to my Assistant Professors **Dr. S. Prammaraj M.S., Dr. G. Sathishkumar M.S.,** for their valuable inputs and constant encouragement without which this dissertation could not have been completed.

I express my sincere gratitude to mentor, **Dr.M.Elanogovan M.S.,** former unit chief of my unit, Department of General Surgery.

I am particularly thankful to my fellow postgraduate colleagues Dr.C.Chandrasekaran and other fellow postgraduates for their valuable support in the time of need throughout the study.

I thank my Seniors Dr.Saravannan, Dr.HridhyaVasudevan, Dr.P.A.Kabilan and Dr.Charuchandran and my junior PG's who supported me in completing the dissertation.

It is my earnest duty to thank my dear parents and brother without whom accomplishing this task would have been impossible. I am extremely thankful to my patients who consented and participated to make this study possible.

CONTENTS

INTRODUCTION

Thyroid diseases are global, affecting 3-5% of the populace.These diseases include swelling of the gland which is diffuse and nodular solitary nodule can be benign, malignant and inflammatory diseases.

Goiter means an enlargement of the thyroid gland at least twice its normal size. The normal thyroid gland weighs between 25 and 30 grams. It is normally non palpable. True solitary nodule is a single or discrete nodule confined to one lobe of the thyroid and the opposite lobe may not be visible or palpable occurring at about 70%. Solitary nodule thyroid (SNT) presents more commonly in women, occurring in 1-3% of the adult population. Malignancy occurs at a rate of 12-15% and increased chance for malignancy is seen in a cold and solid nodule. Men show higher rate of malignant SNT, more than 25%. Malignancy rates as high as 60% has been described in patients either younger than 25 or older than 60. Multi nodular goiter presents only a single lobe on examination and is differentiated by surgical or histological examination.

A dominant nodule in multi nodular gland is considered benign unless some findings are suggestive of malignancy, like laryngeal nerve palsy or enlarged lymph nodes, whereas a STN is considered malignant until proved benign, especially in young patients.

AIM & OBJECTIVES:

1. To know mode of presentation of Solitary Nodule Thyroid.
2. To know incidence of malignancy
3. To know the role of FNAC in Solitary Nodule Thyroid.

METHODS AND MATERIALS

This is a prospective study of patients who had suffered from clinically palpable, solitary nodule thyroid diagnosed and treated at Thanjavur Medical College/Hospital. Total duration of study from December 2017 to October 2019. A total of 74patients were selected.

Patient details like relevant personal information, symptoms as experienced by the patients and signs were entered in a proforma(affixed in annexure) with routinely performed general examination followed by systemic examination and appropriate examination in relationto the thyroid swelling and lymph node involvement.

Fundamental investigations likecomplete hemogram, blood sugar, urea, urine analysis, chest radiogramand neck radiogram were done. Differential diagnosis

of the state of thyroid disorder was obtained by fine needleaspiration cytology in all these patients.

Thyroid profile was considered for the study and performed on all patients withsolitary nodule thyroid. Radioiodine study was not done since the facility was notavailable at our hospital. All operated specimens were subjected to histopathological examination

Mostcases were regularly followed up throughout the study period. All the

observations were analysed and compared with other studies.

INCLUSION CRITERIA:

- All patients listed for surgical procedures to manage solitary thyroid nodule
- Both toxic and non-toxic solitary thyroid nodule

EXCLUSION CRITERIA:

- Recurring thyroid nodules
- Patients of age 12 years or less
- Diffuse hyperplastic goiter

REVIEW OF LITERATURE

HISTORICAL BACKGROUND

Goitre (from the Latin word ***guttur*** meaning throat) has been recognized since 2700 B.C. as an enlargement of the thyroid. In 1619, Hieronymus Fabricius ab Aquapendente noted that goiters occurs in thyroid gland.

Celsus and Galen described various masses in the neck such as cysts, tuberculous lymph nodes (scrofula) and goiter. Celsus stated that the operation for removal of such masses was hazardous. Goitre was considered fatal and inoperable in settlements where it was confined to and causality in goitre was commonly due to respiratory obstruction. Surgical procedures were performed on goitre for disfigurement and relieving dyspnea or dysphagia. Albucasin, the 11th century surgeon of Corodoba (Spain) also explained dismantling the gland.

The first recorded partial thyroidectomy was performed in the year 1791 by Pierre Joseph Desault. He removed a mass from thyroid through a vertical incision, ligating superior and inferior thyroid arteries and then dissecting the gland from trachea.

Figure 1: Theodor Kocher (1841-1917)

Theodor Kocher (1841-1917) of Berne and Theodore Billroth of Vienna were among the leading specialists of thyroid surgery in the late nineteenth century. The Both European Surgeons performed thousands of thyroidectomies with good prognosis.

Theodore Kocher was the Professor of Surgery in Switzerland. He practiced diligent surgery which spared the yet to be discovered parathyroid glands and he anatomically delineated the recurrent laryngeal nerve.

His procedure lowered mortality rates of thyroidectomies from almost 59% to about 0.2%. The most significant discovery by Kocher was that total thyroidectomies led to myxoedema and reformed partial, subtotal thyroidectomy to avoid the complication.

In 1909, for his contributions in thyroid surgeries and concepts in anatomy of thyroid, Kocher was awarded the Nobel Prize. Theodore Kocher is regarded as father of thyroid surgery.

Kocher states that "There are three types of operations for thyroid disease: 1. Total extirpation, 2. Partial thyroidectomy or resection, 3.Enucleation. He discovered pressure of the goitre as the cause of softening of the cartilages, distortion of the trachea and the consequent respiratory embarrassment.

The indications of operation were reformed heavily considering the prevention of complications, specifically in cases like thyrotoxicosis and thyroid cancer. After the advent of non-surgical methods to manage most cases of hyperthyroidism and colloid goitre, owing to accessibility of radioactive iodine and anti-thyroid drugs. Thyroid nodules received major surgical attention whether it was benign or malignant.

EMBRYOLOGY

The primordium for thyroid gland is derived from an endodermal invagination of tongue at the point of foramen caecum, characteristically seen in fourth week of gestation.

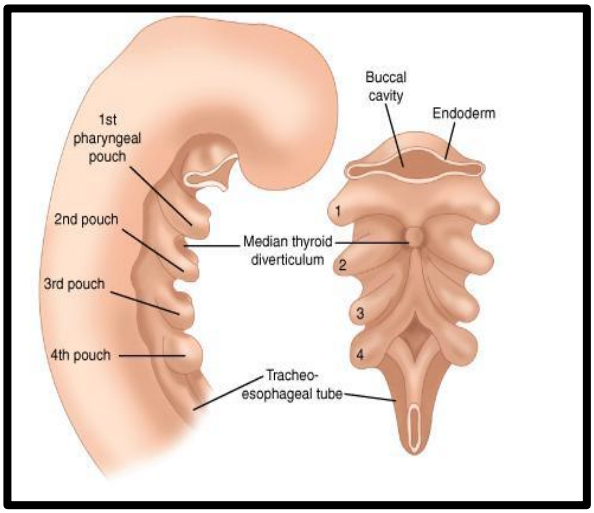


Figure. 2: Embryology of Thyroid

Thyroid gland mainly develops from the thyroglossal duct. Parafollicular cells originate from the caudal two pharyngeal pouches and are separate by a median swelling called the tuberculum impar. Immediately deep to the tuberculum, the epithelium lining floor of the pharynx shows a condensation in the midline. This region forms a diverticulum below the surface called the thyroglossal duct. During 6^{th} week of embryonic life, the diverticular thyroid structure becomes bilobar and descends to its ultimate position with a lobe on either side of trachea in the neck, later these lobes are connected by isthmus. At the same time, normally the thyroglossal duct disappears.

The distal part of the thyroglossal duct degenerates but may remain, as a pyramidal lobe. There is also a contribution to the thyroid from the fifth pharyngeal pouch (ultimobranchial body). These cells are believed to be neural crest in origin. They migrate into the thyroid and differentiate into the calcitonin-producing C cells.

By 8th week of embryonic development, small cavities appear in the thyroid tissue. They expand and proliferate, as colloid appears in follicles. Formation of follicles is accomplished by fifth month of fetal life, there after the new follicles are formed by division of existing follicles.

Thyroid is the earliest glandular structure to appear. It becomes functional during the third month of development of fetal life.

SURGICALANATOMY

A normally developed adult thyroid is a bilobed gland that lies in front of the thyroid cartilage anterolateral to the junction of the larynx and trachea where it encircles about three-fourths of the circumference of the laryngo-tracheal junction.

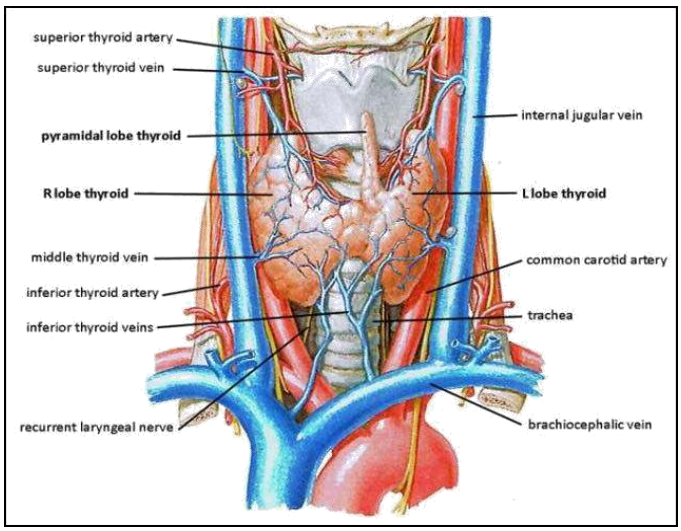


Figure 3: Adult thyroid gland

Thyroid gland weighs 20-25gm.Females show larger thyroids than in males which enlarges during pregnancy and cyclically during menstruation.Thyroid gland has two lobes, of which each are shaped like slender pears, holding onto antero lateral aspect of trachea from level of thyroid cartilage to 5th or 6th tracheal rings.

Right lobe is usually larger compared to left and the two lobes join together across midline by an isthmus which is quite firmly attached to anterior surface of trachea, at level of 2nd and the 3rd tracheal ring. A small sized pyramidal lobe usually arises from isthmus along the upper border close to midline. Thyroid gland is

enclosed by the fascia strap muscles and laterally it is located under anterior borders of sternocleidomastoid muscles.

Thyroid is surrounded by a fine layer of connective tissue. This layer of fascia is derived from the investing part of pre-tracheal fascia. This fascia fuses posteriorly with the capsule of thyroid and laterally to suspensory ligament of Berry. The ligament of Berry is closely approximated to the cricoid cartilage and has surgical significance due to its relationship to the recurrent laryngeal nerve. Infrahyoid and sternomastoid along with their epimysium surrounds the superficial aspect of the gland.

The medial aspect of the gland is closely related to trachea, oesophagus, recurrent and external laryngeal nerves, inferior constrictor and cricothyroid muscles Posterior aspect to common carotid artery and distal part of inferior thyroid artery.

The gland moves upward on deglutition because of its fascial attachments and hence slides under the fingers on examination. The normal gland can be felt in thin necks. It is soft, supple and the tracheal rings can be palpated through it.

The important anatomical features with surgical relevance are:

The Musculo-fascial Coverings of the Thyroid Gland:

The strap muscles are covered by the investing layer of cervical fascia and this unites them in the midline. These muscles are imposed on the anterior surface of

the gland but separated from it by an investing loose connective tissue from the pre-tracheal fascia. This false capsule covers the gland which is in turn enclosed by its ultra-fine true capsule with very rich blood supply, clearly visible just beneath its surface. The nerve supply of these muscles, the sternohyoid and sternothyroid comes from cervical roots 1, 2 and 3 via branches from the Ansa cervicalis. These branches enter the muscles at its lateral border, on the deep surface and though it is not often necessary. These muscles may be divided transversely to facilitate access to the gland provided they are re-sutured, with no impairment of function.

Blood Supply

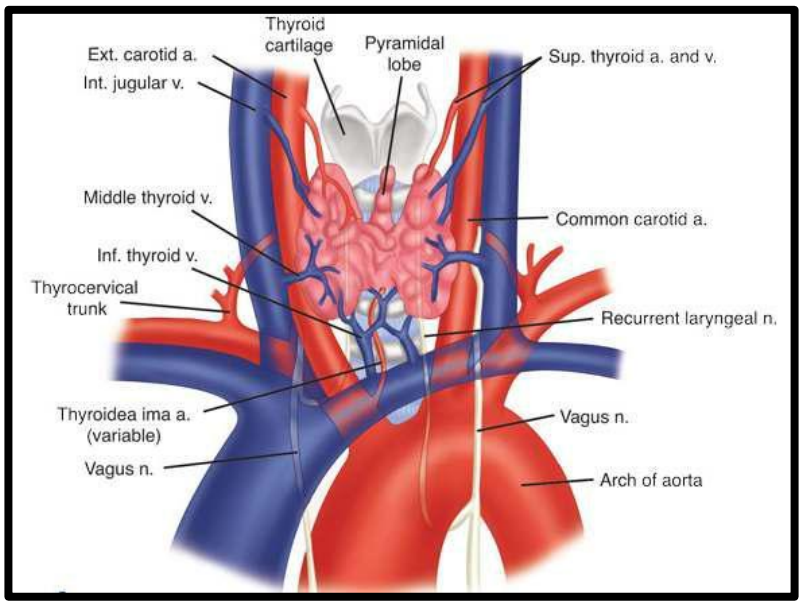


Figure 4. Blood supply of thyroid

The arterial supply to the thyroid gland consists of four main arteries, two superior thyroid arteries and two inferior arteries.

1. Superior thyroid artery: The external carotid artery gives rise to the superior thyroid artery as its first branch which arises immediately above the bifurcation of common carotid artery. The superior thyroid artery passes medially onto the surface of inferior constrictor muscles and enters the apex of the superior pole. As the superior thyroid artery proceeds medially, it is adjacent to the external laryngeal nerve, and thus care must be taken not to damage it when ligating the artery.

2. Inferior thyroid artery: It is a branch of thyrocervical trunk which arises from the first part of the subclavian artery. In the neck, it passes deep to the carotid artery. It divides into 4 or 5 branches that pierce the pre-tracheal fascia separately to reach the lower pole of the gland. It gives rise to oesophageal and tracheal branches before its final distribution into the gland. 35% of patients show congenitally absence of inferior thyroid artery. It makes significant contribution to blood supply of thyroid by supplying the lower 2/3rd of the lobe and the lower ½ of isthmus along with parathyroid glands.The inferior thyroid artery has important anatomic relationships with RLN. The recurrent laryngeal nerve is usually directly adjacent (in either an anterior or posterior position) to inferior thyroid artery. So artery has to be carefully dissected till the nerve is identified. Inferior thyroid artery also supplies both parathyroid glands, so parathyroid gland should be evaluated after the artery is ligated.

3. Throideaima artery

The arteria thyroideaima artery from the brachiocephalic trunk extending in front of the trachea is small and surgically irrelevant.

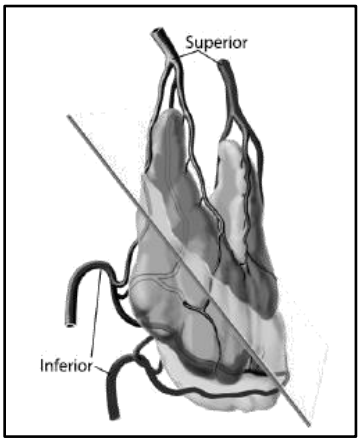


Figure 5: Arterial supply of thyroid and parathyroid glands divided into Superior and inferior system.

<u>Veins draining the thyroid:</u>

The thyroid gland is drained by following veins.

1. Superior thyroid vein: It exits at the upper part of the gland, crosses the common carotid artery and drains into the internal jugular vein or common facial vein.

2. Middle thyroid vein: It drains the middle parts of the lateral lobes of the gland, passes along the medial border of the omo-hyoid muscle across the

carotid vessels to finally drain in to internal jugular vein. It is brief in its course directly enters the jugular vein and only seen in 30% of individuals.

3. Inferior thyroid vein: It drains into the innominate vein after leaving the isthmus at its inferior border and courses down in front of the trachea to end in ipsilateral innominate vein.

4. Fourth thyroid vein: KOCHER gave much emphasis on the consistent occurrence of this vein which passes outward between middle and inferior thyroid veins.

The Important Surgical Relations of the Thyroid Gland:

Important surgical relations are recurrent laryngeal nerves, external laryngeal nerves and parathyroid glands. All important relationship injuries should be recognized and repaired immediately .

1.The External Laryngeal Nerve: The external laryngeal nerve, a branch of the superior laryngeal nerve, descends on the fascia of the inferior pharyngeal constrictor, relates closely to the superior vascular pedicle of the thyroid and then leaves this at a variable height above the gland to travel medially to its destination in the cricothyroid muscle. It is functionally important for the pitch of the voice, because the cricothyroid muscle is a tensor of the vocal cord. Damage to this nerve alters the voice quite significantly and is especially noticeable in singer.

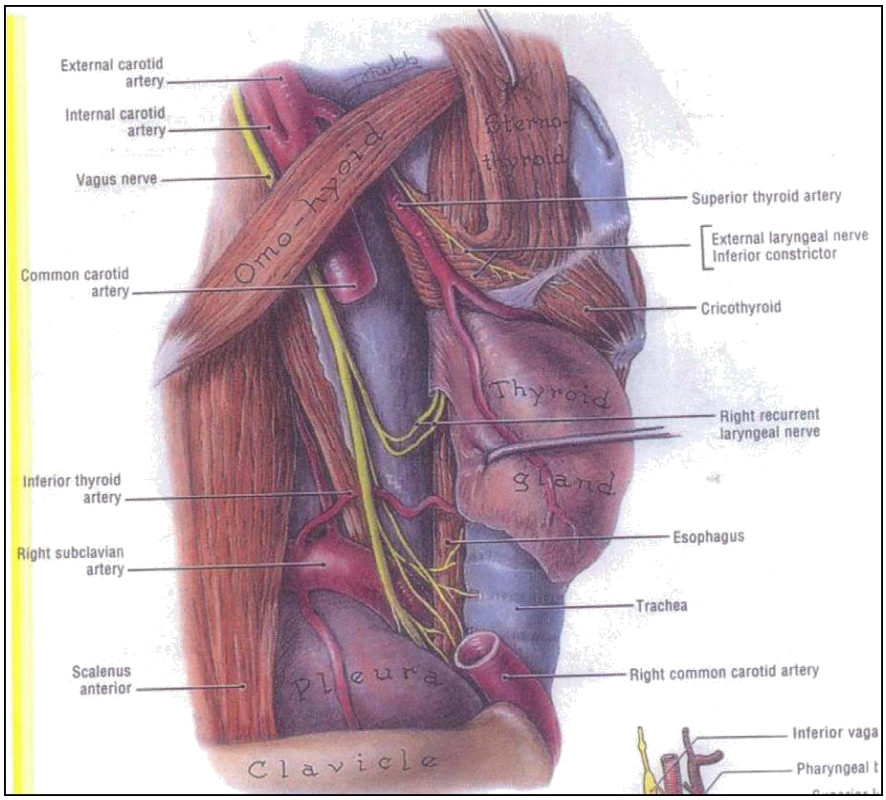


Fig. 6: Course of recurrent laryngeal nerve

2.*The Recurrent laryngeal nerves* climb on either side of the trachea, and passes close laterally to the ligament of Berry as they enter the larynx. There are a number of important variations. Recurrent laryngeal nerve contained inside the ligament as it enters the larynx. Is seen in 25% of patients. On the **right side**, the Vagus gives off the Recurrent Laryngeal nerve as it crosses the subclavian artery; it then takes course posteriorly and ascends lateral to the trachea along the tracheoesophageal groove. At the level of lower border of thyroid, the right recurrent laryngeal nerve usually lies in the tracheoesophageal groove or at most, 1 cm away from it. As it ascends to the midportion of

the thyroid, however, the nerve assumes its position within the tracheoesophageal groove. At this location the nerve might divide into two or more branches as it pierces either the first or second tracheal ring, the most significant branch disappearing deep to the inferior border of the cricothyroid muscle. At this level, the nerve can usually be seen immediately anterior or posterior to the main arterial trunk of the inferior thyroid artery. Unusually, a nonrecurrent right laryngeal nerve is seen in 0.5% to 1.5%of patients originating directly from the Vagus and passing medially to the larynx. Even more infrequently, patients may have both a recurrent and a nonrecurrent laryngeal nerve on the right. These two nerves usually join in a position beneath the lower border of the thyroid.

On the **left side**, the recurrent laryngeal nerve branches off from the vagus as it courses over the arch of the aorta. The left recurrent laryngeal nerve then passes inferior and medial to the aorta and ascends toward the larynx, where it finds its way into the tracheoesophageal groove as it climbs to the level of lower lobe of the thyroid. Both recurrent laryngeal nerves are consistently found within thetracheoesophageal groove when they are within 2.5 cm of their passage into the larynx. These nerves pass either inferior or posterior to branch of inferior thyroid artery and eventually enter the larynx at the

level of the cricothyroid articulation on the inferior border of the cricothyroid muscle. Here the nerve is immediately adjacent to the superior parathyroid, the inferior thyroid artery, and the most posterior aspect of the thyroid. Great care is needed during surgical dissection in this area because the nerve is essentially tethered as it dives beneath the cricothyroid muscle and can be stretched by overly vigorous dissection.

The nerve usually bifurcates extra laryngeally but often at a point less than 0.5 cm from the cricoid cartilage. Up to 58% of recurrent laryngeal nerves will bifurcate proximal to inferior border of the cricoid cartilage. Extra laryngeal trifurcations exist in approximately 1% of RLNs.

3.The parathyroid Glands: The number of Parathyroids vary from 2 to 6 but in 80 percent of cases there are 4 (2 on each side). The size of gland is equivalent to split pea. They are pink or brown in color. The superior glands lie on the posterior surface of the middle third of the thyroid, usually above the inferior thyroid artery, but posterior to this plane. The inferior glands are mostly found on the posterior surface of the lower pole of the thyroid or within 1 cm below the lower pole. They lie in a more anterior plane than the upper glands. A parathyroid gland is located within the surgical false capsule of the thyroid. Sometimes the parathyroids may be embedded in the thyroid gland. A small parathyroid artery supplies each gland. The lower parathyroid artery

comes from the inferior thyroid artery. The upper parathyroid artery arises from the inferior thyroid artery or from an anastomosing artery joining the superior and inferior thyroid arteries. They will be at risk during operations on the thyroid gland.

Lymphatics of Thyroid

The gland is drained by two sets of lymphatics

1) Ascending and 2) Descending vessels. Each consisting of medial and lateral channels.

1.Ascending Vessels:

Medial: Leaves the upper border of the gland and drain into nodes situated on the cricothyroid membrane and the pre-laryngeal nodes.

Lateral: Leaves the upper pole of the gland and run along the superior thyroid artery draining into the deep cervical nodes situated at the bifurcation of common carotid artery.

2.Descending Vessels:

Medial: Pass to the gland on the trachea and pre-tracheal lymph nodes.

Lateral: Pass from the deep surface of the gland to small nodes placed on recurrent nerve.

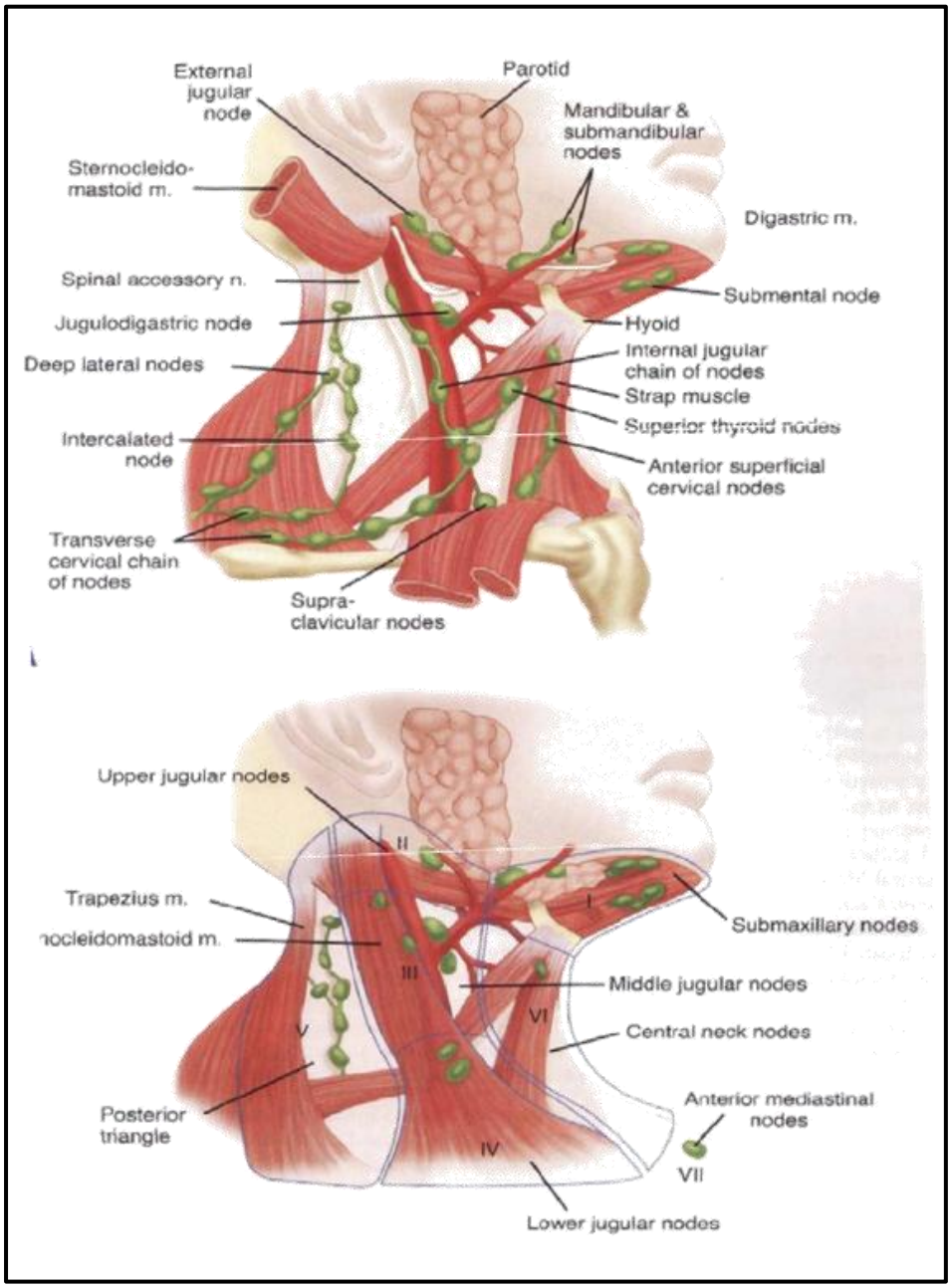


Figure 7. Lymphatic Drainage of Thyroid

The lymph vessels run in the interlobular connective tissue and connect with the network within the capsule of the gland. The ascending lymphatic channels drain the upper border of isthmus and surface of the lobes.

The descending channels drain the major part of isthmus and lower part of lateral lobes. The median lymph node near the isthmus is often involved in thyroid cancer, which is called ***Delphian*** node.

HISTOLOGY OF THYROID

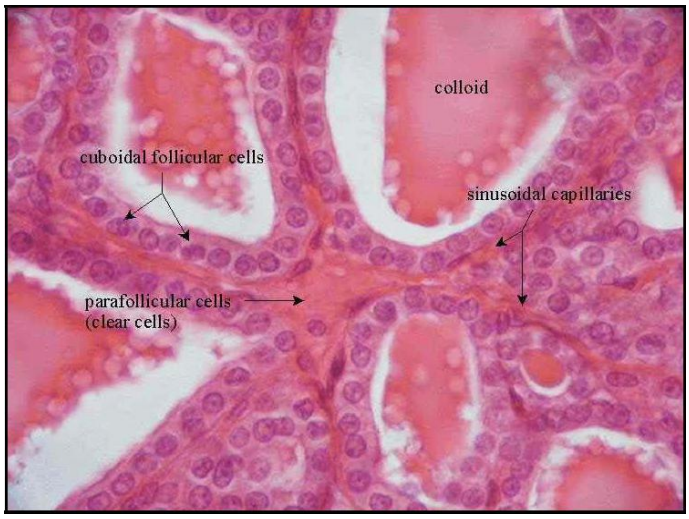


Figure 8. Histology of thyroid

The gland is surrounded by a thin connective tissue capsule, which sends in septa dividing the gland into groups of follicles or lobules. There is very little connective tis sue between the individual follicles. This connective tissue gives support to the abundant fenestrated capillaries that are present in the gland .The glandular substance is composed of spherical (acini) follicles with a large lumen. The follicles vary in size and are filled with proteinaceous colloid, which stain acidophilic. The epithelial cells lining the follicles are cuboidal or columna according to the activity of the follicle.

The acini are arranged in subunits of 20 to 40 and connected to form lobules, each supplied by an individual artery. The size of the follicles, being around 200 m in diameter.

The parafollicular cells or “C” cells which stain lighter in colour but are bigger in size are present in the follicular epithelium lying in between the basement membrane and epithelial cells. Some C cells are also present in the interfollicular spaces.

PHYSIOLOGY

The thyroid gland is responsible for the sustained level of metabolism in the tissues that is optimal for their normal function. Thyroid hormones increase the uptake of nutrients by most cells in the body, help regulate lipid and carbohydrate metabolism, and are necessary for normal growth and maturation. Though not quintessential for life, its absence causes poor mental and physical states, intolerance to cold and in children cause mental retardation and dwarfism. On the contrary, excess thyroid secretion leads to emaciation, nervousness, tachycardia, trembling, and excess heat production. The thyroid gland also secretes calcitonin, a calcium- lowering hormone.

Iodine metabolism

Iodine is taken in the form of Iodides sea fish; egg and milk are good dietary source of iodide. Dietary iodide is absorbed from upper gastrointestinal tract and carried as inorganic iodide in plasma. Normally thyroid, salivary glands and kidney compete for iodide but thyroid and kidney are the principal organs that compete for iodide.

The adult man requires 0.14 mg of iodide per day and an adult female requires 0.10 mg, while growing children, pregnant and lactating women require more. The daily requirement is met by balanced diet and drinking water, exception being hilly areas where food and water may be deficient in iodine.

Formation and Secretion of Thyroid Hormones

The principal hormones secreted by the thyroid are thyroxine (T4) and triiodothyronine (T3), T3 is also formed in the peripheral tissues by deiodination of T4. Both hormones are iodine-containing amino acids. Small amounts of reverse triiodothyronine (3,3', 5'-triiodothyronine. RT3) and other compounds are found in veins draining thyroid gland. T3 is more active than T4. The naturally occurring forms of T4 and its congeners with an asymmetric carbon atom are the L isomers. D-Thyroxine has only a small fraction of the activity of the L form. T4 and T3 are synthesized.

in the colloid by means of iodination and condensation of tyrosine molecules bound in peptide linkage in thyroglobulin. This glycoprotein is made up of two sub-units and has a molecular weight of 6,60,000. Thyroglobulin is synthesized by the thyroid cells and secreted into the colloid. The hormones remain dormant and incorporated in thyroglobulin until secreted. During the process of secretion, colloid is endocytosed by the thyroid cells, the peptide bonds are hydrolyzed, and free T4 and T3 are discharged into the capillaries. Thyroglobulin enters the blood as well as the colloid. The normal serum thyroglobulin concentration in humans is about 6 ng/mL, and this level is increased in hyperthyroidism and some forms of thyroid cancer.

The synthesis of thyroid hormones is divided into four steps:

1. Iodine trapping

The thyroid traps the plasma iodine in the inorganic form. It is essentially an active process by an active iodide transporter, Na+/I-symportor and stimulated by TSH. It is competitively inhibited by Thiocynates and perchlorates.

2. Organification of thyroglobulin

The inorganic iodide is oxidized to inorganic iodine at the thyroid follicular cells with the help of an enzyme peroxidase.

Iodine combines with amino acid tyrosine in the thyroglobulin molecule within the follicular cells to form monoiodotyrosine and diiodotyrosine (MIT and DIT). This process is inhibited by Thiouracil group of antithyroid drugs and by PAS and chloroquine.

3. Coupling reaction

Thyroxine (T4) is formed by coupling of two molecules of DIT and triiodothyronine (T3) by coupling of one molecule of each MIT and DIT. The coupling reaction occurs at the Thyroglobulin molecule. They are oxidative reactions and need peroxidase enzyme.

4. Hormonal release

The follicular colloid containing thyroglobulin is taken by the way of pinocytosis by follicular cells to form colloid droplets, which then fuses with lysozyme to form "phagolysozome", in phagolysozome the thyroglobulin is hydrolyzed by protease enzyme to liberate T3 and T4 which diffuse through the base of follicular cells to enter the circulation.

Inactive iodo-tyrosines liberated are acted upon by deiodinase enzyme to release the iodine which is reutilized by the cells to synthesize T3 and T4.

Key Steps in Synthesis of Thyroid Hormone:

1.Secondary active co-transport of iodide (I-) along with Na+.

2.Administration of competing ions such as perchlorate, bromide or chlorate causes decreased iodine uptake by the gland.

3.The key regulating hormone for iodide uptake and hormone synthesis, is provided by TSH.

4.Active iodine form is attained by oxidation of iodide ion by hydrogen peroxidase called thyroid peroxidase (TPO).

5.Active transport of iodine into the colloid across the apical surface of the follicular cell.

6.Formation of mono- and di-iodotyrosines by addition of active iodine into the tyrosine residues of thyroglobulin molecules.Uptake of the thyroglobulin into the lumen of the follicle and lining of iodinated tyrosine residues.

About 1% of stored colloid is removed each day. It may increase abnormally up to 100% in case of hyperactive thyroid and colloid stores are depleted.

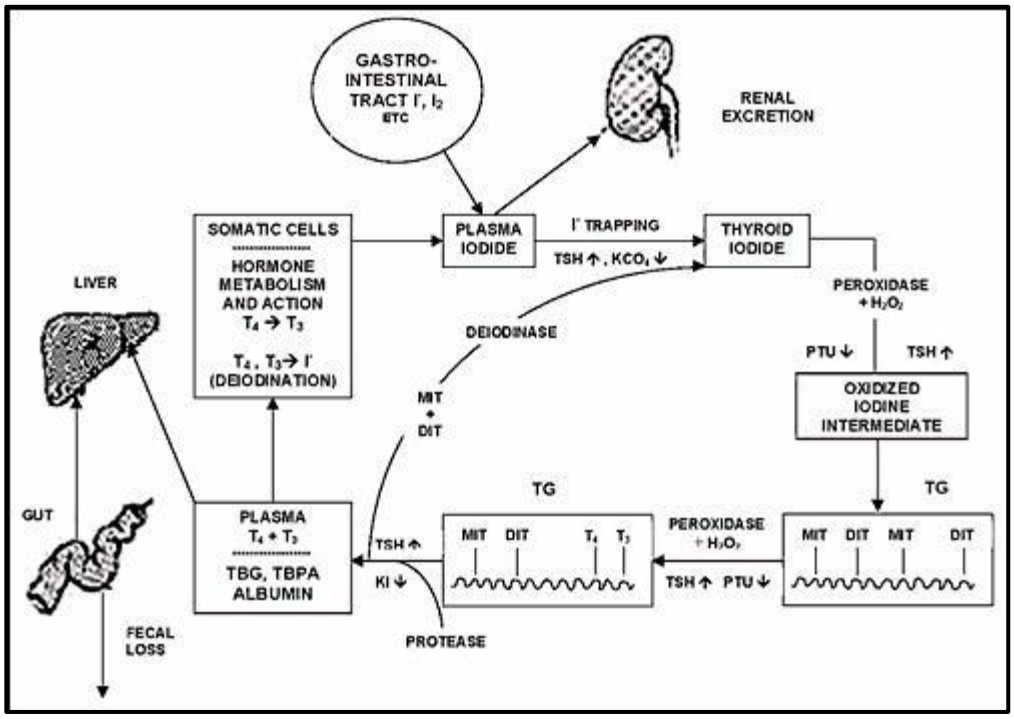


Figure 9. Schematic representation: Thyroid Hormone synthesis

Regulation of Thyroid Hormone Secretion:

Thyroid function is regulated primarily by variations in the circulating level of pituitary TSH. TSH secretion is increased by the hypophysiotropic hormone TRH and inhibited in a negative feedback fashion by circulating free T4 and T3.

Human TSH is a glycoprotein that contains 211 amino acid residues, hexoses, hexosamines and sialic acid. When TSH is administered thyroid function is stimulated. Whenever TSH stimulation is prolonged, the thyroid becomes conspicuously enlarged. Enlargement of the thyroid is called goitre. The negative feedback effect of thyroid hormones on TSH secretion occurs on a long loop in part at the hypothalamic level, but it is the very long loop acting on

pituitary which provides significant control, since T4 and T3 repress the increase in TSH secretion produced by TRH. Infusion of T4 as well as T3 reduces the circulating level of TSH, which declines measurably within one hour.

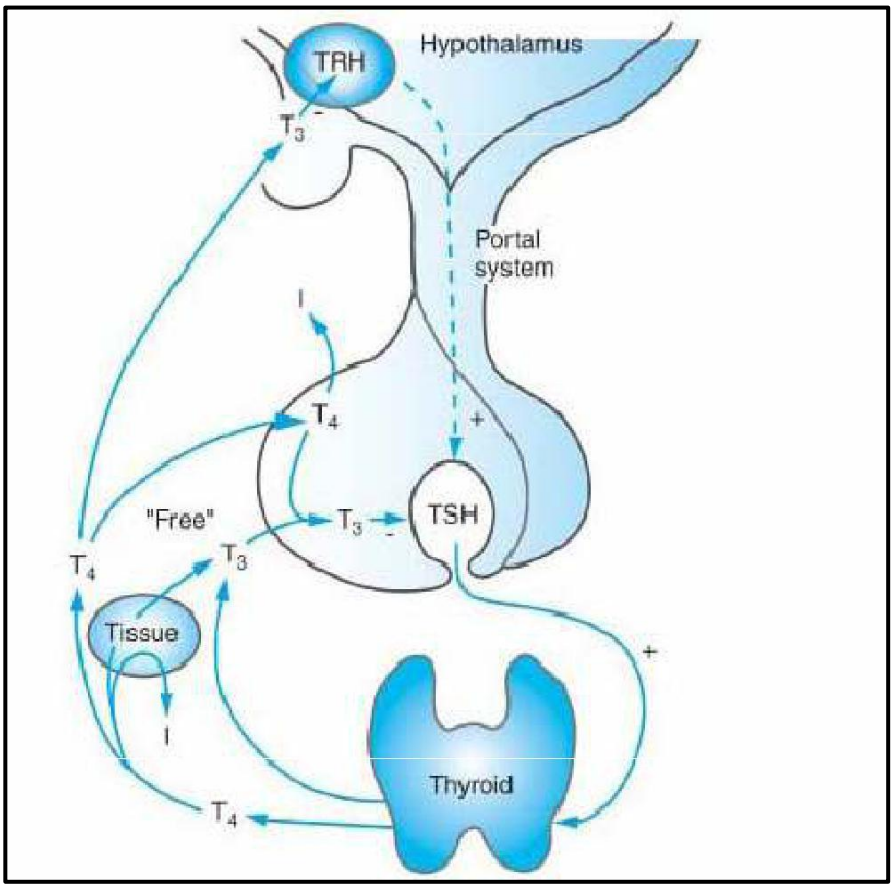


Figure 10. Hypothalamo-Pituitary Axis Feedback Mechanism.

PATHOLOGY

A single palpable nodule in otherwise impalpable thyroid gland is called solitary nodule thyroid.

Formation of Nodules

A loss of co-ordination between iodine metabolism, epithelial multiplication, thyroglobulin synthesis and colloid endocytosis are important in the genesis of nodule. Iodine deficiency and ingestion of goitrogens are the commonest cause of goitre formation. Iodine deficiency or goitrogens or hereditary factors lead to decrease in serum thyroid hormones with followed by increase in TSH which will produce diffuse hyperplastic goitre. The patient will become euthyroid because of normal thyroid hormone level, TSH level drops down and goitre disappears. If it persists after that it is a colloid goitre with inactive follicles. Because of fluctuation in TSH level, and varied response of cells to TSH, mixed active and inactive follicles are formed. In active follicles, because of high vascularity, haemorrhage occurs with central necrosis. Growth stimulating antibodies are also responsible for multinodular goitre. Patient is usually euthyroid. Firm painless nodules are palpable; hardness may be due to calcification. Pain & sudden increase in size may be due to haemorrhage and simulate malignancy.

Many thyroid disorders, both benign & malignant may manifest as solitary nodule.

SOLITARY THYROID NODULE

Causes

1. Dominant nodule in MNG (50%)
2. Adenoma (20%)
3. Carcinoma (Papillary or follicular) (20%)
4. Cysts (colloid degenerative cyst, neoplastic) (5%)
5. Thyroiditis (Hashimoto's) (5%)
6. Lymphoma (rare)
7. Medullary carcinoma (rare)
8. Other Differential diagnosis of solitary Nodules

    A. Infection
        1) Granulomatous
        2) Abscess

    B. Developmental Anomalies
        1) Unilateral Lobe Agenesis
        2) Cystic hygroma
        3) Dermoid
        4) Teratoma

CLINICAL EVALUATION

For proper management of STN, the three main prerequisites are

1. To make a correct diagnosis

2. To know when to operate

3. To know how to operate with minimal rate of complication

SNT usually presents as an asymptomatic mass that is observed by either the patient or the clinician. Upon initial contact a systematic inquiry of the patient's medical history is necessary. The goitre can cause two groups of symptomsThose connected with the swelling in the neck and pressure or obstructive effect

1. Those related to the endocrine activity of the gland

So, the clinician should have the knowledge of surgical anatomy and applied physiology of thyroid gland. The development of management strategy for the individual patient involves integration of information from a variety of possible sources including

1.History (Presentation)

2.Clinical examination (inspection -palpation -percussion - auscultation)

3.Investigation

Presentation

A. Swelling in the Neck

1. Lump at the junction of Isthmus & Lateral Lobe

2. Obstructive symptoms (Dyspnoea - Dysphagia)

3. Stridor, respiratory wheeze, engorgement of the neck veins, venous collateral vessels over the anterior chest wall occur in very large impacted retro sternal Solitary Thyroid Nodule

4. Painless, rapid development of thyroid nodule (malignancy)

5. Pain in the thyroid gland with sudden enlargement of the nodule (Hemorrhage into dominant nodule in MNG or benign tumour or cyst.

6. Pain in the thyroid gland with enlargement of entire lobe (HASHIMOTO'S disease)

7. Hoarseness of voice and cannot produce an explosive cough

   (Laryngeal nerve damage causing Unilateral vocal cord paralysis)

8. Horner's syndrome (Carcinoma involving the sympathetic Nerve)

Previous History:

During enquiry we can find out prior low and high dose radiation exposure to head and neck can cause consequent development of thyroid cancer. Between 1940 and 1960 large numbers of American children were exposed to low dose radiation therapeutically for variety of benign conditions such as tonsillar, adenoid hypertrophy and thymic enlargement and also high dose radiation to the cervical region in neurosurgical practice. Review and screening of these patients after 20-30 years has revealed an unexpected high incidence of thyroid malignancy like papillary and mixed papillary carcinoma. Especially the findings of STN in an individual with the previous history of radiation exposure should be regarded with high suspicion for malignancy.

Family History:

Papillary carcinoma of the thyroid has been reported within families but the rarer variety- medullary carcinoma is familial in approximately 20% of cases usually as an invariable component of MEN Type II syndrome associated with parathyroid adenoma and Pheochromocytomas.

EXAMINATION

Age and Sex:

Although over 80% of the STN arise in women, the malignant potential of a nodule in a man is approximately three times more common. Malignancy is more likely in the nodule in children or teenagers or over the age of 60 years. In the great majority of patients, the tumour is papillary or mixed papillary follicular type. Approximately two third of such individuals demonstrated palpable metastatic cervical lymphadenopathy and about 15% have pulmonary metastases.

Anxiety-related sinus tachycardia and atrial fibrillation may suggest a diagnosis of hyperthyroidism. If the patient is hyperthyroid and has a STN most probably diagnosis is solitary toxic nodule and it is a functioning autonomous thyroid nodule and causes toxicity in the older patient. The lesions are usually adenoma and on occasion adenomatous hyperplasia. The nodule is rare in children and such nodule in a child must raise a higher concern of its being malignant.

Pressure Effects:

1. Dyspnoea in due to compression and deviation of trachea in both benign and malignant condition of STN or due to extension of the growth into the trachea

2. Dysphagia occur late in the course of disease

3. Dysphonia - due to involvement of Recurrent Laryngeal nerve or Vocal cord.

4. Pressure on the sympathetic chain produces Homer's syndrome. Pressure on the internal jugular vein or innominate vein and obstruction of the venous return of the head and neck sometimes produce edema of the face.

5. No examination of the thyroid gland is complete without palpation of neck for lymphadenopathy.

Clinical Features:

1. A Solitary nodule limited to one lobe and not visible or palpable thyroid lobe on opposite side.

2. Nodule moves on swallowing unless it's a large impacted retrosternal or malignant invasion or severe thyroiditis

3. Tracheal deviation to one side occurs in large swelling.

4. Solitary nodule, hard in consistency, irregular with or without enlargement of ipsilateral cervical lymph nodes (Malignancy)

5. Nodular shape-size more than 4 cm and fixation of adjacent skin and soft tissue to rule out extra glandular invasion

6. The Carotid artery is displaced and less felt (BERRY'S SIGN)

7. Young lady with solitary nodule and palpable ipsilateral lymph nodes discrete, rubbery or firm and mobile (Papillary carcinoma)

8. In elderly patient, a rapid enlargement of thyroid lump (Follicular Ca. or Thyroiditis, Lymphoma or Anaplastic Ca.)

9. Hashimoto's thyroiditis - one lobe firm to hard in consistency with reactive enlarged Lymph node.

10. Unilateral vocal Cord palsy due to recurrent laryngeal nerve involvement is almost due to thyroid carcinoma in a patient with STN or due to extension of the growth into the trachea. But rarely occurs with benign thyroid nodule lesions because of stretching or compression of the nerve.

Investigations:

Laboratory Evaluation

1) A complete blood count and ESR are obtained if case of suspected inflammatory or infectious thyroiditis.

2) A thyroid peroxidase antibody assay is appropriate for the diagnosis of Hashimoto's thyroiditis.

3) The laboratory values most commonly obtained include thyrotropin (TSH) T_4 and T3; thyroglobulin, thyroglobulin antibody, erythrocyte sedimentation rate, thyroid peroxidase antibody (TPO antibody and microsomal antibody) .

4) The functional status of the thyroid gland has to be evaluated when working up a solitary thyroid nodule. A total T4 and total T3 levels are often obtained during the initial clinical visit. Their levels can fluctuate based on the circulating level of thyroid-binding globulin levels. A more accurate assay is the free T4 level, which correlates better with the activity of thyroid hormones in the body now a days.

5) Free T4 and T3 are measured routinely in many advanced centers because of the problem of high T4 and T3 values found in patients with increased level of binding proteins (TBG) This is due to estrogen (Pregnancy or oral contraceptive pill) which induce increased production of TBG by the liver. The high-sensitivity thyrotropin assay (TSH) provides more accurate results and is essential to detect abnormality in thyroid function.

6) TSH level in peripheral blood is an important and widely used value, particularly useful in hypothyroidism. Serial measurement in the course of T4 therapy is essential to ensure correct replacement. TSH level will be fully suppressed in primary, secondary or autonomous thyrotoxicosis

7) A thyroglobulin level can also be obtained. Many factors exist that may produce falsely elevated or decreased levels. Some of these factors include the extent of thyrotropin receptor stimulation, the bulk of the gland itself, the presence of thyroid inflammation, injury to the gland (radiation, hypoxia, hemorrhage, biopsy, or surgery), multinodular goitre, decreased renal clearance, tobacco smoking and estrogen level. One of the major limiting factors of the serum thyroglobulin assay is the presence of thyroglobulin antibodies. They may be present in up to 10% of normal subjects and in approximately 15% to 30% of patients with differentiated thyroid cancers. Thyroglobulin antibodies are present in 100% of patients with Hashimoto's thyroiditis and in between 89% to 98% of patients with Grave's disease. Benign and malignant conditions can produce elevated levels of thyroglobulin. A preoperative assay cannot be used to diagnose or exclude cancerous lesions and is probably not relevant when evaluating a thyroid nodule. The best use of this is in the follow-up of patients with thyroid cancer after thyroidectomies. Calcitonin is a valuable serum marker for medullary cancer. The test is important in screening the relatives of a patient with known medullary cancer. Although not used routinely, calcitonin level should be considered in high-risk patients, such as patients with familial medullary thyroid carcinoma or multiple endocrine neoplasia. Recent studies advocated the routine use of calcitonin assay, followed by a pentagastrin-stimulating test if an abnormal calcitonin level is detected in the evaluation of

patients with nodular diseases. A routine calcitonin level may allow identification of this aggressive tumour at an earlier stage. (Microscopic tumors without nodal metastasis)

Radioisotope imaging

Nuclear scans of the thyroid, once the cornerstone of thyroid nodule evaluation, have fallen out of favors in the past few decades. Recent surveys by the American thyroid Association and the European thyroid Association showed that 23% and 66% of endocrinologists respectively, still routinely obtain a nuclear scan in the evaluation of a solitary nodule.

1. Autonomous Toxic nodule to localize the area of Hyperfunction.

2.RetrosternalGoitre

3. Other Indication-Ectopic Thyroid tissue

4.Recurrence

5.Metastasis in Thyroid Ca.

The most commonly used radioisotopes are technetium (^{99m}Tc) and^{123}I. The choice of radioisotope is dependent on the preference of the clinician and radiologist .^{123}1 is more physiologic than ^{99m}Tc. 99^{m}Tc quickly washes out of the thyroid gland before being organified inside the gland. The property of "^{m}Tc allows for a shorter scanning time (20-30 minutes) and the scanning over the

thyroid can be performed immediately after intravenous the administration of ^{99m}Tc. ^{I23}I imaging needs to be performed 24 hours after administration of ^{123}I and the scanning time can run 4 to 6 hours in length. Radiation exposure is comparable for both agents and is not significant. Imaging resolution is better with ^{99m}Tc than radio-iodine. Nodules smaller than 1 cm cannot be detected reliably by either scan, as they are below the differentiation power of scintigraphic devices.

Approximately 80% to 85% of nodules are "cold" on scintigraphy, with 14% to 22% of them ultimately proven to be malignant. Five percent of nodules are "hot" with less than a 1% risk of malignancy. The remaining 10% to 15% are "warm or indeterminate nodules. It was suggested that these nodules posses a higher risk of malignancy than "hot" nodules, with a reported range of less than 10% up to 36%. when grouping

1. Cold Nodule - 80% - (Malignant - 20%)
2. Hot Nodule - 5% - (Malignant - 1 %)
3. Warm Nodule - 15% - (Malignant - 10%)

D/D of cold nodule

1. Cyst
2. Carcinoma
3. Thyroiditis
4. Benign Adenomas
5. Haemorrhage

"Cold" and "warm" nodules together, the sensitivity of scintigraphic scans for cancer diagnosis is 89% to 93%, but specificity is only 5% with a positive predictive value of only 10%.

The following circumstance would be indications for nuclear scans and its great value.

1. Outlining nodules and determining their studies (Hot, warm, cold).
2. Identification of a functional solitary thyroid nodule when initial serum thyrotropin is decreased.
3. If an FNA is reported as "follicular neoplasm" or “suspicious", the finding of a "hot" nodule decreases the suspicion of malignancy.
4. Retrosternal goitre especially in young women with chubby necks.

5. Intrathoracic extension of thyroid.

6. To rule out neck metastasis.

7. Discovery of pulmonary or other metastasis after ablation of the gland (Tracing and Therapy).

X-ray:

X-ray chest including the neck (AP & lateral view) is useful.

1. Calcifications in tumours are of two varieties.

The common one is dense, well circumscribed

2.. The second type appears as fine grains of sand or as thin strands and can only be seen in those tumours which contain calcified "psammoma bodies"

3. The other x-ray evidence includes invasion of trachea or esophagus (by barium swallow examination)

4. Deposits in the lung may be discrete, well-defined rounded lesions. Spread to mediastinal glands occur in medullary carcinoma

5. Pleural effusion may be present

6.Bone deposits are osteolytic and occur in 60 - 70% of cases in ribs, spine & pelvis especially in follicular carcinoma and are usually pulsatile

7.Some patients may present with pulsatile bone swelling in the scalp

CT and MRI

CT scans are a highly sensitive technique in detecting thyroid nodules. They have a very limited role in the initial management of a STN. CT scan can be helpful. If the nodule occurs in a diffusely enlarged gland that makes palpation difficult.

CT scans are more useful in detecting thyroid tissues in the retro tracheal and retro clavicular region. Assessment of mediastinal involvement and cervical lymphadenopathy MRI plays a minor role in the evaluation STN but it reveals minute soft tissue details and vasculature.This allows identification of extra-glandular metastasis involving the great vessels. An advantage of the MRI scan over the CT SCAN is the possible use of contrast (Gadolinium) without interfering with nuclear scintigraphy. A few studies investigated the use of MRI to study nodules in different functional status

BONE SCAN

To rule out Suspicion of secondary skeletal metastasis.

ULTRASOUND (HIGH RESOLUTION)

Ultrasonography is the most widely used imaging technique for the evaluation of thyroid nodules. Modern ultrasound is performed with high frequency transducers (7-13 MHz) and can detect nodules of 3 mm to 4 mm (solid nodules) and of 2 mm (cystic nodules) in diameter. In 50% of patients, co-existing nodules are visualized on routine ultrasounds for solitary nodules.

The routine use of ultrasound for solitary nodules was investigated by Marqusee et al at the Thyroid Nodule Clinic of Brigham and Women's Hospital. Ultrasonography changed the clinical management of 44% of patients who were referred for solitary nodules. The findings that changed management included the identifying of multiple nodules, no actual nodule and very small solitary nodules (<1 cm). Based on these investigations concluded that routine US should be seriously considered in the evaluation of solitary nodules.

Nodules can be solid or cystic on ultrasound. Purely cystic nodules are uncommon (-1%), with partially cystic lesions accounting for up to 20% of nodules. Cystic lesions were reported to carry a lower risk of malignancy (0.5% to 3%). Occurrence of papillary carcinoma in cystic or partially cystic thyroid nodule is well recognized.

Many studies looked into the echogenic pattern of nodules to predict malignancy, but currently none of them has discovered a definitive pattern.

The characteristics that suggest a malignant nodule are described

1) A hypoechoic signal is more typical of malignant nodule although many benign nodules also demonstrate hypoechogenicity.

2) Benign nodules, such as adenomas, are generally surrounded by a well-defined capsule, and thus demonstrate a 'halo' sign on ultrasound.

3) Calcium deposits can be fine, punctuate findings in papillary cancer that correspond with Psammoma bodies histologicaly, but can also be coarse and amorphous.

4) Kakkos et al reported a series of 82 solitary thyroid nodules that were imaged with ultrasound and managed by surgical excision. Ultrasound showed that 22 patients had calcification in their thyroid glands.

5) Histopathological slides were compared with preoperative US. Theynoted a malignancy incidence of 55% (12 out of 22) in patients with solitary nodules with calcifications versus 23% (14 out of 60) for patients with non- calcified nodules.

6) In another study, Thakashima et al reported a series of micro calcifications with a specificity of 93% and positive predictive value of 70% for cancer, albeit with a sensitivity of only 36%.

The specificity is 92% and 89% respectively thus ultrasound is a safe, noninvasive, non-radioactive test that should be ordered . Recommendations for ultrasound included are:

- Non-palpable or difficult to palpate nodules for US- guided FNA
- Assessment of regional lymph nodes (Pre-&Post-Operative)
- Follow- up imaging for solitary nodules that are managed medically or by observation
- Non-diagnostic fine needle aspirate (as an adjunct to repeat FNA)

Box l. Ultrasound features suggesting malignancy

- Absent 'halo' sign
- Solid or hypoechogenicity
- Heterogeneous echo structure (Hypoechoic)
- Irregular margin - Poorly defined margin
- Fine calcifications
- Extra glandular extension

Ultrasound features suggesting Benign

- Rim (Halo) around the nodule
- Significant Cystic component
- Hyper echoic nodule
- Well - defined nodule margin
- Peripheral egg shell like calcification

Routine use of US is probably not indicated at the time because of its cost, its subjective interpretation, and the existence of alternative diagnostic tools, such as FNA. The cytology analysis of the nodule still remains the gold standard, but features on ultrasound may provide the clinician with crucial information, especially when a needle aspirate is inconclusive. The best use of US as a diagnostic modality is combination with FNAC.

Fine Needle Aspiration and Cytology:

Needle aspiration of the thyroid was pioneered in the 1930s by Martin. Scandinavian workers introduced fine needle aspiration. It gained wide acceptance in the western world in the 1980s and now used increasingly as first line investigation of the patient with solitary thyroid nodules. FNAC is a simple, relatively non-invasive procedure that provides extremely valuable clinical information. It is highly sensitive and specific test in diagnosis of thyroid cancer especially papillary carcinoma which forms 80 to 85% and in medullary, lymphoid tumours and anaplastic carcinoma.

It is least valuable in differentiation of benign and malignant follicular and Hurthle cell neoplasms. FNA is performed with lcc pistol syringes coupled with 22, 23- or 25-gauge needle (Minimum 6 passes) Tissue sludge, tissue fragments and blood are aspirated and air-dried smears are produced which are

stained by May-Grunwald or Diff Quick- staining. Complications from FNA are neither significant nor frequent.

Box 2. Complications of FNA

- Pain
- Hematoma
- Entry into trachea
- Transient thyroid swelling - cystic degeneration
- Transient Vocal cord paralysis
- Formation of calcification
- Necrosis of nodule - Capsular pseudo invasion Fibrosis
- Transient thyrotoxicosis
- Elevation of thyroglobulin level
- Seeding along the tract is extremely rare

The four recognized categories of FNAC are

- Benign
- Malignant
- Suspicious (Atypical)
- Insufficient (non-diagnostic)

I. Benign Reports Includes (75%)

1. Follicular Adenoma (nontoxic & Toxic) - confirmed by histopathology
2. Hyperplastic colloid nodule
3. Thyroiditis
4. Cysts

II. Malignant Category Includes (5%)

1. Papillary
2. Medullary
3. Lymphoma
4. Poorly differentiated or undifferentiated Thyroid cancer (Anaplastic)
5. Metastatic non-thyroid cancer from breast, lung, kidney

III. Suspicious (10%) (Atypical)

The most common cause of categorizing an FNA aspirate as "Suspicious" is the inability to differentiate a follicular adenoma from a well-differentiated follicular carcinoma because one is unable to visualize the capsule and vascular invasion. Some of the other possible causes of a "Suspicious" report are as follows.

1. Follicular neoplasm
2. Hurthle cell neoplasm

3. Follicular variant of papillary carcinoma

4. Low-grade papillary carcinoma

5. Hyalinizing trabecular adenoma

6. Hashimoto's thyroiditis with metaplasi

IV. Insufficient (Non-diagnostic)

The highest rates of "Non-diagnostic" reports are found in cases with multiple calcifications, small nodule (< lcm) and necrosis among others. "Non diagnostic " reports are caused by the lack of cellular components in the aspirate or because of improper handling of the specimen. An adequate smear consists of at least five to six groups of follicular cells, with each group containing at least 10 cells; pseudocysts are believed to occur in cancerous and benign nodules at a rate of 23% to 33% and 27% to 35%, respectively. Repeat FNAC, ultrasound-guided FNAC, or excision is recommended in patients with cystic nodules.

CORE NEEDLE BIOPSY

Indication:

1. Anaplastic Ca.

2. Lymphoma

3. Employing a needle of true-cut type and carried out under local anesthesia is occasionally of value in establishing a diagnosis in the patient with a large, often hard and fixed mass in the neck.

4. Core biopsy produces a small cylinder of tissue, which is then submitted to histopathology, not cytological examination. Because of risk of hemorrhage and injury to adjacent structures like trachea, there is no place for large needle biopsy of this type in the routine assessment of the STN.

ROLE OF FROZEN SECTION

1. Used for Atypical solitary thyroid nodule after getting inconclusive.

2. FNAC report especially Follicular and Hurthle Neoplasm

3. Recent studies in John Hopkin, Medical college of Georgia Rush Medical College, Chicago have reported that 80% of Frozen section rendered no useful information because of difficulty to identify the capsular & vascular invasion and 5% gave inaccurate result

THYROID INCIDENTALOMAS

Incidentaloma is used to refer to a lesion which is detected duringunrelated procedure or an investigation, and it can be surgical or radiologic. Incidentalomas of thyroid refer to thyroid lesions discovered during

radiologic investigations which are unrelated to thyroid gland. Due to increasing use of such imaging, prevalence of such lesions will most probably increase and their management will be controversial.

Thyroid nodules are very common, detected by palpation in 4% to 7% of population and in about 60% patients during postmortem examination. In 2004, a study was done to detect thyroid nodule prevalence incidentally during carotid doppler scanning and in 9.4% of ultrasound examinations, 1 or even more nodules were identified. Other numerous studies identified incidental thyroid nodules during unrelated diagnostic tests, which included computed tomography (CT), then positron emission tomography (PET), and also nuclear scintigraphy**.**

In another study by Papini et al in 2002**,** thyroid cancers were identified in 9.2% of the solitary nodules and 6.3% of the multinodular goitres.8 During surgery, 35.5% of such lesions showed extra capsular growth and 19.4% cases showed lymph nodal involvement.

Many other studies said that prevalence of the thyroid cancers in an incidental impalpable thyroid nodule was similar to that seen in palpable thyroid nodules. But, overt thyroid cancer is a rare malignancy, which constitutes only 1% of all the malignancies.

Most common type of thyroid cancer detected in FNAC or surgery was the papillary carcinoma. Papillary carcinomas which are less than 1 cm are called “microcarcinomas” and they can be incidentally detected in almost 36% postmortem examinations.

In a large retrospective study, although prevalence of thyroid carcinoma was almost double during the period (especially papillary), the disease mortality was stable. Based on this finding, authors said increased use of the ultrasound and USG guided FNA will increase identification of subclinical papillary carcinoma. But such small primary cancers may be associated with metastatic lymph node diseases, with some histologic subtypes like tall cell or otherwise columnar types, especially at risk. Hence it looks like papillary micro carcinomas are more frequent and indolent, and in certain cases alone, they act aggressively, even if less than 1 cm.

According to a study by Kang et al in 2004, thyroid incidentalomas occurred at a rate of 13.4%, showing a malignancy rate of 28.8%. No significant findings such as differences in age, nodule size and number, thyroid function test, and Tc99m thyroid scan differentiating benign and malignant incidentalomas. Evocative evidence for identifying malignancy in incidentalomas may be obtained by means of US characteristics of solid echo structure, irregular margin, and calcification. Most malignant incidentalomas were discovered in low stage. He stated that occult thyroid cancers are not rare

findings. No noteworthy differences in clinical and laboratory parameters between benign and malignant thyroid nodules of size<1.5 cm, with only US findings provide enough information for appropriate management strategies.

MANAGEMENT OF SNT:

The challenge of management of a SNT is to differentiate between benign and malignant neoplasms. The management option for benign condition is surgical or non-surgical. Surgery should be advised after fine needle aspiration of SNT and cytology in the following conditions.

1. SNT in younger than 20 or older than 60 yrs.
2. Malignant potential of nodule in men is more.
3. Previous radiation to the cervical region.
4. Strong family history of thyroid cancer.
5. Malignant nodules.
6. Cytological diagnosed follicular neoplasm.

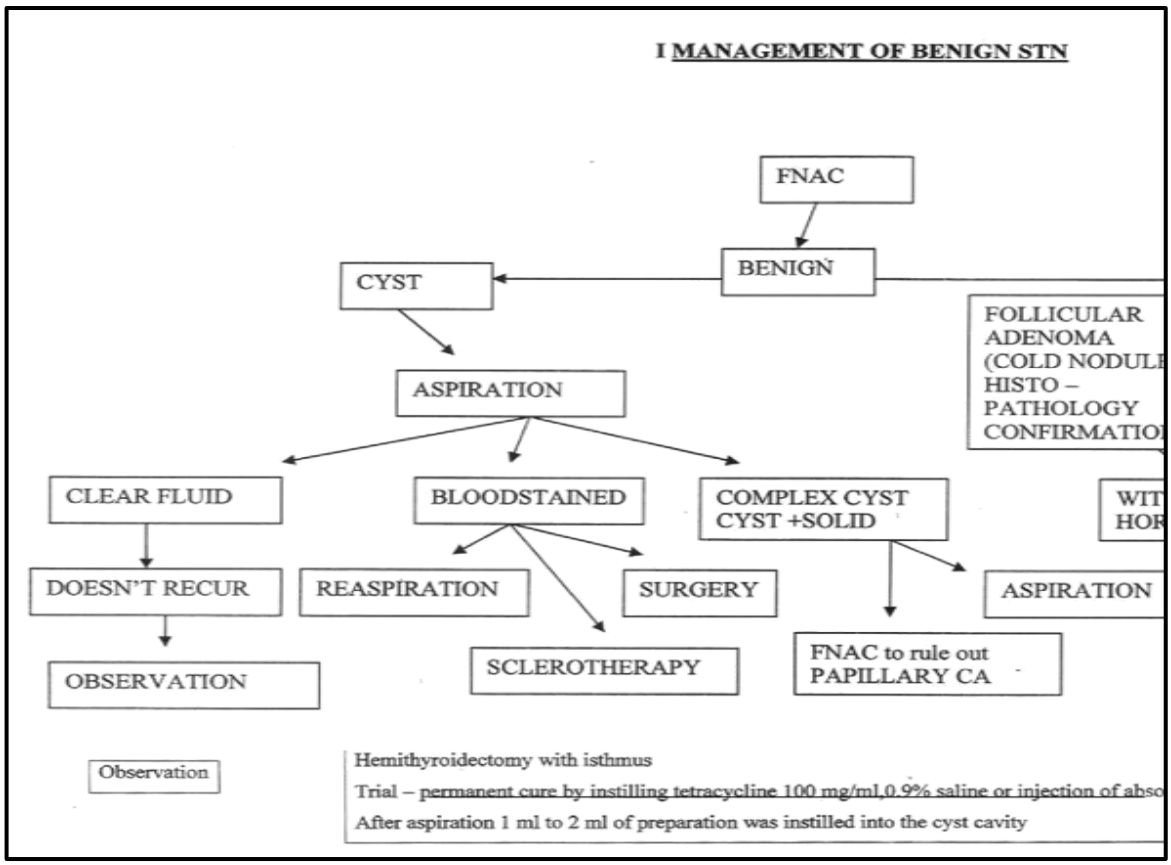


Fig.11. Management of Solitary Thyroid

MANAGEMENT OF MALIGNANT SNT

PAPILLARY CARCINOMA

1. **Tumor Confined to one lobe-Multifocal Lesion with no Lymph Node involvement**

Current Method

- FNAC-1st
- Pre-operative Assessment of Lymph Nodules in the neck(clinical & by high resolution ultra sound)

- Then expose the gland and proceed

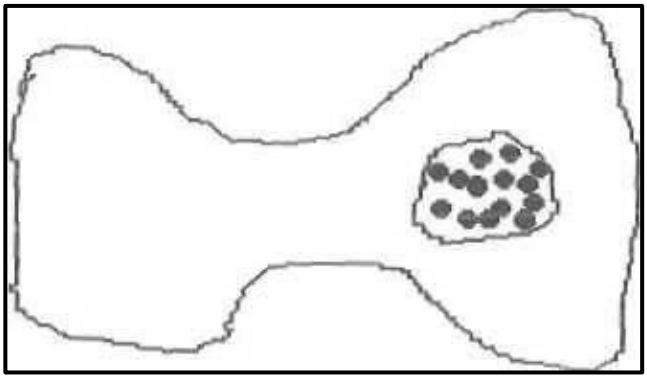


Fig.12. Tumor Confined to one lobe-Multifocal Lesion with no ` Lymph Node involvement

TREATMENT:

- Total thyroidectomy or near total thyroidectomy (Involved Lobe -> Total lobectomy + contra lateral Lobe ->Lobectomy. Leaving the post. Capsule to protect Rec. Larynx. Nerve and parathyroid. l-2gm of thyroid tissue, should be left and it helps to preserve blood supply the Parathyroids.
- Why total & not Hemithyroidectomy?
- Due to early intraglandular lymphatic invasion, the chances of opposite lobe involvement are more than 30%
- Post-operative-TSH Suppressive Therapy as it is TSH dependent tumour.
- FollowUp

2. TUMOUR CONFINED TO ONE LOBE + LYMPH NODES

INVOLVEMENT IN THE SAME SIDE

- Lymphadenopathy - by clinical examination
- Identified LNS by imaging
- Biopsy-excision LN.
- During surgery frozen section-Biopsy.

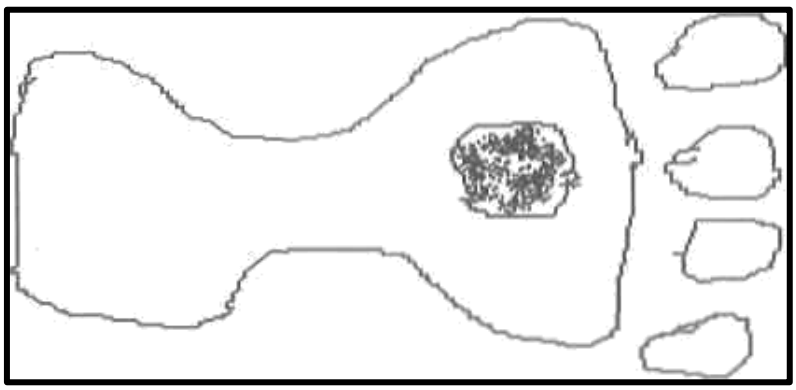


Figure 13. Tumor confined to one lobe with lymph node involvement

PRESENT ADVICE:

- Total Thyroidectomy
- Central neck nodes dissection

1.Including Ipsilateral trachea- Oesophageal groove and Pre-tracheal area

2.Along the Recurrent laryngeal nerve and Inferior thyroid vein and Anterior mediastinum

If Lymph nodes are involved in the lateral Triangle, Functional Block Dissection (MRND) is added

- Presently all the patients who undergo total thyroidectomy for carcinoma of size >1.5 cm should be considered for Iodine ablation treatment
- If residual tumours is present external radiotherapy to thyroid bed, neck, Lymph node and upper part of the mediastinum is recommended
- Post-operative TSH Suppressive therapy - The average daily dose (0.25-0.3mg)
- Follow up.

3. <u>TUMOUR CONFINED TO ONE LOBE+ NO LYMPHNODE:</u>

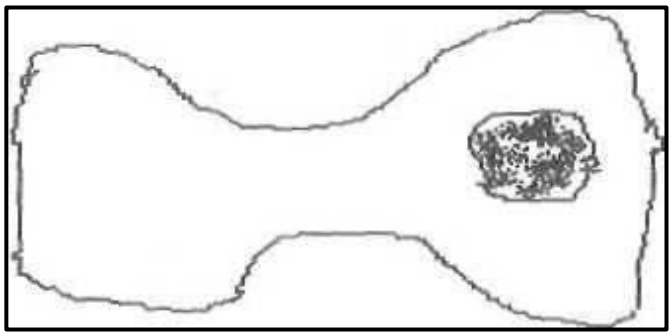


Figure 14. Tumor confined to one lobe with no lymph node involvement

CURRENT SURGICAL PROCEDURE:

LIMITED SURGERY

- Total thyroid Lobectomy on the same side of the lesion
- Resection of the Isthmus
- Further excision of 60% of the grossly unaffected lobe by leaving sleeve of the contra lateral lobe
- Post-operative. TSH Suppressive therapy [Current data suggests that 20% SNT do respond to Thyroid Hormone suppressive therapy]
- Prognosis is good in Low risk patient
- Follow Up

FOLLICULAR CARCINOMA

- Presents rarely as SNT and the surgical treatment is controversial
- Low risk patient (AMES) scoring system

1. Male- less than 40 yrs.
2. Female -less than 50 yrs.
3. No distant Metastasis.
4. Minor invasion of capsule with no vascular involvement.
5. The size of the tumour less than 5 cm,

LIMITED RESECTION

- Total lobectomy on the same side of the lesion
- Resection of the isthmus
- Leaving sleeve of the contra- lateral lobe (Hemi-thyroidectomy + isthmusectomy are good enough procedure)
- Follow up
- Post op histopathology report reveals extensive vascular & capsular invasion
- Completion thyroidectomy is indicated
- Post-operative Radio Iodine Tracing and Treatment (Ablation)
- Thyroxin (0.25 - 0.3 mg daily) as TSH suppressive docs

MEDULLARY CARCINOMA (Rare)

If Medullary Carcinoma presents as SNT- total thyroidectomy & central Lymph node dissection from hyoid to innominate vein and laterally to Jugular Vein. Lymph node lateral to the internal jugular vein is sampled and if positive in frozen section biopsy, formal modified radical neck dissection should be carried out.

III MANAGEMENT OF SUSPICIOUS *(*Atypical)

(FOLLICULAR & HURTHLE CELL NEOPLASM)

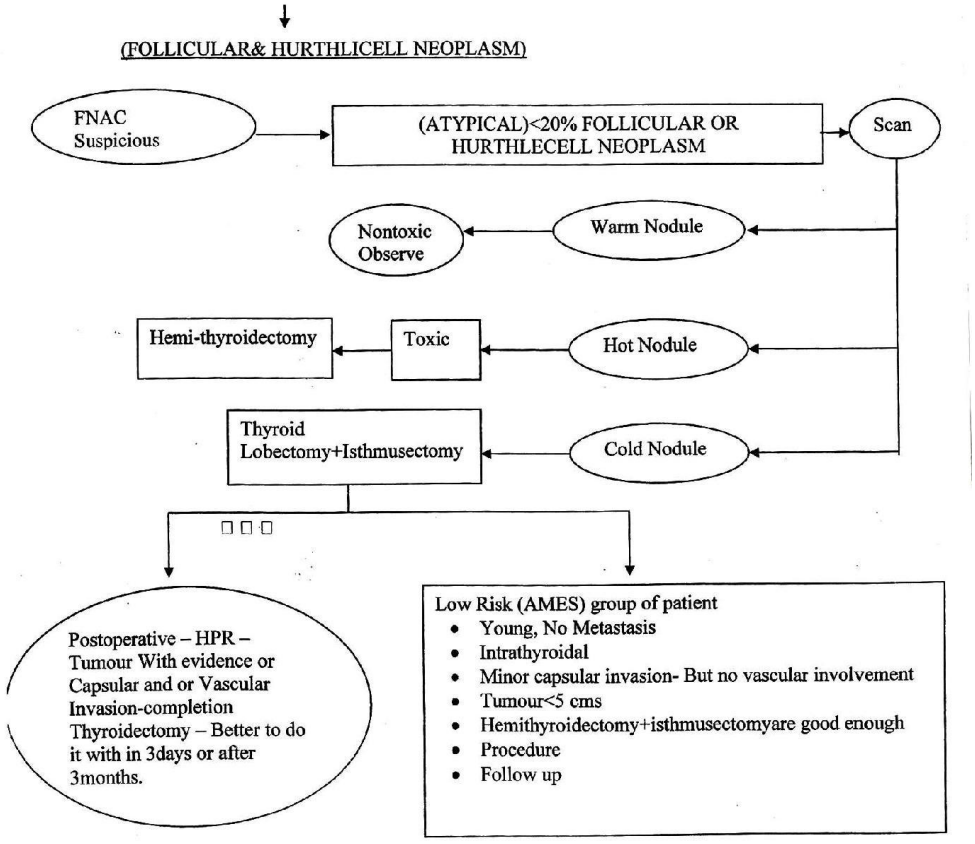


Fig.15. Management of Follicular and Hurthle Cell cancer

IV. INSUFFICIENT OR NON-DIAGNOSTIC

The last category of FNAC result is "non diagnostic" for "insufficient of diagnosis" reading. When this result is obtained, a repeat FNA is performed, possible with ultrasound guidance to increase the yield. Carmeci et al reported that the rate of insufficient sampling decreased from 16% to 7% when ultrasound guidance was used. Despite repeated aspirations, a small group of patients will still have non diagnositc FNAs. It is acceptable to have clinical follow-up, with surgical intervention only when poor prognostic indicators are present. In this situation, the management should be tailored to the individual patient.

The main goal of FNAC is to accurately predict which nodule is malignant and which is benign

- Overall accuracy is estimated 92%-95%
- False positive rate is approximately 0,8%-9%
- False negative rate is 5%
- One of the most common causes of a false negative reading is Cystic nodules especially when larger than 3 cm

- Pseudocysts are believed to occur in cancerous and benign nodules at the rate of 23% to 33%. Repeat FNA, ultrasound guided FNA or excision is recommended in patients with cystic nodules

NON - SURGICAL TREATMENT

- When the question of malignancy within an isolated thyroid nodules has been eliminated by FNA and cytology, and in the absence of obstructive symptoms it is reasonable to offer the patient a conservative management plan

- Though not proven by constant believable results from studies– TSH suppression by exogenous T4 has been practiced in the assumption that benign tumour will regress or stop growing while carcinoma may continue to grow, since benign lesions are more TSH dependent. On average 16% of malignant-22% of Benign lesions were suppressible

- Administration of suppressive dose of thyroxin therapy 50-100mcg /day is acceptable for patient with benign STN. If the swelling recurs surgery is indicated

- If FNA shows Lymphocytic thyroid, thyroxine is likely tohelp especially if TSH in above normal whereas colloid nodule this treatment is unlikely to succeed

KEYFACTS

- FNAC is now used as a first line investigation in patients with solitary nodule and it is considered the gold standard diagnostic test

- Solitary thyroid nodules are commonly occurring disorders of thyroid of which most are benign. The surgical treatment of thyroid cancer is controversial

- True solitary thyroid nodules are conventionally taken to be malignant until proven benign, especially in young and elderly patients.

- A dominant nodule in multinodular gland is considered benign unless a finding suggestive of malignancy is discovered (Laryngeal nerve palsy, enlarged lymph nodes)

- Hemithyroidectomy with resection of isthmus in continuity seems a safe and good enough procedure and the complications are minimal

- Ultrasound and nuclear scans are also useful tests, but are best used in conjunction with FNA. Clinical decisions are often based on the results of the FNA

OBSERVATION AND RESULTS:

Statistical analysis:

Data were entered in the excel spread sheet and variables were coded accordingly. The statistical analyses were performed using Graph pad Prism version 5 software. Data were presented as mean with Standard deviation for normal distribution/scale data. Data were presented as frequency with proportion n(%) for categorical data. Fisher's exact test was used to compare the frequencies between the groups. $p<0.05$ were considered statistically significant.

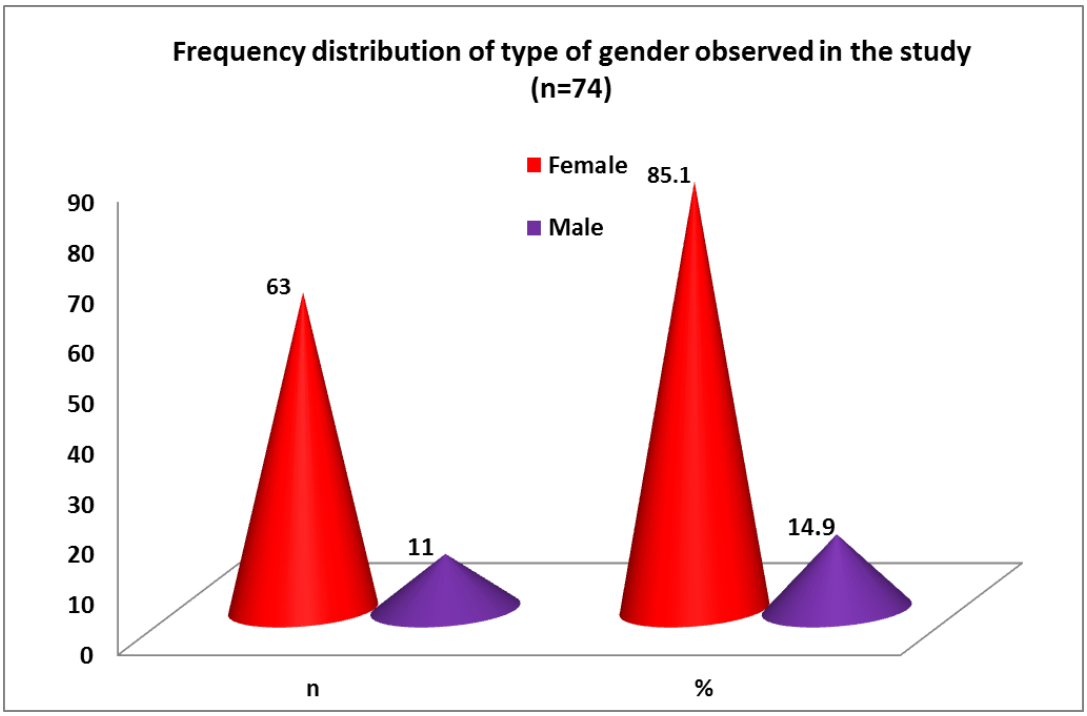
GENDER DISTRIBUTION:

Table 1. Frequency distribution of type of gender observed in the study.

S.No	Gender	n	%
1	Female	63	85.1
2	Male	11	14.9
	Total	74	100

Source: Primary Data

By Table 1.depicts the distribution of SNT among the two genders, with more female than male, at 85.1% compared to male patients at 14.9%

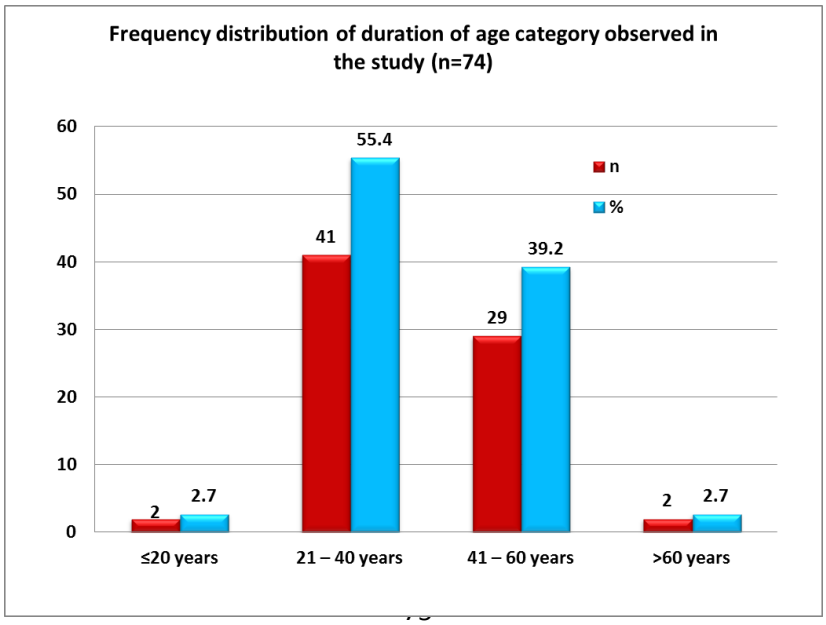


AGE DISTRIBUTION:

Table 2. Frequency distribution of duration of age category observed in the study.

S.No	Age (in Years)	Frequency	Percentage
1	≤20	2	2.7
2	21 – 40	41	55.4
3	41 – 60	29	39.2
4	>60	2	2.7
	Total	74	100

Data The above table depicts the distribution of SNT in different age groups, with 2.7% patients in the age group of ≤ 20 years, 55.4% of patients in the age group of 21-40 years, 39.2% of patients in the age group of 41-60 years and 2.7% in the age group of >60 years old. Maximum occurrence is observed in 21-40 years old and 41-60 years old patients, with incidence of 55.5% and 39.2% respectively. Low incidence is seen in the age groups of ≤20 years and >60 years old patients.



CLINICAL PRESENTATION:

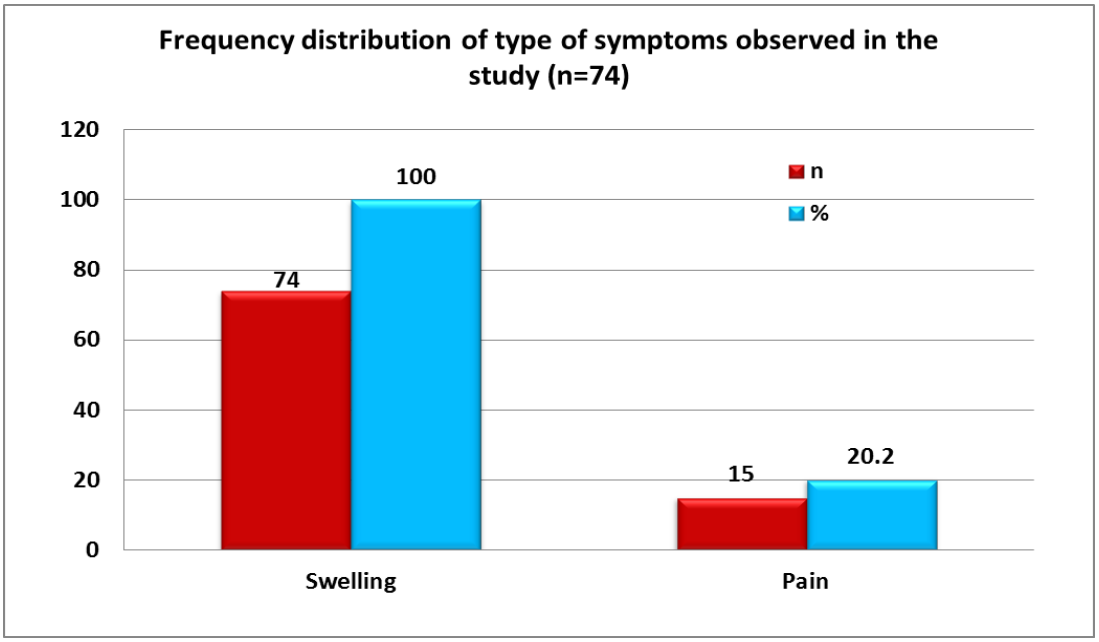
SYMPTOMS:

Table 3. Frequency distribution of type of symptoms observed in the study.

S.No	Type of symptoms	Frequency	Percentage
1	Swelling	74	100
2	Pain	15	20.2

Source: Primary Data

The above table depicts the distribution of symptoms as experienced by the patients, being either swelling or pain. Swelling was experienced by all the patients considered for the study 100%, pain was experienced by roughly 20.2%. Swelling was the predominant symptom experienced by the patients.



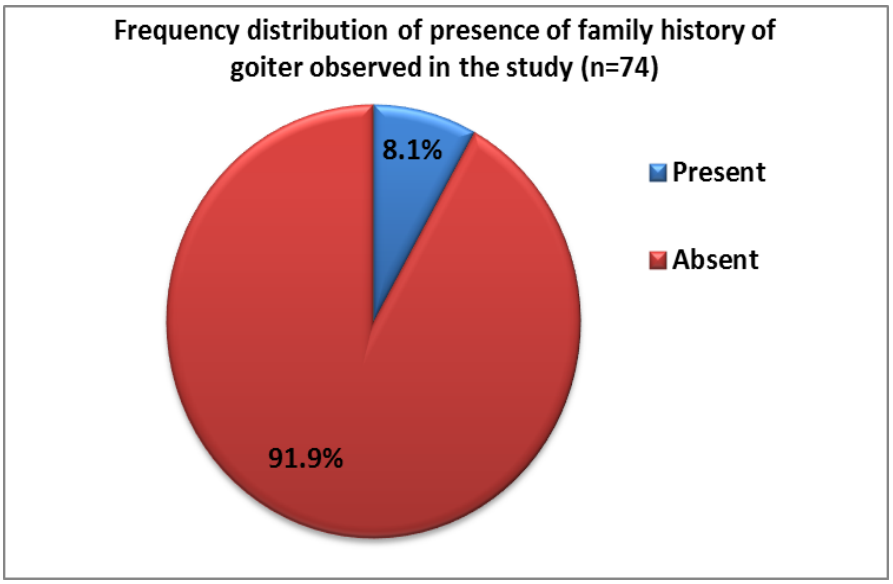
FAMILY HISTORY:

Table 4. Frequency distribution of presence of family history of SNT observed in the study.

S.No	Family history of SNT	N	%
1	Present	6	8.1
2	Absent	68	91.9

Data are expressed as n with %. The total N=74

The above table depicts the relevance of family history for SNT, with 8.1% of patients stating familial occurrence in their close blood-relatives and 91.1% of the patients showed no familial inheritance. Familial inheritance was not seen in majority of the patients 91.9%.



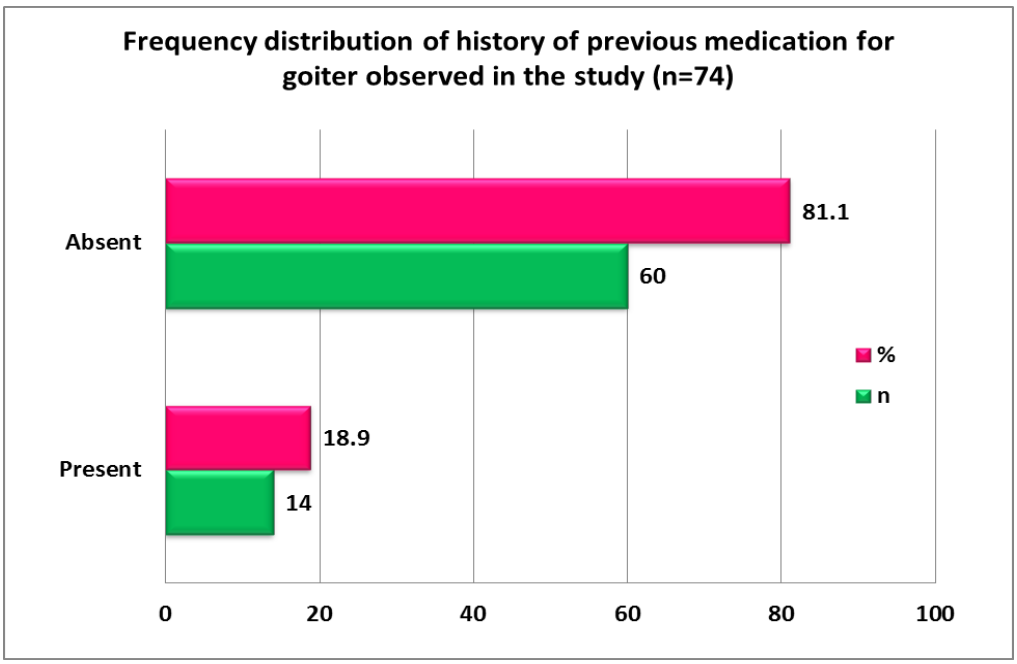
MEDICATION HISTORY:

Table 5. Frequency distribution of history of previous medication for SNT observed in the study.

S.No	Previous medication intake for SNT	n	%
1	Present	14	18.9
2	Absent	60	81.1

Data are expressed as n with %. The total N=74

This table depicts the drug history of patients with SNT considered for this study. 18.9% of the considered patients stated that they took medication previously for thyroid dysfunction, whether hypo- or hyperthyroidism and 81.1% of patients state that they took no prior medication for thyroid disfunctions.



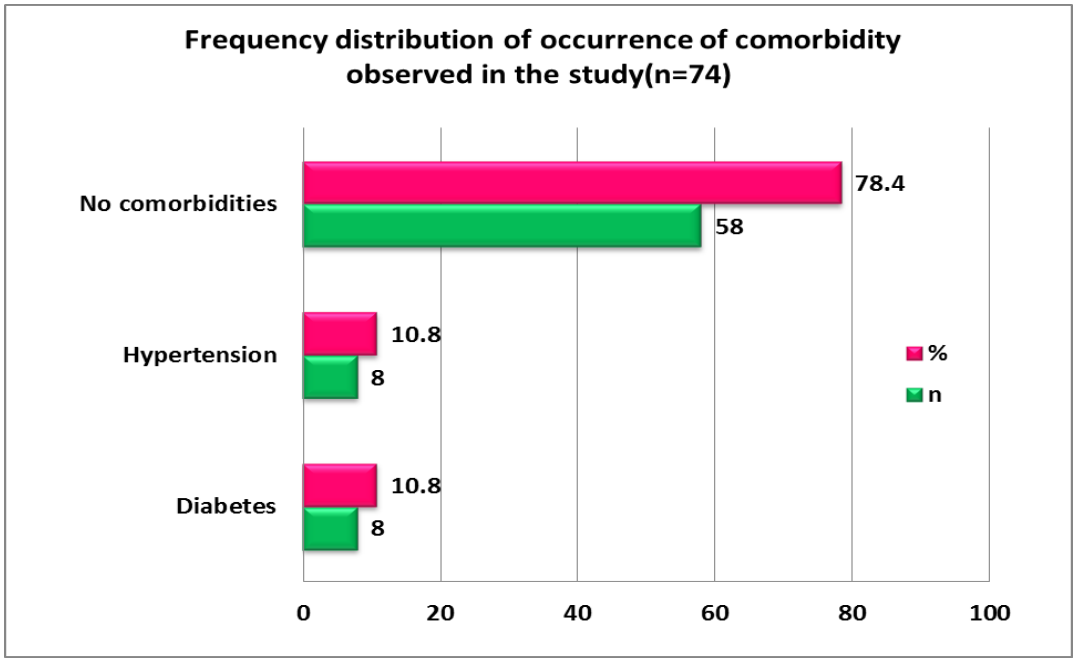
CO- MORBIDITIES HISTORY:

Table 6. Frequency distribution of occurrence of comorbidity observed in the study.

S.No	Type of comorbidity	n	%
1	Diabetes	8	10.8
2	Hypertension	8	10.8
3	No comorbidities	58	78.4

Data are expressed as n with %. The total N=74

This table depicts the comorbidities associated with SNT as seen in the patients considered for study. Diabetes was seen in 10.8% of patients and hypertension in 10.8% patients. No comorbidities were seen in 78.4% of patients.



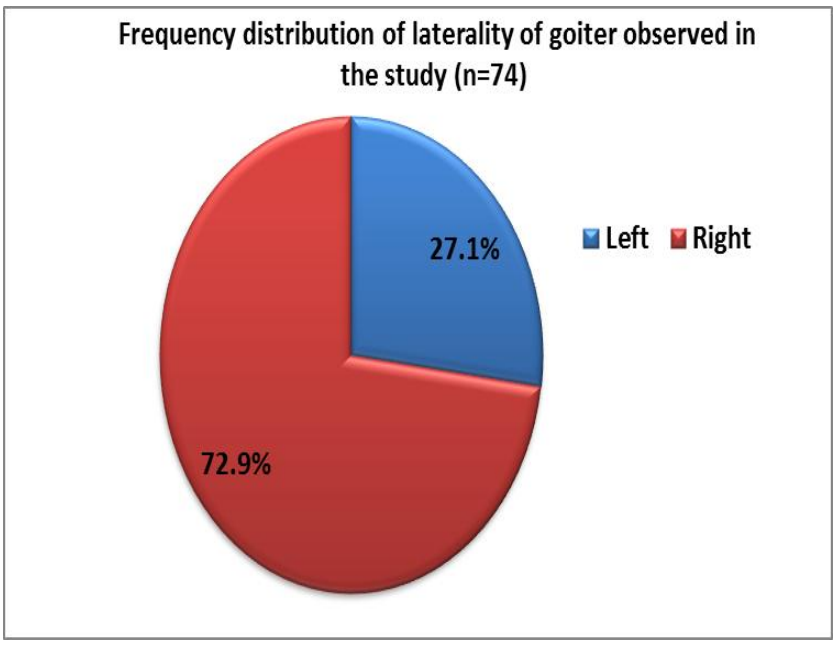
LATERALITY OF SNT:

Table 7. Frequency distribution of laterality of SNT observed in the study.

S.No	Laterality of the lesion	n	%
1	Left	20	27.1
2	Right	54	72.9

Data are expressed as n with %. The total N=74

This table depicts the occurrence of laterality of SNT as seen in the patients considered for study, with 72.9% of patients with a right laterality and 27.1% of patients with left laterality.



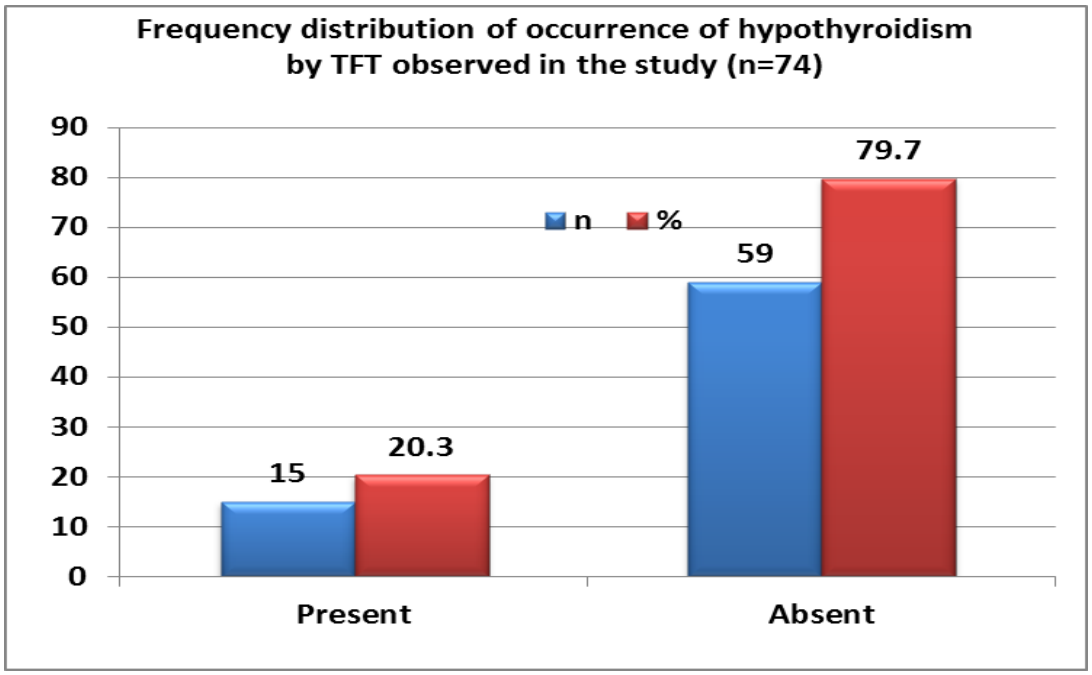
HYPOTHYROIDISM OCCURRENCE:

Table 8. Frequency distribution of occurrence of hypothyroidism by TFT observed in the study.

S.No	Hypothyroidism by TFT	N	%
1	Present	15	20.3
2	Absent	59	79.7

Data are expressed as n with %. The total N=74

The above table depicts the occurrence of hypothyroidism as seen in the patients considered for the study, with 79.9% of patients showing normal thyroid functioning(euthyroid), and 20.3% of patients showing hypothyroidism.



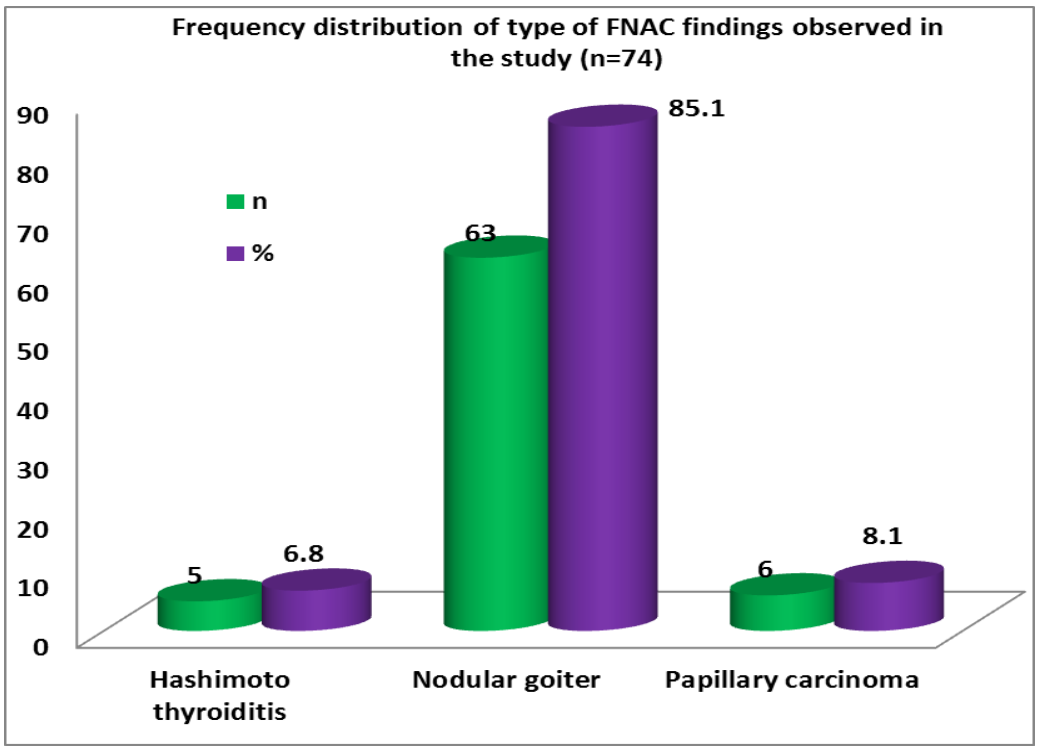
FNAC CORRELATION:

Table 9. Frequency distribution of type of FNAC findings observed in the study.

S.No	FNAC findings	n	%
1	Hashimoto thyroiditis	5	6.8
2	Nodular goiter	63	85.1
3	Papillary carcinoma	6	8.1

Data are expressed as n with %. The total N=74.

The above table depicts the distribution of FNAC findings in patients with SNT considered for the present study, of which 85.1% show nodular goiter, 8.1% showing papillay carcinoma and 6.8% with Hashimoto thyroiditis.



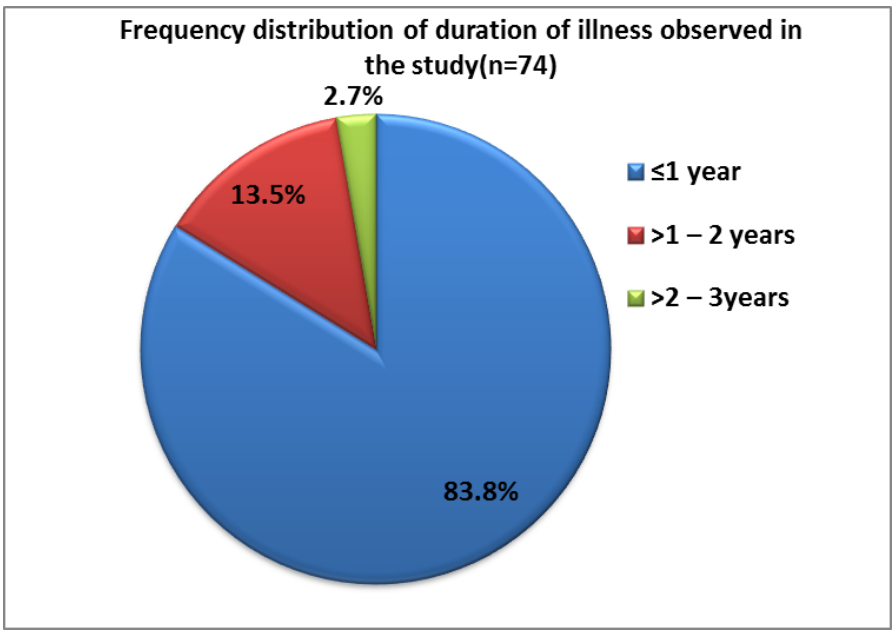
DURATION CRITERIA:

Table 10. Frequency distribution of duration of illness observed in the study.

S.No	Duration of the lesion	n	%
1	≤1 year	62	83.8
2	>1 – 2 years	10	13.5
3	>2 – 3years	2	2.7

Data are expressed as n with %. The total N=74.

This table depicts the distribution of duration of illness seen in the patients considered for the study, with 83.8% having the illness for ≤83.8%, 13.5% of patients having the illness for 1-2 years and 2.7% showing 2-3 year.



COMPARISON BETWEEN AGE:

Table 11. Comparison of frequency distribution of age category with respect to the gender in the study.

S. No	Age category	Gender				Chi square value	df	P value
		Female (n=63)		Male (n=11)				
		Freq.	%	n	%			
1	≤20 years	2	3.2	0	0	0.883	3	0.831 (NS)
2	21 – 40 years	34	54	7	63.6			
3	41 – 60 years	25	39.7	4	36.4			
4	>60 years	2	3.2	0	0			

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. NS = Not significant. The above table depicts the distribution of patients depending on the age group and sex. The prevalence of SNT was prominent in age groups of 21-40 years and 41-60 years with percentage of male and female patients being 54% and 63.6% and 39.7% and 36.4%. The p value for the relationship between sex and age groups is 0.831, which suggests that there is no significant relationship between prevalence of SNT in age groups of either of the sexes.

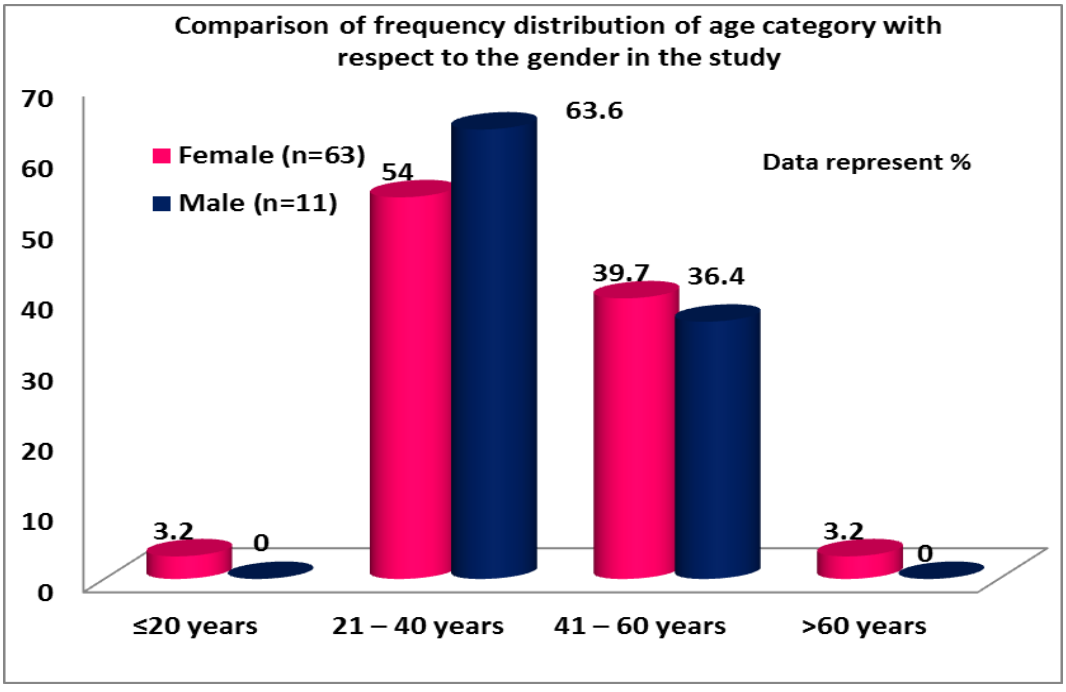


Table 12. Comparison of frequency distribution of occurrence of pain with respect to the gender in the study.

S. No	Occurrence of pain	Gender				Chi square value	df	P value
		Female (n=63)		Male (n=11)				
		n	%	n	%			
1	Present	10	15.9	5	45.5	5.07	1	0.03*
2	Absent	53	84.1	6	54.5			

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. *indicates $p<0.05$ and considered statistically significant.The above table depicts the relationship between occurrence of pain predominantly in either of the sexes. Pain is seen predominantly in male patients with 45.5% of male patients and less predominant in females 15.9%. The p value for this relationship is 0.03, showing that there is a significant relationship between gender and occurrence of pain as a symptom, with male patients more likely to experience pain as a symptom.

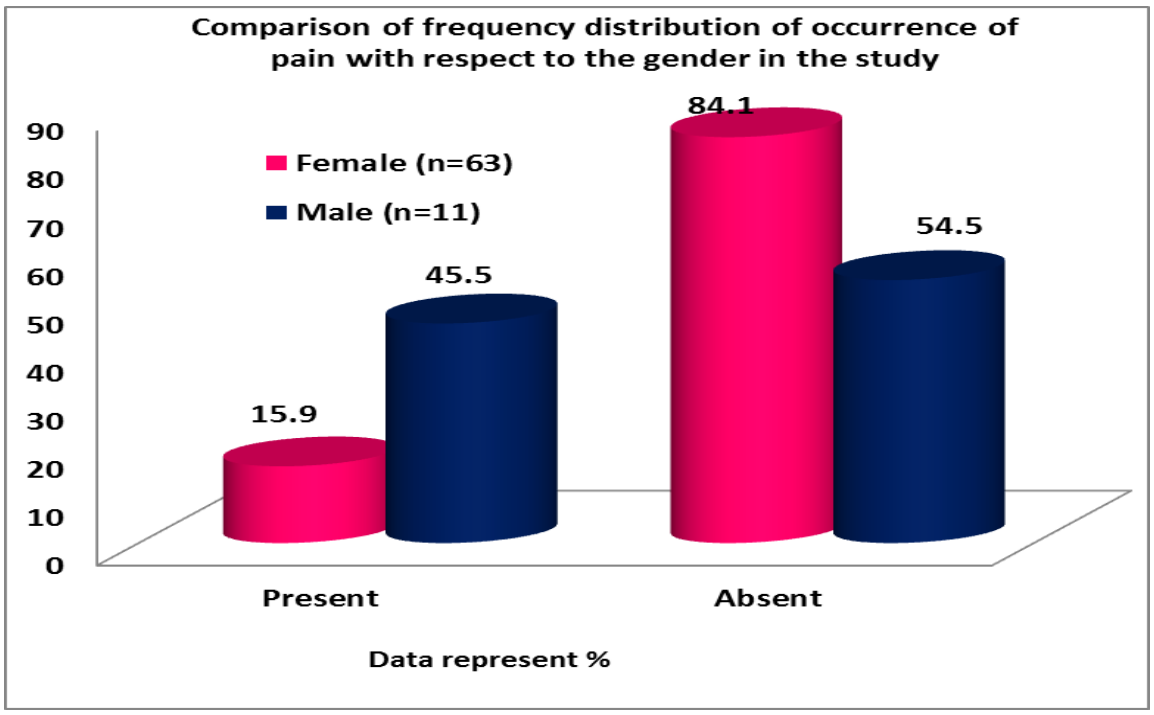


Table 13. Comparison of frequency distribution of duration of illness with respect to the gender in the study.

S. No	Duration of illness	Gender				Chi square value	df	P value
		Female (n=63)		Male (n=11)				
		n	%	n	%			
1	≤1 year	52	82.5	10	90.9	0.615	2	0.735 (NS)
2	>1 – 2 years	9	14.3	1	9.1			
3	>2 – 3years	2	3.2	0	0			

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. NS = Not significant.

The above table depicts the relationship between the gender of patient and duration of disease. Of the two genders, only female patients had SNT for more than 2 years (>2-3 years) and 14.3% had >1-2 years. Only 9.1% of male patients have SNT for more than a year.

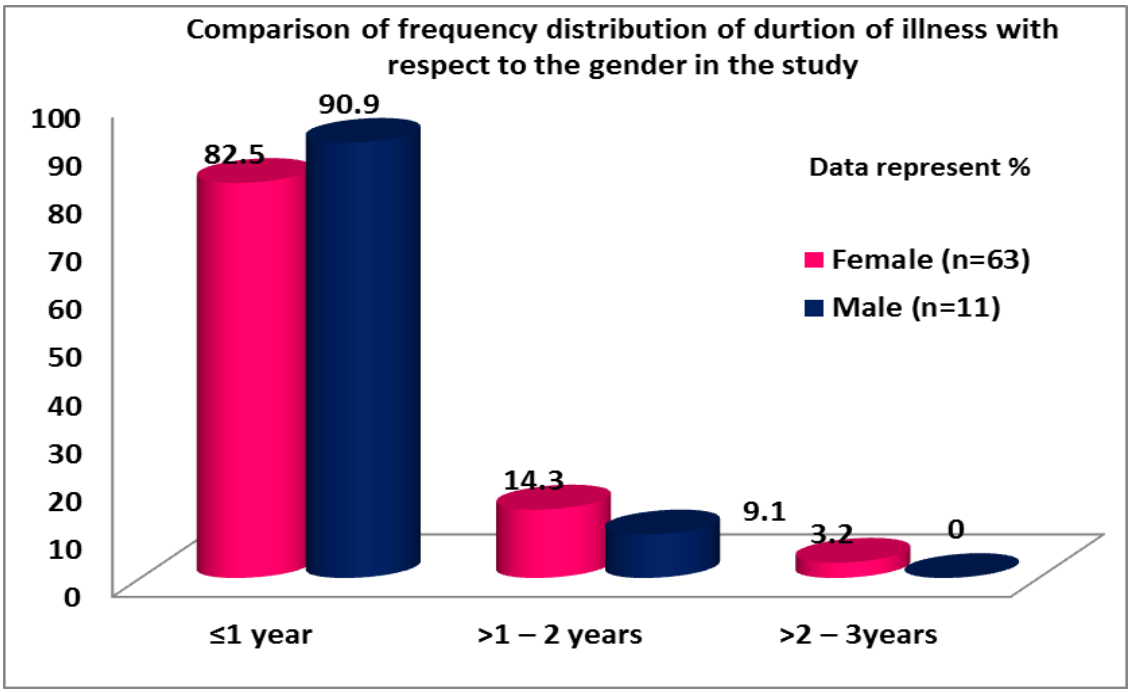


Table 14. Comparison of frequency distribution of various histories with respect to the gender in the study.

S. No	Parameter	Gender				Chi square value	df	P value
		Female (n=63)		Male (n=11)				
		n	%	n	%			
1	Presence of family history of SNT	6	9.5	0	0	1.14	1	0.583 (NS)
2	History of previous medication for SNT	14	22.2	0	0	3.01	1	0.11 (NS)

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. NS = Not significant.

The above table shows the relationship between gender and family history of SNT and history of previous medications. The p value for relationship between presence of familial history and gender is calculated to be 0.583, which is insignificant while the p value for relationship between gender and history of previous medication is calculated to be 0.11, which is also insignificant. The=us there is no significant relationship between gender and familial history and gender and history of previous medication.

Table 15. Comparison of frequency distribution of comorbidities with respect to the gender in the study.

S. No	Comorbidities	Gender				Chi square value	df	P value
		Female (n=63)		Male (n=11)				
		n	%	n	%			
1	Diabetes	6	9.5	2	18.2	1.65	2	0.437 (NS)
2	Hypertension	6	9.5	2	18.2			
3	No comorbidity	51	81	7	63.6			

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. NS = Not significant.

The above table shows the relationship between comorbidities and gender. The P value for the relationship is 0.437 is not significant depicting that there is no significant relationship between gender and concomitant disorders.

Table 16. Comparison of frequency distribution of hypothyroidism with respect to the gender in the study.

S. No	Hypothyroidism	Gender				Chi square value	df	P value
		Female (n=63)		Male (n=11)				
		n	%	n	%			
1	Absent	50	79.4	9	81.8	0.035	1	0.999(NS)
2	Present	13	20.6	2	18.2			

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. NS = Not significant.

The above table depicts the relationship between gender and occurrence of hypothyroidism. Though hypothyroidism seems prevalent in female patients, the p value of 0.999 states otherwise, showing that there is no significant relationship between presence of hypothyroidism and gender.

COMPARISON BETWEEN FNAC WITH GENDER:

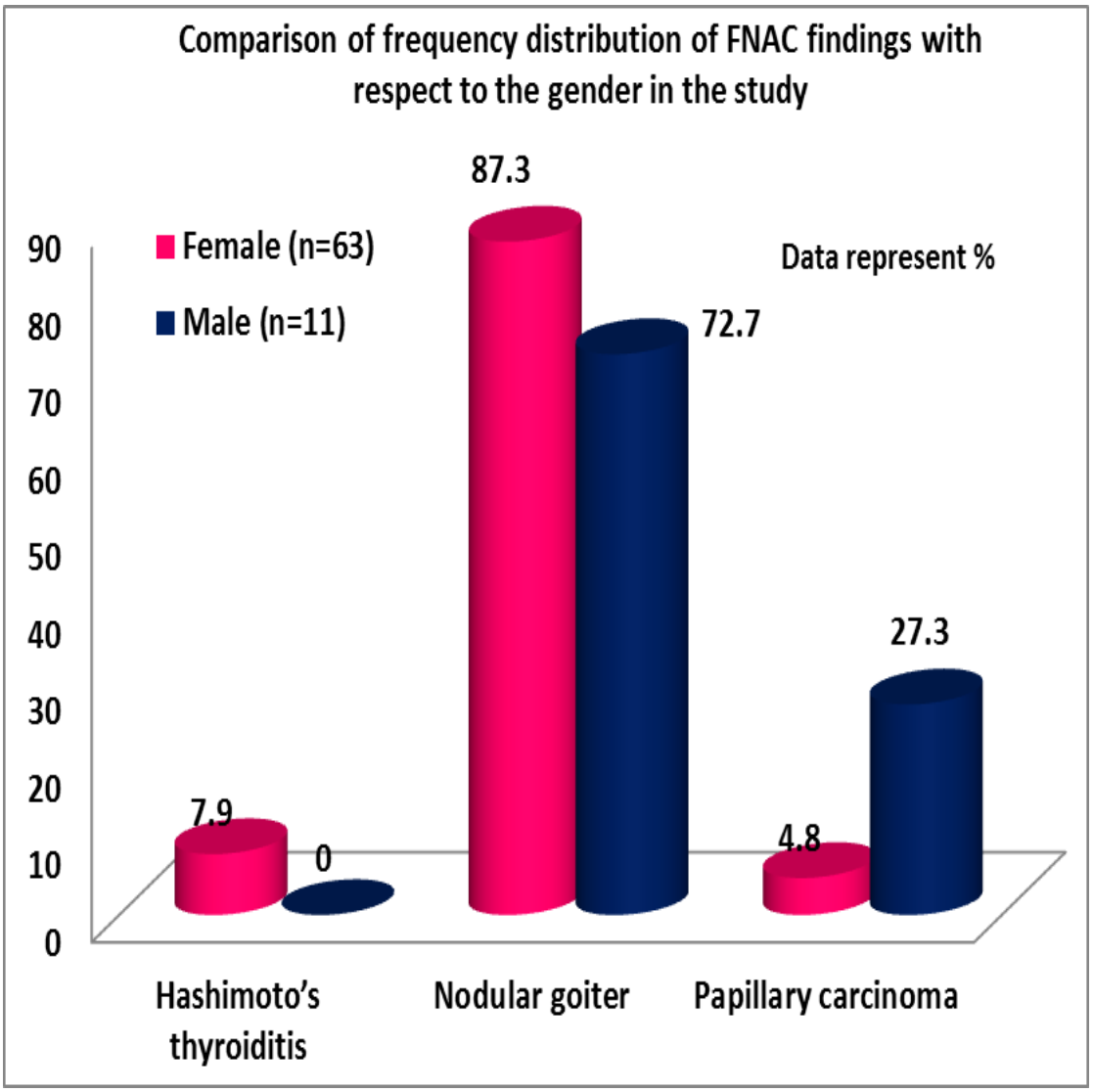
Table 17. Comparison of frequency distribution of FNAC findings with respect to the gender in the study.

S. No	FNAC findings	Gender				Chi square value	df	P value
		Female (n=63)		Male (n=11)				
		N	%	N	%			
1	Hashimoto's thyroiditis	5	7.9	0	0	6.959	2	0.031*
2	Nodular goiter	55	87.3	8	72.7			
3	Papillary carcinoma	3	4.8	3	27.3			

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. *indicates $p<0.05$ and considered statistically significant.

The above table depicts the relationship between gender and FNAC findings.

Nodular goiter seems to be the prevalent FNAC observation in male and female patients, followed by papillary carcinoma and Hashimoto's thyroiditis in male and female patients respectively. The p value for this relationship is 0.031, showing that there is a relationship between FNAC findings and gender, with Nodular goiter being more common in both the genders, followed by Hashimoto's thyroiditis in female and papillary carcinoma in male patients.



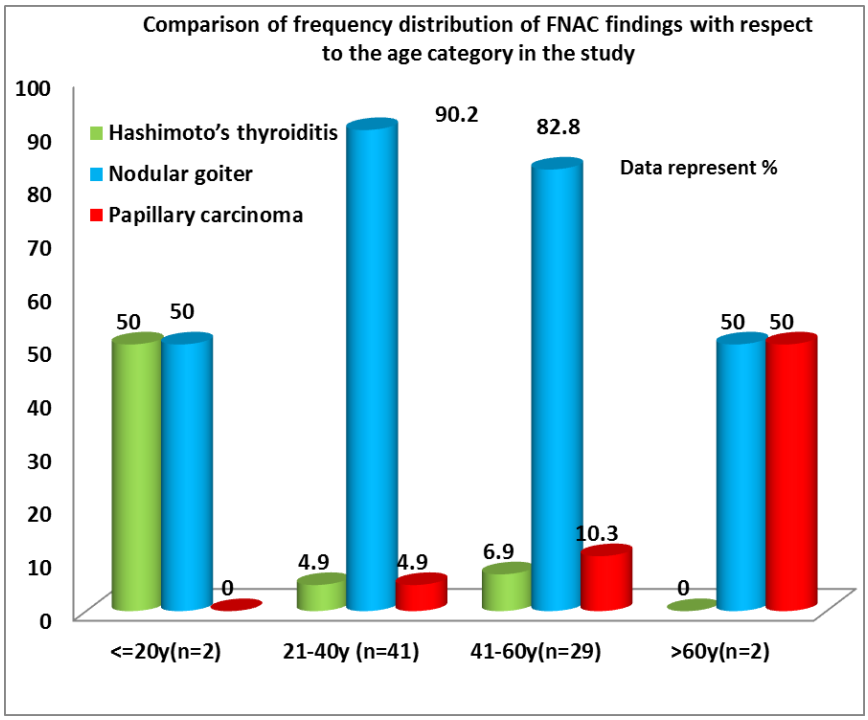
COMPARISON BETWEEN FNAC WITH AGE:

Table 18. Comparison of frequency distribution of FNAC findings with respect to the age category in the study.

S. No	FNAC findings	Age category								Chi square value	df	P value
		≤20y (n=2)		21-40y (n=41)		41-60y (n=29)		>60y (n=2)				
		n	%	n	%	n	%	n	%			
1	Hashimoto's thyroiditis	1	50	2	4.9	2	6.9	0	0	11.8	6	0.048*
2	Nodular goitre	1	50	37	90.2	24	82.8	1	50			
3	Papillary carcinoma	0	0	2	4.9	3	10.3	1	50			

Data are expressed as n with %. Fisher's exact test was used to compare the frequencies between the groups. *indicates $p<0.05$ and considered statistically significant.

The above table depicts the relationship between age group and FNAC finding. The p value of the relationship between age group and FNAC finding is 0.048, showing a significant relationship between the two variables.



DISCUSSION

For this study, 74 preoperative patients with diagnosis of single nodular goitre were considered for study, with data collected from them for the present study. Relevant investigations were done, along with Fine Needle Aspiration Cytology providing the key points for differential diagnosis.

In this study, 63 of the total 74 patients (85%) were female and 11 were male (15%). Antanio Rios-Zumbudio et. Al. (2004) in his study stated that 89% of the cases considered for his study were female patients. Nagori et. Al. (1992) in his study stated that in his sample of patients suffering from single nodular thyroid, maximum number of patients were seen in the age group of 40-50 years old, of about. In the present study, maximum occurrence was seen in the age group of 21-40 years old with 55.4%, followed by 40-60 years old, with 39% of patients in this category. The patients considered for the present study all showed swelling as a symptom (100%) and only 15 (20%) of the patients showed pain as an associated symptom. Only 8% of patients stated that they had a familial history of thyroid disorders with at least one of their close blood-relations with some thyroid disorder. 92% stated no incidence of thyroid disorders in their family. R.L. Gupta in his study found the prevalent in the right side and were seen in 54% of patients. In the present study, 73% of patients showed right sided solitary nodule thyroid.

CONCLUSON:

- Females were apparently more vulnerable to SNT than male patients, the percentage of female patients being 85% and 15% patients being male.
- The age group most vulnerable to SNT seems to be in the age group of 21-40 years old patients with 54% of patients with SNT belonging to this age group.
- A swelling was experienced by all the patients (100%), while the symptom of pain was only experienced by only 20.2% of all patients.
- Familial occurrence of thyroid disorders proved invaluable for the study as a majority of patients with SNT(92%) denied the occurrence of any such thyroid disorders in any of their close blood relatives and 8% of the patients stated that there was a closely related blood relation with some thyroid disorder.
- SNT show a laterality towards right lobe, with SNT present in right lobe of 73% of patients with a decreased affinity to occur in left lobe seen in the left lobe of 27% of the patients.
- Hypothyroidism was seen in 20% of patients with SNT while euthyroid status was predominantly seen in 80% of the patients.

- From the findings of FNAC, it was evident that the most common disorder seen in the past history of the patients was colloid nodular goitre, being the most prevalent lesion and papillary carcinoma being the most common malignancy.
- For benign tumours, non-surgical management with prognostic follow up is the most sought-after mode of treatment that surgical procedures that may provide therapeutic and even diagnostic purposes.
- Further, the analysis of the data collected for the present study, as revealed by FNAC, states that nodular colloid goitre and follicular adenoma are the main precursor of benign variety of SNT as they were seen in the past history of patients with benign SNT, while papillary carcinoma was seen prior to development of malignant SNT.
- Management strategies depends on the results from HPE, which provides the final diagnostic proof.
- As SNTs respond better to treatment and usually shows increased survival rate than other thyroid malignancies, prognosis is indispensable for follow-up treatments.
- For the management of Solitary Nodule of thyroid, the improvised surgical procedure performed is hemithyroidectomy. As for other and

all thyroid malignancies, completion thyroidectomy is conventionally performed on patients.

- The requirement to perform another surgery is made unnecessary by frozen sections and is of utmost importance.
- The hazards of thyroidectomy should be vividly described to patient listed for thyroidectomy during counselling preoperatively especially the risk of recurrent Laryngeal nerve paralysis.

LIMITATIONS

- The acquired sample taken for the present study of 74 patients is too - small to be reliably accurate.
- The range taken for age groups of patients were too large and contained a huge fraction of the patients, i.e. 21-40 and 41-60 together contributed to 94% of all patients taken for the study. This may be due to complementary effect caused by small sample space and large range for age group.

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ANNEXURE

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LIST OF ABBREVIATIONS

USG	-	Ultrasonogram
FNAC	-	Fine Needle Aspiration Cytology
ANDI	-	Aberration in Normal Development and Involution
ER	-	Estrogen Receptor
ERE	-	Estrogen Receptor Elements
SERM	-	Selective Estrogen Receptor Modulator
FSH	-	Follicle Stimulating Hormone
LH	-	Luteinizing Hormone
OR	-	Ormeloxifene
PL	-	Placebo
R	-	Right
L	-	Left
B/L	-	Bilateral
F	-	Female
Y	-	Yes
N	-	No

PROFORMA

PARTICULARS OF THE PATIENTS:

- Name
- Sex
- Age
- Occupation
- Address

COMPLAINTS AND DURATION

HISTORY OF PRESENTING ILLNESS:

- Swelling
- Pain
- Pressure symptoms
- Hyper/hypothyroidism
- Toxic symptoms
- Cervical Lymphadenopathy

PERSONAL HISTORY

FAMILY HISTORY

PAST HISTORY

MENSTRUAL HISTORY

GENERAL EXAMINATION

VITAL DATA

- Pulse
- Bp

LOCAL EXAMINATION

- Inspection
- Palpation
- Percussion
- Auscultation
- Regional lymph nodes

OTHER SYSTEMS

- Cvs
- Rs
- Abdomen

INVESTIGATIONS:

- Ultrasound neck
- FNAC
- Indirect laryngoscopy

ஆராய்ச்சிக்கான ஒப்புதல் கடிதம்

"CLINICAL PROFILE OF SOLITARY NODULE GOITRE"

புறநோயாளி எண் : தேதி :

பெயர் : வயது :

இனம் : ஆண் / பெண்

இந்த ஆய்வின் நோக்கம் மற்றும் விவரங்கள் எனக்கு தெளிவாக அறிவிக்கப்பட்டது. எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்துகொண்டு நான் என் விருப்பத்தினைத் தெரிவிக்கிறேன்.

இந்த ஆய்வின் நன்மைகளைப் பற்றி மருத்துவர் மூலம் தெரிந்துகொண்டேன்.

இந்த ஆய்வில் பிறரின் நிர்பந்தமின்றி என்னுடைய சொந்த விருப்பத்தின்பேரில் பங்கு பெறுகிறேன் மற்றும் நான் இந்த ஆய்விலிருந்து எப்போது வேண்டுமானாலும் விலகிக் கொள்ளலாம் என்பதனையும் அறிந்துகொண்டேன்.

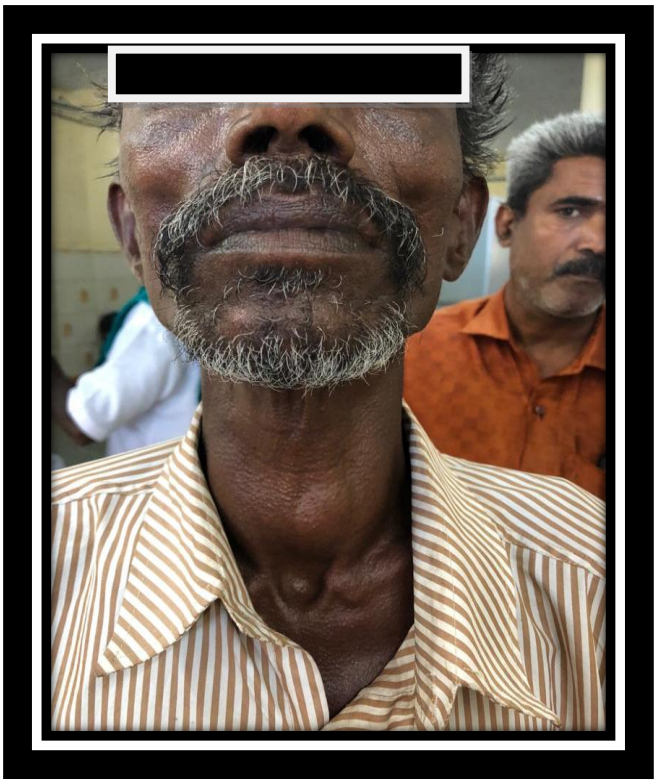
நான் என்னுடைய விருப்பத்தின்பேரில் முழு ஒப்புதலுடன் இந்த மருத்துவ ஆய்வில் என்னை சேர்த்துக்கொள்ள சம்மதிக்கிறேன்.

மருத்துவர் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

நாள் :

இடம் : தஞ்சாவூர்.

PHOTOGRAPHS



SI.NO	NAME	AGE	GENDER	CLININCAL		DURATION	FAM H/O	PREV MED	COMORDITIES	SIDE	HYPOTHYROIDISM	FNAC
				SWELLING	PAIN							
1	KAVITHA	38	F	P		4	p	NO	HT	R		NG
2	RONIKA MARY	40	F	P		7		NO	NO	R		NG
3	DHAVAMANI	31	F	P	P	8		YES	NO	L		NG
4	DEEPA	38	F	P		6		NO	NO	R		NG
5	PANDIAN	55	M	P	P	2		NO	HT	R		PC
6	PAVALAKODI	37	F	P		3		NO	NO	L		NG
7	MOHANA SUNDARI	34	F	P		4		NO	NO	R		NG
8	JEEVA	39	M	P		5		NO	HT	R		NG
9	PARAMESHWARI	48	F	P		5	p	YES	NO	R		NG
10	SARALA	26	F	P		3		NO	NO	R	P	NG
11	MURUGESAN	37	M	P		1		NO	NO	R		NG
12	RAMADOSS	29	M	p		1		NO	NO	R	P	NG
13	VELLAIYAMMAL	43	F	P		12		YES	NO	R		NG
14	IRUDHAYAMARY	55	F	P		24		YES	NO	R		NG
15	DEVI	48	F	P		10		NO	NO	L		NG
16	KAMALI	18	F	P		2		NO	NO	R	P	NG
17	SEETHALAKSHMI	45	F	P		8		NO	DM	R		NG
18	RAJESHKANNAN	28	M	P	P	9		NO	NO	L		PC
19	RADHA	35	F	P		7		NO	NO	R		NG
20	MAITHYLI	48	F	P		2		NO	NO	L		NG
21	MALLIKA	50	F	P		14		NO	NO	L		NG
22	SAYAMANI	50	F	P		16		NO	HT	R		NG
23	BACKIYAM	52	F	P		15		NO	HT	R		NG
24	CHINNAPPAN	55	M	P		20		NO	DM	L		PC
25	RAJESHWARI	40	F	P	P	3		NO	DM	R	P	NG
26	MASILAMANI	40	M	P		4		NO	NO	L		NG
27	SELVI	54	F	P		5		NO	NO	R	P	HT
28	CHITRA	43	F	P		24		NO	NO	R		NG

29	VEERAMANI	27	M	P	P	1		NO	NO	L		NG
30	MEGALA	37	F	P		2	p	YES	NO	R	P	NG
31	RATHIKA	34	F	P		5		YES	NO	L		NG
32	NAGALAKSHMI	56	F	P		36		NO	NO	L		NG
33	CHITRA	40	F	P		9		NO	DM	R	P	NG
34	DHANALAKSHMI	37	F	P	P	5		NO	NO	R		NG
35	GOMATHY	38	F	P		4		NO	NO	R		NG
36	KALAISELVI	37	F	P		12		NO	NO	R		NG
37	SEVANTHI	35	F	P	P	10		NO	NO	R		NG
38	RAMYA	24	F	P		3		NO	NO	R	P	NG
39	YELAMBAL	37	F	P		4		NO	HT	R		NG
40	SHEELA DEVI	30	F	P		5	p	NO	NO	R		NG
41	KAVITHA	35	F	P	P	1		NO	NO	L	P	HT
42	KASIYAMMAL	35	F	P		12		NO	DM	R		NG
43	RAJA KUMARI	38	F	P		4		NO	NO	R		NG
44	JAGATHAMBAL	47	F	P		15		NO	NO	L	P	NG
45	SARATHA	50	F	P		36		NO	NO	R		NG
46	SARULATHA	30	F	P		1	p	YES	NO	R		NG
47	ARUMUGAM	45	M	P	P	2		NO	DM	R		NG
48	NEELAVATHY	45	F	P	P	8		NO	NO	R	P	HT
49	CHELLAMMAL	50	F	P	P	16		NO	NO	R		NG
50	LATHA	42	M	P		2		NO	NO	R	P	NG
51	PORSELVI	40	F	P		10		NO	NO	R		NG
52	SANTHADEVI	45	F	P		11	p	NO	NO	L		NG
53	VIMALA	35	F	P	P	3		NO	NO	L		PC
54	AMUTHA RANI	27	F	P		2		YES	NO	R	P	NG
55	RENUGA	38	F	P		3		YES	DM	R		NG
56	DEVI	40	F	P		9		NO	NO	R		NG
57	MATHIVAANAN	27	M	P	P	1		NO	NO	L		NG
58	JAYASELI	16	F	P	P	1		NO	NO	R	P	HT
59	AROKIYA MARY	40	F	P		2		YES	NO	R		NG
60	CHANDRA	50	F	P		16		YES	NO	R		NG
61	VIJI	28	F	P		2		YES	NO	L		NG

62	VIJAYAKUMARI	29	F	P		3		NO	NO	R		NG
63	NATHIYA	26	F	P		4		NO	NO	L	P	HT
64	SHANTHYA	45	F	P		3		NO	DM	R		NG
65	GOKILA	33	F	P		1		NO	NO	R		NG
66	JENOVA MARY	54	F	P		18		NO	HT	R		NG
67	KAMALA	45	F	P		4		NO	NO	R		NG
68	SUSEELA	65	F	P	P	7		YES	NO	R		NG
69	MARIYAMMAL	60	F	P		8		NO	NO	L		NG
70	UPPILIYAYEE	65	F	P	P	8		NO	HT	L		PC
71	CHANDRA	50	F	P	P	9		NO	NO	R		NG
72	BANUMATHY	45	F	P		3		NO	NO	R		NG
73	MEERA	32	F	P		3		NO	NO	R		NG
74	KALAA	45	F	P	P	7		YES	NO	R		PC