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STATISTICAL ANALYSIS OF THYROID DISORDERS IN SURGICAL PATIENTS – YEAR 2005

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DECLARATION

I, **Dr. R. MANIMARAN** solemnly declare that the dissertation titled "**STATISTICAL ANALYSIS OF THYROID DISORDERS IN SURGICAL PATIENTS – YEAR 2005**" has been prepared by me at Department of Surgery, Madurai Medical College, Madurai, in partial fulfillment of the regulation for the award of **M.S. (GENERAL SURGERY)** degree examination of The Tamil Nadu Dr. M.G.R. Medical University, Chennai to be held in September 2006.

Place: Madurai

Date:

CERTIFICATE

This is to certify that this dissertation entitled "**STATISTICAL ANALYSIS OF THYROID DISORDERS IN SURGICAL PATIENTS – YEAR 2005**" is a bonafide record of work done by **DR. R. MANIMARAN,** under my guidance and supervision in the Department of General Surgery, Madurai Medical College, Madurai during the period of his Postgraduate study for M.S. General Surgery from 2003-2006.

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CONTENTS

INTRODUCTION

Thyroid is the largest and most easily accessible gland. Enlargement of thyroid gland (Goitre) is a common problem and attracted the attention of surgeons and provides a great deal of work and interest for them.

The following sections deal with anatomy, Physiology, pathogenesis of various thyroid disorders and their prevalence in our institution in the year 2005.

AIM OF THE STUDY

1. To analyse the incidence of various types of thyroid disorders in relation to age and sex.

2. To find out the incidence of thyroid disorders in and around Madurai.

HISTORICAL ASPECTS

The thyroid gland, previously referred to as the ‘laryngeal gland’, was so named by Wharton in 1646, because of either its own shield like (thyreos, shield) shape or the shape of the thyroid cartilage, with which it is closely associated.

Classical descriptions of hyperthyroidism, or exophthalmic goiter were presented by parry (1825), Graves (1835) and Von Basedow (1840).

Hypothyroidism or myxedema was described by curling (1856) and Gull (1875).

Schiff in the middle of the nineteenth century conducted experiments demonstrating the importance of thyroid gland.

In 1882 Reverdin produced experimental myxedema by total or partial thyroidectomy.

In 1890s Murray and Howitz successfully treated myxedema with thyroid extract.

Theoder Kocher, who is regarded as the father of Thyroid Surgery, had performed thyroidectomy operations in the late 1800s. Over 2000 times with only a 4.5 percent mortality. He also described ‘Cachexia Strumapriva i.e., myxedema, which he noted as a sequele in 30 of his first 100 thyroidectomies.

In 1909 Nobel Prize was awarded to Theodor Kocher for his pioneering efforts in the field of thyroid surgery.

The first successful transplantation of thyroid was reported by Payr in 1906 who transplanted a portion of the gland from a woman into the spleen of a myxedematous daughter with successful results.

Isolation of thyoxine hormone was accomplished by Kendall in 1914.

Medullary carcinoma of thyroid was first described by J.Hazard et al in 1959.

As a resident J.Sipple was asked to see a patient with hypertensive crisis after Neurosurgical operation. But the patient died. At the autopsy

J.Sipple found large bilateral pheochromocytomas, thyroid tumours and an enlarged parathyroid gland (MEN II A).

In 1962 D. Copp et al described calcitonin as a new hormone that lowered the blood calcium. They thought calcitonin was secreted from the parathyroid, but 2 years later, it was shown that parafollicular cells (C cells) of the thyroid were the orgin of this hormone.

In 1968 E.D. Williams and his group suggested that C cells were the origin of medullary carcinoma thyroid.

ANATOMY

EMBRYOLOGY

The thyroid gland develops as an endodermal tubular structure from the posterior aspect of the fetal tongue in the region of foramen caecum and grows downwards infront of the developing hyoid and larynx. Primordial cells from the neural crest migrate ventrally and become incorporated within the ultimo branchial body. The main body of the thyroid is joined by para lateral components pouches, which form the “C” cells.

SURGICAL ANATOMY

The normal thyroid gland which has an average weight of about 20-25g is convex anteriorly and concave posteriorly as a result of its relation to the antero lateral portions of the trachea and larynx around which it is wrapped and to which it is firmly fixed by fibrous tissue.

Thyroid gland consists of two lateral lobes connected by an isthmus. A variable sized, but usually small pyramidal lobe arises from the isthmus, some were along its upper border near the midline. The

thyroid gland is covered by fascia and the strap muscles and more laterally it is tucked under the diverging anterior borders of the sternocleidomastoid muscles.

The important anatomical features, with surgical relevance are:

1. THE MUSCULO FASCIAL COVERINGS

The strap muscles are ensheathed by the general investing layer of deep cervical fascia and this unites them in midline. These muscles are applied to the anterior surface of the gland but separated from it by a loose condensation of fascia derived from the pretracheal fascia. This false capsule covers the gland which is enclosed by a thick true capsule with its very rich blood supply. The thyroid gland is enclosed with in the pretracheal fascia which is attached to the thyroid cartilage. During deglutition thyroid cartilage moves up and down so, thyroid gland also moves up and down during deglutition.

2. BLOOD SUPPLY

Superior thyroid artery and vein

Each thyroid lobe is supplied by two arteries and drained by the veins. The Superior thyroid artery, is the first branch of external carotid

artery. Its accompanying vein drains into the internal jugular vein. The superior thyroid pedicle is occupied by this artery and vein.

The superior thyroid artery enters the upper pole of the gland at its apex with branches to the front and back of the gland. These superior vessels are easily dealt with surgically because the loose space between the two capsules is developed at the upper pole of the gland and a ligature is placed close to the upper pole to include both vessels and exclude the external laryngeal nerve.

The inferior thyroid artery

This artery arises from the thyrocervical trunk and ascends and passes behind the carotid sheath and then runs transversely across the space between this and the thyroid gland to enter the deep surface of the gland as several separate branches close to the tracheo thyroid groove. These terminal branches of inferior thyroid artery are uncomfortably close to the recurrent laryngeal nerve and the inferior parathyroid gland. If the inferior thyroid artery is to be ligated, it should be done in its transverse portion medial to the carotid sheath.

The inferior thyroid veins

These are always a few on each side leave the lower pole of the gland and pass through the loose fascial space to join the left brancheocephalic vein.

The middle thyroid veins

These are thin walled vessels leaving the middle of the gland and directly coursing laterally to pass infront of or behind the carotid artery and enter the internal jugular vein. It is the first vessel encountered in thyroidectomy operations.

The thyroidia ima Artery

It is usually arises from the Arch of aorta. It may also arise from the branchiocephalic trunk extending in front of the trachea. It is small and supply mainly the isthmus part of the gland.

Important close surgical relations of the thyroid gland

THE EXTERNAL LARYNGEAL NERVE

It is a branch of the superior laryngeal nerve which is a branch of vagus nerve, descends on the fascia of the inferior pharyngeal constrictor, relates closely to the superior vascular pedicle 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 to the pitch of the voice, because the cricothyroid muscle is the tensor of the vocal cords. Damage to this external laryngeal nerve alters the voice (Huskiness) significantly.

THE RECURRENT LARYNGEAL NERVE

It is a branch of the vagus nerve arising embryologically in relation to the 4^{th} aortic arch. Because of the descent of these vessels forming the subclavian artery on the right and the aortic arch on the left, the recurrent nerves are taken caudally and this run upward course to reach the vocal cord destination.

This nerve usually lies in the tracheo oesophageal groove and then bear a variable relationship to the branches of inferior thyroid artery, before entering the larynx. In the majority of cases, the nerve is found easily in the tracheo oesophageal groove just below the thyroid gland, but its course may be anomalous and it may be much more lateral.

Sometimes the recurrent laryngeal nerve may be non-recurrent because of the failure of development of 4^{th} arch vessel and a resultant

anomalous right subclavian artery. This non-recurrent laryngeal nerve passes directly medially at a much higher level from the vagus to the larynx. In this position it would be in danger at the time of ligation of middle thyroid vein.

Some times in 7% of cases the recurrent laryngeal nerve may pass in between the branches of the inferior thyroid artery. Sometimes in 8% of cases the nerve may be far anterior and may be embedded in the ligament of berry, which is of importance because traction on the gland would pull the nerve on stretch and make it subject to damage.

LYMPHATIC DRAINAGE

There is an extensive network of lymphatics within the gland. Some lymphatics pass directly to the deep cervical group of lymphnodes. The subcapsular plexus drains principally to the juxta thyroid nodes that is paratracheal (Delphian), pretracheal, prelaryngeal and nodes on the superior and inferior thyroid veins, thence to the deep cervical and mediastinal group of nodes.

Microscopic features of thyroid gland

The functioning unit of thyroid gland is the lobule supplied by a single arteriole and it consists of 30-40 follicles which are lined by cubical epithelium. The resting follicle contains colloid in which thyroglobin is stored.

SURGICAL PHYSIOLOGY

Thyroid hormone secretion is regulated by TSH from the anterior pituitary gland. Secretion of TSH is regulated by a negative feedback mechanism acting directly on the pituitary and is normally inversely related to the concentration of unbound hormone in the blood. Release of TSH is induced by TRH, secretion of which appears to set the level of pituitary feedback mechanism.

The thyroid gland has two physiologic functions,

1. Production of thyroid hormones and
2. Production of calcitonin (thyro calcitonin)

Thyroid hormone secretion is dependent on interplay between several processes including

1. Iodine metabolism
2. Production, storage and secretion of thyroid hormone by the thyroid gland
3. The effects of the thyroid hormones on various organ systems.

IODINE METABOLISM

The formation of thyroid hormones depends on the availability of exogenous iodine, which is normally supplied by dietary sources and is thus dependent on the iodine content of water and soil.

Ingested iodine is rapidly absorbed from the gastro intestinal tract usually within one hour. It is then distributed through the extra cellular space in the form of iodides and is extracted from the plasma by the thyroid gland. It is also excreted in kidney. The iodide absorbed by the thyroid gland is used for thyroid hormone synthesis. A small fraction of the iodine that had been removed from the extra cellular fluid by the thyroid gland is ultimately secreted back into the circulation as organic iodide.

SYNTHESIS AND SECRETION OF THYROID HORMONE

The following steps occur in the thyroid gland for the synthesis of thyroid hormones.

1. Concentration of iodide in the gland
2. Rapid oxidation of iodides to iodine.

3. The formation of precursor aminoacids, 3 mono iodo tyrosine (MIT) and 3-5, di-iodo tyrosine(DIT) and
4. The coupling of these inactive iodo tyrosines to form the hormonally active iodo throsines, triiodo tyrosine(T3) and thyroxine (T4).

The iodine transfer mechanism is influenced by TSH, which stimulates every step in thyroid hormone synthesis and secretion.

The hormonally active iodo-tyrosines, T4 and T3 are held in peptide linkage with a specific thyroprotein, thyroglobulin which form the major components of intra follicular colloid.

Release of the active hormones into the circulation involves hydrolysis of the thyroglobulin by proteases and peptidases, resulting in T4 and T3. The active thyroid hormones become attached to the plasma protein, the best known of which is the thyroid hormone binding globulin (TBG) and the more recently recognized thyroid hormone binding prealbumin (TBPA).

The Protein bound thyroid hormones released to the peripheral tissue and are responsible for metabolic actions.

PATHOLOGY

The normal thyroid gland is impalpable. The term GOITRE is used to describe generalized enlargement of the thyroid gland.

CLASSIFICATION OF THYROID SWELLINGS

SIMPLE GOITRE (EUTHYROID)

- Diffuse Hyperplasic
- Multinodular Goitre

TOXIC

- Diffuse (Grave's Disease)
- Multinodular
- Toxic adenoma

NEOPLASTIC

- Benign
- Malignant

INFLAMMATORY

- Auto immune thyroiditis – Hashimoto's thyroiditis
- Granulomatous thyroiditis – De Quervian's thyroiditis
- Riedel's thyroiditis

Infective

Acute (Bacterial, Viral)

Chronic (TB, Syphilis)

Sub acute

Other (Amyloid)

FORMATION OF NODULES

Iodine deficiency or goitrogens or hereditary factors leads to decrease in serum thyroid hormones which is followed by increased TSH which will produce Diffuse hyperplastic goiter. Then patient will become euthyroid. Because of normal thyroid hormones, TSH level drops down and goitre disappears usually by 21 years. If it persists after that, it is a colloid goitre with inactive follicles. Because of fluctuation of TSH level, mixed active and inactive follicles are formed. In active follicles, because of high vascularity, hemorrhage occurs with central necrosis. These necrosed follicles become nodules in future.

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 and sudden increase in size may be due to haemorrhage.

ADENOMA

Approximately 30% of the solitary nodule of thyroid is due to adenoma.

It is common in women

Rarely exceeding 3 cm in diameter

Firm, well defined, smooth swelling

Encapsulated

Slow growing

Commonest site is at the junction of one lobe and the isthumus.

Almost all adenomas are follicular variety.

Rare types are papillary cystadenomas, Hurthle cell adenomas.

Microscopically it resembles normal thyroid or may be composed of tightly packed acini or diffuse sheets of epithelial cells. It may contain large colloid filled acini or even be replaced by a single cyst.

Pressure symptoms may occur, 50% of the adenomas are cold nodules and remainder behave as a normal thyroid as warm nodule.

HISTOLOGICAL CLASSIFICATION

Type I

i. Embryonal

The follicles are premature, arranged in the form of cords.

ii. Fetal

Small follicles are closely packed with abundant connective tissue stroma.

i. Simple follicular

ii. Colloid adenoma

Type II

1. Micro follicular
2. Macro Follicular
3. Atypical adenoma

Adenomas attain certain size and remain in that because the expansile pressure restricts blood supply.

It may suddenly enlarge and painful because of haemorrhage. The nodule become hyperactive.

Adenoma, occasionally have some dependence on TSH. So it regresses after administration of Thyroid Hormones.

Usually there is no malignant transformation.

CARCINOMA

Papillary Carcinoma (70%)

Common in adults and children.

Responsible for 80% of the thyroid carcinoma occurring below 40 years.

More common in women.

It grows slowly; Metastasis to cervical lymph nodes are common.

About 10-20% may present as only cervical lympth node metastasis. The primary is often occult (Lateral aberrant thyroid). All the lesions below 1.5cm are called as occult.

Blood spread is unusual.

Prognosis is good, 10 year survival rate is about 70-80%.

Histology

Complicate branching tree like pattern of cells outlined by papilliferous axial fibrovascular stroma. Pale empty nuclei (Orphan annie eyed nuclei) and psammoma bodies are present. Papillary carcinoma is subjected to the influence of pituitary T.S.H.

Follicular Carcinoma (20%)

It is a well differentiated carcinoma of the thyroid but more aggressive than papillary carcinoma.

More common in women

Peak incidence occurs in 5^{th} and 6^{th} decade

Two Types

1. Encapsulated – less common
2. Invasive mass.

Encapsulated form is called angioinvasive encapsulated carcinoma. Hemorrhages, cystic degeneration and necrosis are common. Microscopically, picture is that of adenocarcinoma with considerable change in size and differentiation of glands. Blood spread occurs in 70%

of cases. Commonest sites are lungs, Bones, Brain etc. Regional lymph nodes are involved in only 5% of cases.

Medullary Carcinoma

Derived from parafollicular cells (C cells). It is an APUDoma. 80% occur sporadically, usually in adults.

10-20% occur in children and teenagers with associated syndromes.

MEN II b: MEN II a + Mucosal neuroma, morphonoid features, aganglioneurosis.

90% of patients secrete calcitonin; less frequently histamine, prostaglandins, ACTH and serotonin are secreted.

It may present as a single nodule or multiple nodules.

Sporadic forms occur in 5-6 decades, often present in advanced stage. Familial forms present in second decade, associated endocrine abnormalities bring the patient early.

Diarrhoea is present in upto 30% of patients

Metastasis is usually to regional nodes (50%), Lung, Liver and Bone.

Medullary carcinoma is not TSH dependent.

It does not take Radioiodine.

Stimulating calcitonin secretion by pentagastrin and calcium infusions can make diagnosis of medullary carcinoma.

Anaplastic Carcinoma

Usually occurs in 7^{th} and 8^{th} decades of life. It is a rapidly growing, locally infiltrative tumour with very poor prognosis.

It spreads by lymphatics and by blood stream. Two histological types are small cell carcinoma and giant cell carcinoma. 1 year survival is about 20%.

Other tumours like lymphoma, sarcoma and secondaries also occur in thyroid. Secondary tumour usually arise from kidney, Breast, Colon and Melanomas.

THYRODITIS

1. Hashimoto's Thyroiditis

It is an autoimmune thyroiditis

It is the commonest cause of goitrous hypothyroidism in places where iodine intake is adequate.

It is a major cause of non endemic goitre in children.

The goitre is due to thyroid growth stimulating immunoglobulins like autoantibodies to thyrotrophin receptors, follicular microsomes, thyroglobulin.

Thyroid parenchyma is replaced by fibrous tissue because of the infiltration by lymphoid cells, so eventually hypothyroidism develops.

Sometimes in the mid course, patient may develop thyrotoxicosis called hashitoxicosis.

More common in women at menopausal age, usually both lobes are involved. Nevertheless one lobe is larger than the other. It is lobulated, rubbery in consistency.

It may be associated with pernicious anemia, vitiligo, Rheumatoid arthritis etc.

Histology

Excessive replacement of parenchyma by lymphocytes, plasma cells, macrophages and lymphoid germinal centers.

Follicular cells are transformed into eosinophilic granular cytoplasmic cells called hurthle cell (or) oncocytes (or) Askanazy cells.

Diagnosis rests on measurement of serum autoantibodies, by Radio immuno assay. It is positive in over 85% of cases.

Lymphoma may develop in Hashimoto's thyroiditis

2. Subacute Thyroiditis (De Quervain's Thyroditis)

Causative agent is virus, probably mumbs virus.

Patient has flu like illness followed by pain and rapid onset of swelling of thyroid.

Swelling may be diffuse or asymmetrical, tender to Palpation. During active phase patient may develop hyperthyroidism then due to extensive destruction hypothyroidism develops.

Histology

Aggregation of macrophages, admixed with multinucleated giant cells.

3. Riedel's Thyroiditis

Aetiology unknown. There is extensive fibrosing reaction that destroys more or less all the thyroid gland. The fibrous tissue may extent beyond the capsule and involve other structures in the neck. More common in females.

It is characterised by painless enlargement of thyroid, woody hard in consistency, asymmetrical, pressure symptoms may be present especially tracheal compression.

It may be associated with retroperitoneal fibrosis, occasionally it may be associated with sclerosing cholangitis.

About 20-50% of the patient are hypothyroid.

Acute bacterial thyroiditis is rare. Commonest organism is staphylococcus.

TOXIC GOITRE

Diffuse toxic goitre / Grave's disease/primary toxic goitre

The increase in size of the gland seen in patients with Graves' disease is typically due to epithelial proliferation, an increase in stromal vascularity, and lymphocytic infiltration. This may be due to a focal thyroiditis reflecting the production of autoantibodies. Occasionally this condition progresses with increasing fibrosis to become Hashimoto's disease. Grave's disease is not simply the result of the action of increased TSH levels secondary to a primary defect in the hypothalamus or pituitary, as was once thought. Genetic predisposition and psychological trauma have a role, and seasonality of the disease may result from variation in dietary intake of iodine. In populations with a high dietary iodine intake such as in the fish-eating Japanese, Grave's is more common. There is now general agreement that the hyperthyroidism and goitre of Grave's disease is caused by antibodies directed against the TSH receptor on the thyroid cell membrane: these increase the action of TSH acting via the adenyl cyclase and cAMP system. This thyrotrophin receptor antibody was first isolated in 1956 from the serum of patients with Grave's disease, as a substance which, on injection into guinea pigs

caused prolonged stimulation of radioiodine release. The nature of its action resulted in the name long-acting thyroid stimulator (LATS). This has subsequently been identified as a IgG molecule produced by lymphocytes. The presence of IgG, IgM, and IgE in the thyroid, the lymphocytic infiltration of the gland, the generalized lymphadenopathy frequently seen in Grave's disease and the IgG nature of the thyrotrophin receptor support its recognition as an autoimmune process. There is strong evidence of a genetic predisposition associated with the HLA-A1, B8, and DW3 antigens in Caucasians. Class II antigens of the D locus on chromosome 6 are believed to be associated with the gene coding for this abnormal immune response.

Toxic multinodular goitre/plummer's disease/secondary thyrotoxicosis

Patients with long-standing nodular goitre often develop thyrotoxicosis. Excess thyroid hormones may be produced by the nodules themselves, by the paranodular tissue, or by a combination of both. Eye signs are usually slight and cardiac arrhythmias and cardiac failure more common than in Grave's disease; the reason for this is not known.

Solitary nodular toxic goitre / toxic adenoma / autonomous nodule

The distinction between multinodular and solitary nodular toxic goitres may be unnecessary but in approximately 5 per cent of thyrotoxic patients a single nodule consisting of hyperplastic epithelia and surrounded by acini in the resting phase is found. There is good correlation between the size of the nodule and the degree of hormone overproduction. Over production of T3, but not T4, is common (T3-toxicosis). Women are more likely than men to be affected with this type of goitre, and its maximum prevalence occurs between the ages of 40 and 60, although children may also be affected.

Recurrent nodular toxic goitre

Nodules associated with hormone overproduction may occur after thyroidectomy, suggesting that the causal factors are still prevailing.

DIAGNOSIS

Thyroid function tests

There are varieties of tests, available to assess the function of thyroid. No single test is diagnostic and therefore a combination of tests are indicated.

Measurement of thyroid hormones in serum

Total T_4 and T_3 represent total protein bound T_4 and T_3 and are not measurements of free active thyroid hormones. Total T_4 and T_3 are influenced by the Thyroxine binding proteins in the serum. False high levels are seen in pregnancy and those who are taking oral contraceptive pills. False low values are seen in hypoproteinemic states such as nephrotic syndrome. Drugs such as salicylate, pencillin compete with T_3 and T_4 for protein binding. So measurements of free T_3 and T_4 by Radioimmuno assay is specific.

Serum protein bound Iodine (PBI)

Normal range 3-5.8mg/ml. It lacks specificity in that it measures non hormonous forms of iodine in the blood. False positive results are

seen in pregnancy, persons taking iodides, expectorants containing potassium iodide and in those taking oral contraceptive pills.

Indirect method of measuring Thyroid hormones

T_3 resin uptake

Patient's serum is incubated with ratio active T_3 so that the latter become fixed to unoccupied sites of thyroid binding globulin. Naturally in hyperthyroidism, the unoccupied sites are low and in hypothyroidism the unoccupied sites are high. Then a secondary binder, a resin is added to the system. Resin uptake of T_3 is more in thyrotoxicosis and low in hypothyroidism. The test serves as indirect measurements of unbound T_4. From this, free thyroxine index can be calculated.

Measurement of serum TSH

Normal range is 0.3 to 5 mu/L.

Levels over 40mu/L are present in gross thyroid deficiency. The test is invaluable in the early detection of mild degree of hypothyroidism seen after surgery for thyrotoxicosis or after radio iodine. Sensitivity in the range of 0-5mu/L is poor. More accurate assays are now available.

Estimation of these low concentration aids the distinction of hyper thyroidism from euthyroidism.

TRH Test

When thyroid hormones are high as in hyperthyroidism, TSH is suppressed and IV injection of TRH does not result in rise of TSH. When thyroid hormones are normal or low, TRH injection increases TSH level.

Serum TSH is estimated at the beginning of the test and again 20 minutes and 60 minutes after injection of 200mg of TRH. In thyrotoxicosis TSH level remains below 2.5mu/L. In euthyroid TSH level increase just above the basal level. In hypothyroid there is an exaggerated response. This test is infrequently used but it is useful if thyroid hormones and TSH levels are discrepant, i.e., hypothyroidism due to pituitary or hypothalamic diseases.

Radio active Iodine uptake test (RAIU)

RAIU indicate rate of thyroid hormone synthesis and release. 5-25mci of radioiodine I^{123} is given orally. Then after 24 hours thyroid content of I^{123} is measured by a counter. It is measured after 24 hours

because it is convenient to the patient and also the value at 24 hours is usually near its plateau. But in very severe hyperthyroidism, measurement is taken earlier since the uptake and release is rapid.

Increased RAIU

Inference is increased hormone synthesis.

Causes

1. Hyperthyroidism (Except T3 toxicosis and increased body iodine)
2. Aberration in hormone synthesis. eg. Ineffectively or inefficiently used Iodine.
3. Acute or chronic Iodine deficiency.
4. Withdrawal of factors that lead to thyroid hormone depletion. eg. Withdrawal of antithyroid drugs, recovery from subacute thyroiditis, withdrawal of exogenous hormones.
5. Compensatory increase in hormone synthesis after hormone loss eg. Nephrosis, chronic diarrhoea, soya bean ingestion.

Decreased RAIU

i. Hypothyroidism

ii. Antithyroid agents

iii. Primary biosynthetic defects of hormones

iv. Hashimoto's disease

v. Subacute thyroiditis

vi. Exogenous

vii. Increased availability of Iodine

External scintiscanning (Thyroid scan)

With appropriate apparatus, isotopically labelled materials, that are differentially accumulated by thyroid tissue can be detected and quantified in situ and the data transformed into a visual display.

Radio isotopes used are 99^{m} TC-per technetate, I^{131}, I^{125}, I^{123}.

99mTC per technetate

Actively concentrated by the thyroid. But unlike Iodide, it undergoes negligible organic binding. Half life is 6 hours. It delivers very low radiation to the thyroid tissue. So it provides information about iodide transport function of thyroid and not about organic binding and retention. Also stay in the thyroid is brief and imaging done early, so that radiation from intravascular sources or from salivary tissues obscure findings. It is inappropriate for metastasis and substernal goitre.

Route

Single I.V. Bolus and imaging performed 4-6 hours later. Apparatus used is scintillation camera.

I^{125}

Half life is 60 days. Its low energy emissions preclude scanning from deep sources such as substernal goitre or distant metastasis.

I^{123}

Half life is 13 hours. Radiation to the thyroid tissue is about 1% since there is absence of Beta radiation. So it is the ideal Isotope.

I^{131}

Half life is 8 days. Useful to find out functioning metastatic lesions of thyroid carcinoma.

Uses of scan

To define areas of increased or decreased function (Hot or Cold) relative to the function of the remainder of the gland provided these areas are 1 cm or more in diameter. Better visualisation of small nodules

can be achieved by oblique or lateral view along with anteroposterior view.

Though majority of non functioning nodules are not malignant, lack of function increases the likelihood of malignancy particularly only one nodule is present. Conversely hot nodules are unlikely to be malignant.

Scintiscans obtained after administration of exogenous TSH may be useful in documenting the intrinsic functional capability of suppressed thyroid nodules.

Scans performed after exogenous thyroid hormone administration (suppression scans) can reveal autonomous nodules.

They are also useful in detecting retrosternal goitres and ectopic thyroid tissue in the mediastinum or ovary.

The most important use is to know metastasis from thyroid carcinoma.

Serum thyroglobulin

Normal value is 10mg/ml. Concentration is higher in females, pregnant woman and new born.

Elevated levels are found in three thyroid disorders.

i. Those with nontoxic goitre and thyroid hyperfunction.
ii. Thyroid injury and subacute thyroidits.
iii. Differentiated thyroid tumours.

The major clinical use is in the management of differentiated carcinoma. Serum thyroglobulin is increased in both benign conditions and in differentiated carcinoma but it can not differentiate between the two. Following removal of tumours, values decreases to normalcy. The residual mass or with metastasis, thyroglobulin level increases. So it is a prognostic index rather than a diagnostic tool.

Needle biopsy

It is a valuable technique for the diagnosis and management of solitary nodule.

i. Large bore Needle Biopsy

In this a core of tissue is removed for histological examination using trucut needle. Even though it yields adequate tissue for histopathological examination, the disadvantages are pain, haematoma, tracheal damage, recurrent laryngeal nerve palsy. It is now superseded by FNAC.

ii. Fine Needle Aspiration Cytology (FNAC)

This technique has been popular in Scandinavia for more than 25 years, but has gained popularity in USA and UK only in recent years.

This has excellent patient compliance, simple and quick to perform in the outpatient department and is readily repeated.

Thyroid conditions that are readily diagnosed by FNAC include colloid nodules, thyroiditis, papillary carcinoma, medullary carcinoma, lymphoma.

FNAC can not distinguish between a benign follicular adenoma and follicular carcinoma as this distinction is dependent not on cytology but on histological criteria which include capsular and vascular invasion.

There has been few false positives with respect to malignancy but there is a definite false negative rate with respect to both benign and malignant neoplasia.

FNAC is less reliable in cystic than in solid swellings often yielding only fluid with macrophages and degenerated cells. After aspiration, further sample is taken from cyst wall.

Taking account of age and sex, cytological appearance on FNAC may increase or decrease the suspicion of malignancy but there is only one certain diagnostic procedure, i.e. excision. Excision entails total lobectomy and isthumectomy. Local excision is absolutely contraindicated.

Ultrasound

This is of limited value in the diagnosis of malignancy but it can differentiate between solid and cystic nodules and will often detect other impalpable nodules.

High resolution sonography using 10MHz transducer can detect subclinical solid thyroid nodules larger than 2-3 mm in diameter and cysts of 1 mm.

C.T. and M.R.I

Has only a small role to play in the day to day management of thyroid disorders.

Fluorescent scanning

This requires a collimated source of photon radiation (241Am) which results in characteristic 28.5Kv Xray emission from any iodine atoms in the filed. The number of X-rays detected is proportional to the amount of iodine present.

In solitary nodule, the ratio of iodine contact in the nodule compared to opposite lobe may be used to distinguish benign from malignant lesions.

Thyroid auto antibodies

Auto immunity plays a role in the pathogenesis of Hashimoto's disease and graves disease. Following antibodies can be detected,

microsomal antibody, thyroglobulin antibody, long acting thyroid stimulator (LATS). These antibodies give information in the etiology of thyrotoxicosis.

Tumor Marker

Serum calcitonin is diagnostic of medullary carcinoma and also used as a prognostic indicator.

Plain X ray

X ray neck shows soft tissue shadow, calcification and compression of trachea. In retrosternal goitre, soft tissue shadow can be clearly defined by convex lateral margins.

X ray chest may show secondaries.

Miscellaneous tests

Tests for metabolic indices.

i. BMR

Heat loss is measured by measuring the oxygen consumption under basal condition by indirect method. Hyperfunction is associated with increased oxygen consumption.

Normal value is between -10 and +10.

ii. Serum Cholesterol

Normal value 150-240mg%.

MATERIALS AND METHODS

The study was done during the period from January 2005 to December 2005 in the Department of Surgery, Surgical Endocrinology and Surgical Oncology, Government Rajaji Hospital, Madurai. All the patients admitted in Government Rajaji Hospital were examined clinically, patients with thyroid swellings were selected for the study.

Ultrasonogram, X-ray neck-Anteroposterior and lateral views, thyroid profile tests, ENT examination were done for all the patients.

FNAC was done for all. Post operative histopathological examination reports were reviewed and the diagnosis confirmed. According to that, distribution of thyroid disorders estimated.

RESULTS AND DISCUSSION

The study of analysis of thyroid disorders was done in 340 patients, who have been admitted in Government Rajaji Hospital, Madurai from January 2005 to December 2005.

Sex incidence

Out of 340 patients, 312 were female patients and only 28 of them were male patients with striking female predominance.

Female : male = 11.14:1

Distribution of various disorders

Diffuse goitre	4	
Solitary nodular goitre	117	
Multinodular goitre	94	
Toxic SNG	-	
Toxic MNG	48	
Toxic diffuse goitre	8	
Carcinoma	41	
Thyroiditis	11	
Thyroglossal Cyst & fistula	11	others
Thyroid cyst	2	
Lingual thyroid	1	
Recurrent SNG	1	
Recurrent carcinoma	2	
Total	340	

Distribution according to sex

	Female	**Male**
Diffuse goitre	3	1
SNG	114	3
MNG	86	8
Toxic SNG	-	-
Toxic MNG	45	3
Toxic diffuse goitre	8	-
Carcinoma	32	9
Thyroiditis	11	-
Others	13	4

Age incidence

	≤20	**21-30**	**31-40**	**41-50**	**>50**
Diffuse goitre	-	1	3	-	-
SNG	11	41	33	20	12
MNG	5	34	26	15	14
Toxic SNG	-	-	-	-	-
Toxic MNG	1	18	14	12	3
Toxic diffuse goitre	1	2	2	2	1
Carcinoma	2	8	9	4	17
Thyroiditis	-	7	3	-	1
Thyroglossal cyst & fistula	6	3	-	-	-
Thyroid cyst	1	-	-	1	-
Lingual thyroid	1	-	-	-	-
Recurrent SNG	-	-	1	-	-
Recurrent carcinoma	-	-	-	-	2

Solitary nodular goitre

Because of increasing incidence of SNG, it has been given special importance here.

Out of total 340 patients 117 were SNG, approximately 35% of total thyroid cases.

Age / Sex break up

Age	Sex	
	Male	Female
≤20		11
21-30	1	41
31-40		33
41-50	1	20
>50	1	12

Carcinoma Thyroid

Out of 340 total patients, carcinoma thyroid accounts for 41 cases. Out of 41 cases,

Papillary Carcinoma	-	37
Follicular Carcinoma	-	3
Medullary Carcinoma	-	-
Anaplastic Carcinoma	-	-
Lymphoma	-	1

Age / Sex Break up

S.No	Age	Sex		Papillary CA	Follicular CA	Lymphoma	Medullary CA
		M	F				
1	≤ 20	-	2	2	-	-	-
2	21-30	-	8	7	1	-	-
3	31-40	3	9	9	-	-	-
4	41-50	1	4	3	1	-	-
5	>50	5	18	16	1	1	-

REVIEW OF LITERATURE

1. US CENSUS BUREAU, Population estimates, 2004

Thyroid disorders overall	-	7.35%
Hashimotos thyroiditis	-	0.55%
Grave disease	-	1.12%
Auto immune thyroiditis	-	2%

US CENSUS BUREAU, International data base, 2004

INDIA	-	81,055

(extrapolated incidence of overall)

2. ETIOP. MED. JOURNAL 2003(Messele.G)

Total patients	-	334
Multinodular goiter	-	54.2%
Solitary nodular goiter	-	23.1%
Toxic goiter	-	11.4%
Thyroid cysts	-	2.7%
Thyroiditis	-	4 patients only

3. CIR. ESP 2005 (Lucena JR) Venezuela

Thyroid cancer patients studied - 85

Well differentiated cancer - 84.5%

4. EUR .JOU. ENDOCRINE 2000.Nov (Bjoro.T)

Female : Male ratio

In hyperthyroidism - 2.5 : 0.6

Hypothyroidis - 4.8 : 0.9

Non toxic goiter - 2.9 : 0.4

In both sexes, prevalence increased with age

5. ASIAN JOURNAL OF SURGERY 2002(Dorairajan)

Thyroid cancer study,

Female : male-3 : 1 (328 :100)

6. Norman A Matheson

Rate of papillary carcinoma among the malignant lesions is 87.5%.

7. Tajdine MT, Marac.

Study of 100 cases of multinodular goiter

MNG accounts for 6% of all goiters

Sex ratio - clearly female preponderance

Mean age of presentation- 50 years.

On review of the above said literature, the age, sex and pathological incidence are found to be the same as in our series.

CONCLUSION

i. Overall incidence of thyroid disorders is increasing in our part of the world.

ii. Thyroid disorders occur more commonly in females than males.

iii. Most of the thyroid disorders are benign. Malignancy accounts for 12% only.

iv. Most of the patients present with solitary nodular goitre, which accounts for 35%.

v. Most of the thyroid disorders present in third and fourth decades, excluding malignancy.

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PROFORMA FOR INDIVIDUAL CASE

Name: Age Sex

Address:

Occupation

Complaints

History of present illness

1. Mode of onset of the swelling – sudden / insidious
2. Associated with Pain / Fever
3. Mode of Progress : gradual / slow / rapid / remission
4. Episode of sudden increase (Yes / No)
5. Features of hypo / hyperthyroidism / Palpitation / Tremor / Increased sweating / Appetite / Weight gain or loss / Intolerance to Cold or Hot/ Anxiety / Bowel habits / sleep disturbance
6. Pressure symptoms

   Voice change Yes / No

   Dysphagia, Dyspnea Yes / No
7. H/o Cough. Yes / No

Past History

- Any similar problem before
- H/ o irradiation to head / neck area

Personal History

Diet History (to enquire specifically for Iodine deficiency)

Menstrual History

To enquire about (Menorrhagia / Oligomenorhea)

Family History

- To see whether it is sporadic / Endemic goiter
- To find out any genetic predisposing factors to carcinoma of thyroid

Physical examination

I General Study

- Nourishment :- ill nourished / obese
- Alert / Lethargic / hyperkinetic
- Temperature (Febrile / A febrile)
- Dyspnea
- Pedal oedema
- Eye sings (Lid Retraction / Exopthalmos / Opthalmoplegia / Chemosis)
- Tremors (hand , Tongue)
- Pretibial myxedema (Yes/ No)

- Skin whether it is warm & clammy / cold & dry / Rough & scaly
- Pulse Rate
- Respiratory Rate
- Blood pressure

II. Local examination of neck

a) Inspection

- Site
- Shape
- Size
- Single / Multiple
- Extent (Any Restrosternal extension present or not)
- Skin condition (Stretched, Inflamed, Scar, Sinus)
- Subcutaneous (Yes / No)
- Movement with deglutition
- Movement with Progression of tongue
- Plane of the swelling (Behind the sternomastoid / Ribbon muscles)
- Tracheal position

B) Palpation

- Site, Size, Shape, Extension
- Surface (Nodular / Smooth)
- Consistency

- Tenderness & Warmth

- Tracheal Position (Pushed to same side / Pulled to same side /

  No change)

- Cartoid pulse (Position / Volume)

- Skin (Pinchable / Not)

C) Percussion

On either side of manubrium sterni if retrostrenal extension is thought.

d) Auscultation:

Bruit in the superior pole / over the vessels

e) Examination of Regional lymph node

Cervical

Pre / para tracheal

Other node

iii. Examination of other system

a) Respiratory system - Tracheal position

- any evidence of pleural effusion

- Air entry on both side

b) Cardiovascular system

Pulse - Rate / Rhythm / Volume

- Heart rate / Rhythm

- Any murmur

c) Abdomen

1. Hepatomegaly Yes / No

2. Free fluid

d) CNS

e) Skeletal system

Provisional diagnosis

Investigation

a. Urine –Alb/Sug / deposit

b. Hematology

1. Hb%
2. Total count
3. Differential count
4. E.S.R
5. Blood group / Rh typing
6. BT, CT

c. Biochemistry

1. Blood urea / sugar
2. Serum Creatinine
3. Serum cholesterol

d. Thyroid function test

T_3, T_4, TSH Auto Antibodies

e. Radiology

- X ray neck AP

  Lat

- X ray chest PA view

f. ECG

g. Ultrasound of neck

h. FNAC

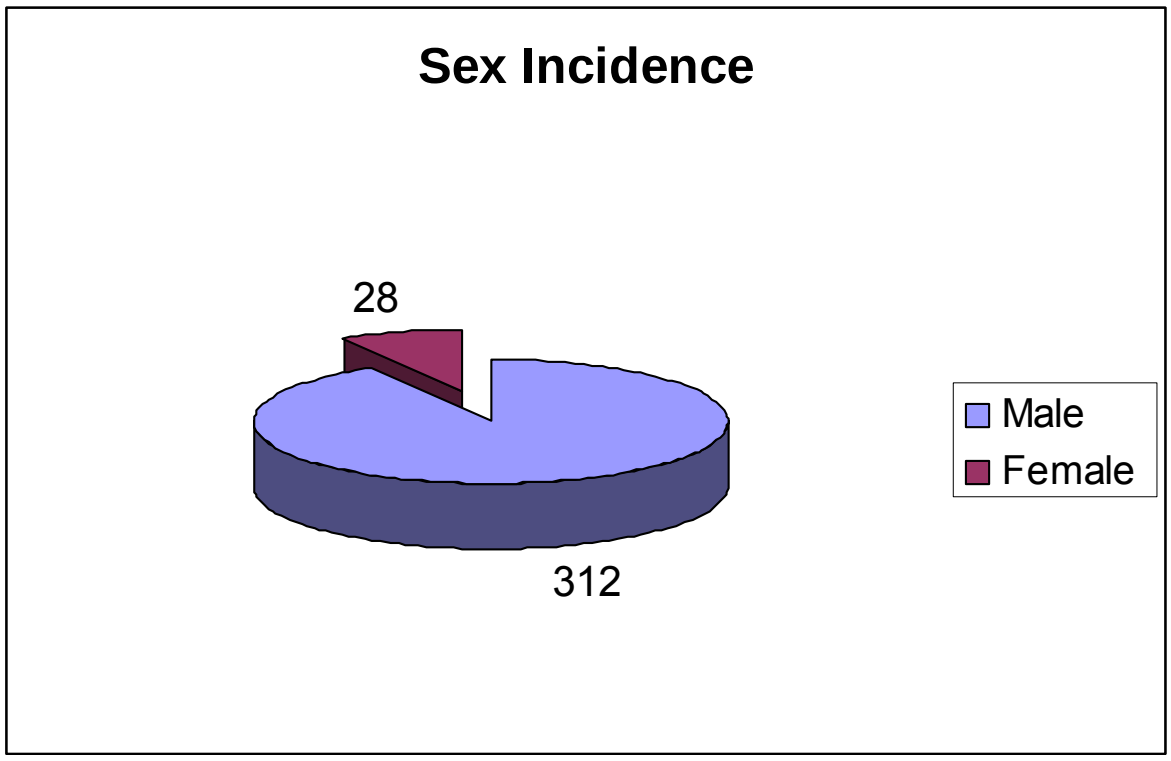
- From the nodule / swelling
- From the lymph node

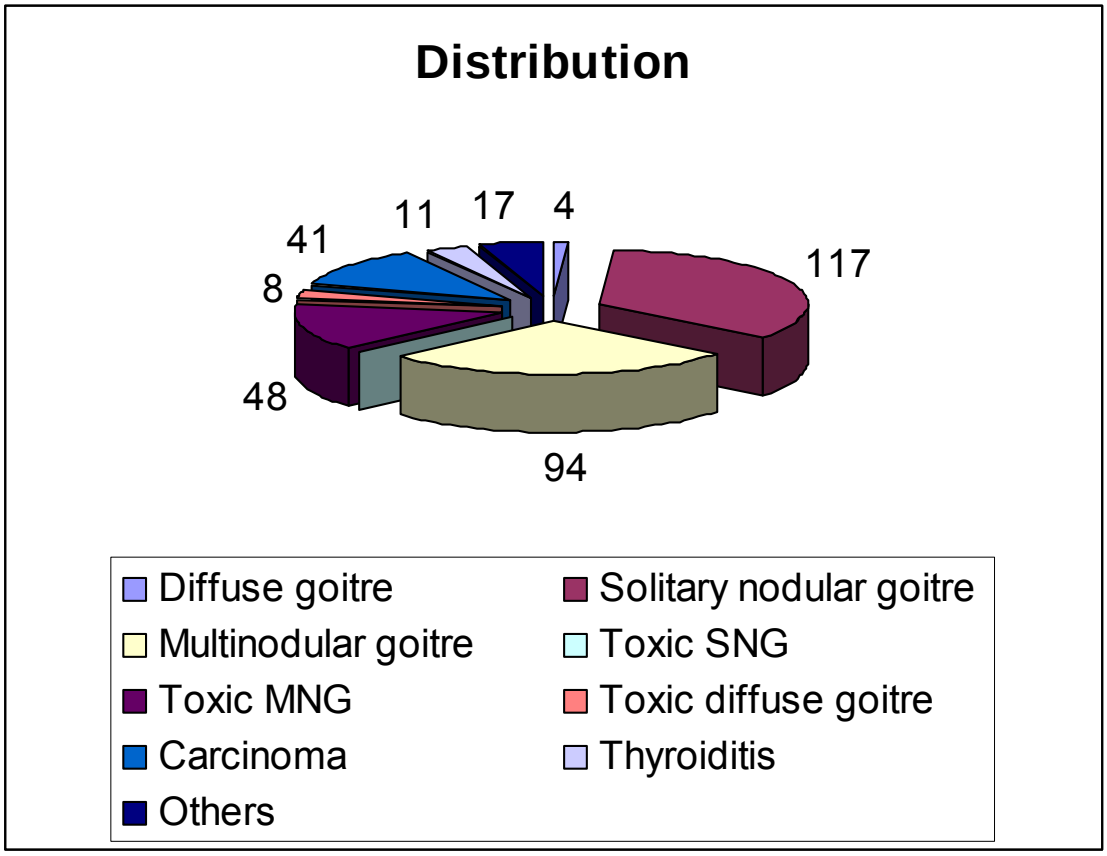
SOLITARY NODULAR GOITRE

MULTI NODULAR GOITRE

RECURRENT NODULAR GOITRE

PAPILLARY CARCINOMA WITH NECK SECONDARIES


Sex Incidence
28
312
Male
Female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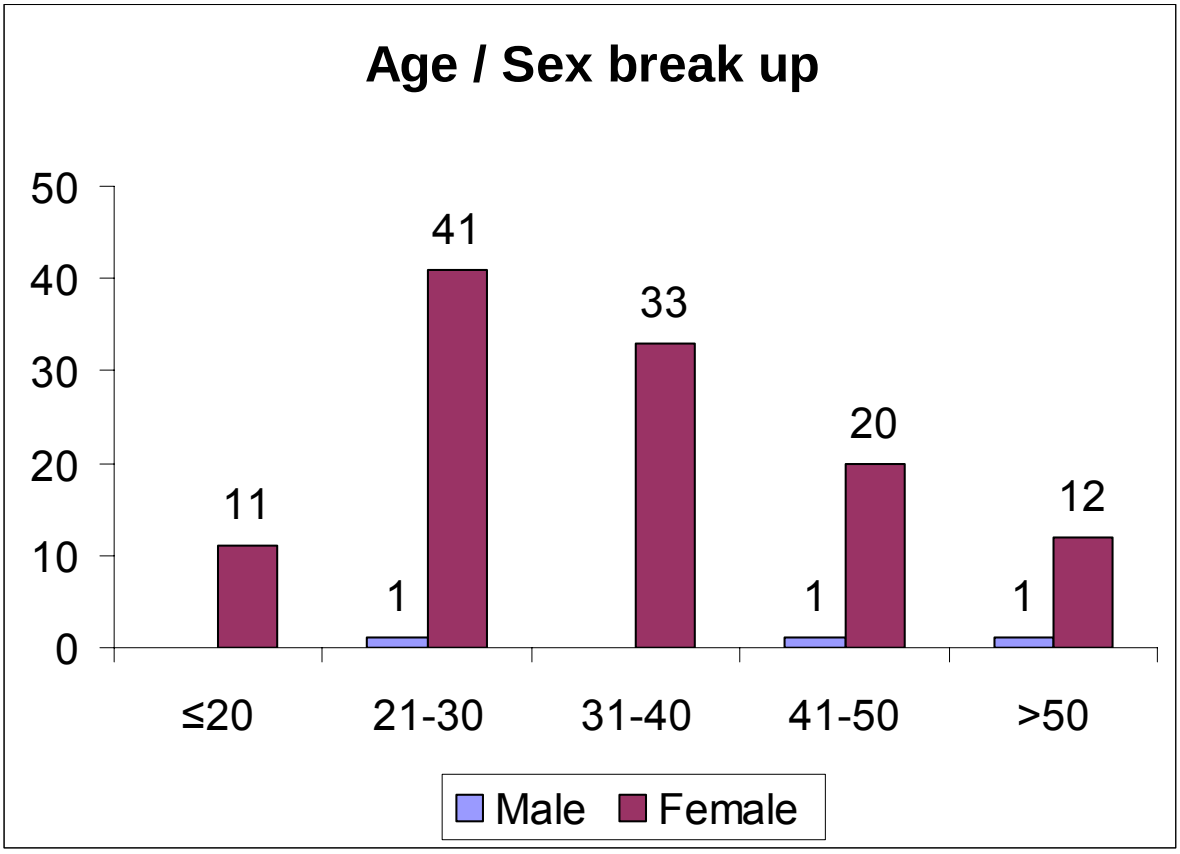
Toxic diffuse goitre
Carcinoma
Thyroiditis
Others


Age / Sex break up
50
40
30
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0
11
1
41
33
1
20
1
12
≤20
21-30
31-40
41-50
>50
Male
Female