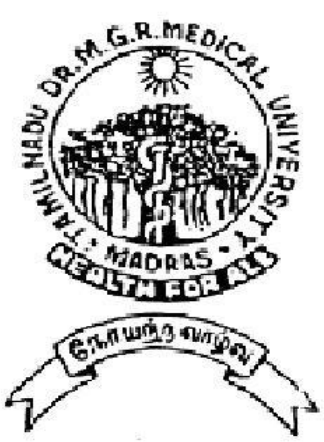
A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY

DISSERTATION SUBMITTED FOR

M.S. DEGREE BRANCH I (GENERAL SURGERY)

APRIL 2013



MADURAI MEDICAL COLLEGE, MADURAI

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI

CERTIFICATE

This is to certify that this dissertation titled **"A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY"** submitted by **DR.J.GOMATHI** to the faculty of General Surgery, The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the requirement for the award of MS degree Branch I General Surgery, is a bonafide research work carried out by her under our direct supervision and guidance from November 2011 to October 2012.

Prof.Dr.D.SOUNDARARAJAN, M.S.,

Head of the Department & Unit Chief,

Department of General Surgery,

Madurai Medical College,

Madurai.

.

DECLARATION

I, Dr. J. Gomathi solemnly declare that the dissertation titled **"A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY"** has been prepared by me. This is submitted to The TamilNadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the regulations for the award of MS degree (Branch I) General Surgery.

PLACE:

DATE: Dr. J. GOMATHI

ACKNOWLEDGEMENT

I wish to thank the Dean, **Prof. Dr.N.MOHAN, M.S.,** Madurai Medical College for permitting me to utilize the clinical materials of the hospital to carry out this study.

I wish to express my sincere gratitude to **Prof. Dr. SOUNDARARAJAN.M.S.,** Professor and Head of the Department of Surgery and Unit Chief , Madurai Medical College, Madurai, for his able guidance in doing this project.

I also thank my Assistant Professors **Dr. V. SELVARAJ, M.S., DCH., Dr.S.SANTHI NIRMALA,M.S.,DGO., Dr.K.SARAVANAN, M.S., Dr. P. MUNIASAMY, M.S.,** for their constant support and help.

Last but not least, I also wish to record my deep sense of appreciation and gratitude to the patients who have co operated and rendered themselves for this study.

CONTENTS

INTRODUCTION

Thyroid disease is a common condition encountered in the outpatient department. Surgery is the main mode of treatment in most of the thyroid diseases. Thyroidectomy is the treatment of choice for most thyroid swellings.

Thyroidectomy is a common operation with low morbidity and mortality. Morbidity and mortality are related to the surgeon's experience. In the higher centers, surgical morbidity rates following thyroid surgery are very low.

Following thyroidectomy major and minor complications may occur. Majority of the complications are avoidable. Most of the major complications are avoidable with proper surgical technique and good pre-operative preparation. Preventable complications are postoperative recurrent, superior laryngeal nerve injury, tension haematoma and post operative hypocalcemia.

Unavoidable complications can occur during surgery. Laryngeal edema associated with airway obstruction and Intra-operative hyperthyroidism are unavoidable, dangerous and life threatening.

Minor complications like wound infection, seroma formation and flap necrosis may also occur with very low incidence.

The incidence and severity of complications are highly dependent on the experience of the surgical team, extent of the operation and the different types of benign or malignant diseases.

Through prospective analysis of the case study, the incidence of the early post operative complications can be analysed and evaluated.

The present study reports the thyroid surgeries undertaken at the Government Rajaji Hospital, Madurai Medical College, Madurai and the incidence of early postoperative complications are analysed and compared with published series.

AIM AND OBJECTIVES

1. To study the incidence of early complications in thyroidectomy.

2. To identify the relationship between the risk of complications and the type of procedures.

3. To identify the risk of complications associated with various thyroid disorders.

MATERIALS AND METHODS

This is a prospective study conducted in the surgical unit at Government Rajaji Hospital, Madurai over a period of one year from November 2011 to October 2012.

Totally one hundred and fifty six patients were admitted with varied clinical presentations. They were evaluated and operated. Of them, one hundred and thirty eight patients were female and eighteen patients were male. The patients were ranged in age from 20-70 years. All were scheduled for thyroidectomy – total, near-total, subtotal or hemithyroidectomy.

Following study groups were included for surgery:

1. Diffuse goiter
2. Solitary thyroid nodule
3. Multi nodular goiter (MNG)
4. Toxic nodular goiter
5. Carcinoma thyroid

Exclusion criteria:

1. Carcinoma thyroid with secondaries
2. Uncontrolled toxic nodular goiter
3. Patients with co-morbid illness

All selected patients were undergone thorough history and complete physical examination. The basic investigations were done for all patients along with thyroid function tests and serum calcium estimation.

Pre-operative indirect laryngoscopy was done for vocal cord status. Pre-operative ultrasonography was done in all patients to distinguish a solid and cystic lesion, benign and malignant disease.

Fine needle aspiration cytology was done for all patients.

Based on the Final diagnosis, surgery was performed by the experts.

The patients were observed in their post operative period for early complications and were documented.

Documented early postoperative complications were analysed. Most of the cases were regularly followed up and observed throughout the study period. All the observations were analysed and compared with other studies.

REVIEW OF LITERATURE

HISTORICAL ASPECTS

The thyroid glands were described as ‘the glands of the larynx’ by Casserio (1601).

Enlargement of the thyroid gland was coined the term ‘goiter’ by Fabricus (1620).

Thomas Wharton attributed the term, thyroid gland (Greek thyreoeides - shield-shaped) in 1656.

Parry (1825), first described the effects of ‘thyrotoxicosis’ - Graves' disease (in England) and Basedow's disease (in Europe).

Emil Theodor Kocher (1841–1917) and C.A. Theodor Billroth (1829–1894) were the most notable thyroid surgeons.

Primary myxedema was described by Gull (1873).

Billroth (1881) reported 48 thyroidectomies performed since 1877.

Kocher (1883) was the first to use artery forceps to ligate the thyroid arteries outside the capsule. The artery forceps, hence, bears his name.

Von Mikulicz-Radecki (1886) described and performed subtotal thyroidectomy.

C. Mayo (1904) reported 40 cases of Graves' disease that were treated by thyroidectomy. He presented a paper on thyroid surgery to the American Surgical Association. The term "hyperthyroidism" was first used in 1907 by him.

Anton Wolfor, explained that the mass ligation of the inferior thyroid vessels lead to the injury of the recurrent laryngeal nerve.

Billroth & apos used lateral incisions for division of the strap muscles. They used artery forceps freely for good haemostasis.

Theodor Kocher was appointed as Chair of Surgery in Berne (1872). He became a professor of surgery at the age of 31. He conducted a study in 100 thyroid surgeries and he observed the mortality rate to be 2.4%. Then he used vertical midline approach and did more cautious extra capsular dissection of the thyroid .He improved and reduced the mortality rate to around 1% by 1895.

For all achievements in thyroid surgery, he was awarded the Nobel Prize in 1909.

THYROID EMBRYOLOGY

The thyroid gland develops between third and fourth week of gestation. The gland develops mainly from the Thyroglossal duct.

Parafollicular cells are derived from the caudal pharyngeal complex that is derived from the fourth and fifth pharyngeal pouches.

After the formation of the arches, the medial ends of the two mandibular arches are separated by a midline swelling called the tuberculum impar. Behind the tuberculum, epithelium of the floor of pharynx shows a thickening in the midline. This region is soon depressed to form a diverticulum called the thyroglossal duct.

Origin of the diverticulum is seen as a depression called the foramen caecum and the diverticulum grows down in the midline into the neck. Its tip soon bifurcates. Proliferation of the cells of this bifid end gives rise to two lobes of the thyroid gland.

The two lobes are situated on either side of the midline. The two lobes are connected by an isthmus over the tracheal rings. Within the bi-lobed mass, thyroglossal duct sub divides into a series of bilaminar plates, and when colloid accumulates within the plates, they are converted into primary follicles.

The descent of the thyroid gland occurs through the thyroglossal duct which is connected to the tongue. This tubular duct later solidifies and subsequently obliterates entirely. The Foramen caecum represents the opening of the thyroglossal duct.

If the lower part of thyroglossal duct persists, it represents the pyramidal lobe. It is observed in 50% of patients.

Parafollicular cells are also known as C cells; arise from the ultimobranchial body which is derived from the branchial pouches.

Superior parathyroid glands develop from the endoderm of the fourth pharyngeal pouch and it is called parathyroid IV.

Inferior parathyroid glands develop from endoderm of the third pharyngeal pouch and it is called parathyroid III.

SURGICAL ANATOMY

Thyroid gland occupies the centre of the neck. It normally weighs about 25 gm. The gland consists of two symmetrical lobes, united by an isthmus in the midline. The gland extends from the thyroid cartilage to the 5th or 6th tracheal ring (C5 to T1).[16] On either side, it is tucked under the anterior borders of the sternocleidomastoid muscles.

The whole thyroid gland looks like a butterfly and each lobe is pear-shaped. The Thyroid gland is covered by fascia and the gland moves upwards with deglutition, because of its fascial attachments. The right lobe is larger than the left. The normal gland is impalpable; the tracheal rings can be palpated through it. (Fig -1).

THE MUSCULOFASCIAL COVERINGS

Beneath the skin, fan-like thin sheet of muscle layer situated in subcutaneous area called the platysma.

The investing layer of deep cervical fascia ensheaths the strap muscles. In the anterior surface of the gland, the strap muscles are separated from it by a loose condensation of fascia (pretracheal fascia). This false capsule covers the gland which is enclosed by true capsule. The pretracheal fascia is attached above to the thyroid cartilage and cricoid cartilage and is responsible for the movement of the gland during deglutition.

In the surgical approach, the musculo fascial envelope is incised in midline, which is avascular. The loose plane between the two capsules of the gland is entered and the gland is exposed after retracting the strap muscles.

The surgical importance of these coverings is that the fascial envelope is re-sutured in the midline at the end of thyroid operations and closes the visceral space.

THE VASCULAR SUPPLY

The thyroid gland receives blood supply from the superior thyroid artery and the inferior thyroid artery. Rarely, it may get blood supply from the lower thyroid artery.(Fig 2).

THE SUPERIOR THYROID ARTERY

A pair of superior thyroid artery arises from the external carotid arteries and reaches the upper pole of the gland on either side to supply the capsule and connective tissues of the thyroid gland.

It runs downwards and forwards in relation to external branch of superior laryngeal nerve. It pierces the pre-tracheal fascia as a single trunk to reach the superior pole of the gland. Here it divides into anterior and posterior branches and descend on the lateral border of the thyroid.

The Anterior branch of the superior thyroid artery anastomoses with the branch of the contralateral side of the thyroid at the level of upper border of the isthmus.

The posterior branch of the artery anastomoses with the ascending branch of inferior thyroid artery.

During thyroidectomy care must be taken for superior thyroid artery ligation, because the superior laryngeal nerve runs closely with the artery just 1cm above the upper pole. Hence ligation must be done as close to the superior pole as possible.

INFERIOR THYROID ARTERY

A pair of inferior thyroid artery arises from the thyrocervical trunk of the first part of subclavian artery. They supply the parenchyma of the gland.

The artery first runs upward in front of vertebral artery continuing the direction of thyrocervical trunk. At the level of C6 vertebra it gives off ascending cervical branch and passes medially behind the carotid sheath and pierces the prevertebral fascia and enters the posterior part of the gland. The terminal part is closely related to the recurrent laryngeal nerve.

Care must be taken for ligation of the inferior thyroid artery. Ligation must be done as far as inferior pole of thyroid to avoid injury of recurrent laryngeal nerve.

THE LOWER THYROID ARTERY (Arteria thyroidea ima)

It is a rare artery arises from the arch of aorta and also from the brachiocephalic artery. It ascends on the trachea to enter the isthmus in its lower border.

SUPERIOR THYROID VEIN

The superior thyroid vein accompanies the superior belly of the omohyoid and drains into internal jugular vein.

During thyroidectomy it is ligated along with the superior thyroid artery. It empties into internal jugular vein.

MIDDLE THYROID VEIN

The middle thyroid vein follows the medial border of the omohyoid muscle and drains into internal jugular vein. It is shorter and wider than the superior and inferior thyroid veins. It usually does not accompany other arteries.

INFERIOR THYROID VEIN

The inferior thyroid vein forms a bunch of veins and emerges from the lower border of the isthmus. It drains into the brachiocephalic veins. The recurrent laryngeal nerve is closely related to this vein.

KOCHER'S VEIN

Sometimes a fourth thyroid vein may be present. It emerges from the lower pole of the gland and drains into internal jugular vein. During thyroidectomy it may bleed profusely and should be ligated early.

THE LYMPHATIC SYSTEM

The thyroid gland is drained by two sets of lymph vessels, ascending and descending. Each consists of medial and lateral channels.

MEDIAL ASCENDING VESSELS

They leave the upper border of the isthmus and go to the nodes in the cricothyroid membrane, namely the pre-laryngeal nodes.

LATERAL ASCENDING VESSELS

Along with superior thyroid artery it leaves the upper pole of the gland and drains into deep cervical lymph nodes.

MEDIAL DESCENDING VESSELS

They pass from the lower border of the isthmus to the pre-tracheal group of nodes.

LATERAL DESCENDING VESSELS

They pass from the deep surface of the thyroid to the small nodes of the recurrent laryngeal chain.

NERVE SUPPLY

The thyroid gland receives sympathetic and parasympathetic innervations. The parasympathetic fibers arise from the vagi and their recurrent laryngeal branches. The sympathetic fibers arise from the middle and the inferior cervical ganglia.

THE RECURRENT LARYNGEAL NERVE

The recurrent laryngeal nerves ascend on either side of the trachea and each lies lateral to the Berry's ligament as they enter the larynx.

The right recurrent laryngeal nerve originates from the vagus as it crosses the subclavian artery. Then it passes posteriorly and ascends lateral to the trachea along the trachea-oesophageal groove.[18]

The left recurrent laryngeal nerve originates from the vagus as that nerve traverses over the arch of aorta. It passes inferior and medial to the aorta and begins to ascend towards the larynx, where it finds its way into the groove.[18] (Fig -3).

Great care is needed during thyroid surgery in this area because the nerve is tethered beneath the cricothyroid muscle and is stretched on vigorous dissection.

NON-RECURRENT LARYNGEAL NERVE

It was first described by Stedman. It is most frequently seen in right side, due to failure of disappearance of the fourth aortic arch. This is associated with the right subclavian artery. Incidence is 0.3-0.8%.

This nerve runs perpendicular to the normal course and present usually at the level of cricoid cartilage.

On left side, it is a great rarity. This can occur in situs inversus.

SUPERIOR LARYNGEAL NERVE

The superior laryngeal nerve originates from the vagus nerve and descend towards the superior pole of the thyroid, associated with internal carotid artery. At the level of the hyoid cornu it divides into two branches.

It arises from the vagus, descends medially to the carotid vessels at the base of the skull. It divides into two branches at the level of the hyoid cornu.

The internal branch is sensory and may anastomose with the sensory branch of the recurrent laryngeal nerve and penetrates the thyrohyoid membrane.

The external branch of the superior laryngeal nerve lies on the lateral surface of the inferior pharyngeal muscles. It descends to innervate the cricothyroid muscle. This is the only muscle supplied by superior laryngeal nerve.

Both the branches lie adjacent to the superior thyroid artery and may be injured if the artery is ligated ‘in bulk’. The nerve lie in the triangle, called

‘sternothyroid laryngeal’ triangle. This triangle is bounded medially by cricothyroid and inferior constrictor, laterally by retracted margin of sternothyroid and the base by the superior pole of the thyroid.[2]

HISTOLOGY OF THE THYROID GLAND

The thyroid gland is enclosed by a dense capsule. The lobes are divided into multiple lobules formed by follicles. The clear viscid colloid is present within the follicles.

The follicles are lined by flattened cuboidal or columnar epithelium depending on the glandular activity.

Within the interfollicular spaces there are the parafollicular cells (the calcitonin-secreting C cells). They are slightly larger than the follicular cells and have large nuclei and cytoplasmic granules. They are located in the upper pole of the thyroid lobes, originate as neuro ectodermal cells derived from the ultimobranchial bodies (part of the APUD series). The follicles are supported by heavily vascularised connective tissues.

OPERATIVE SURGERY

Surgery is the main successful treatment in many thyroid diseases. The procedure varies according to the extent of resection. The various types of thyroidectomy can be grouped as follows:

1. LOBECTOMY: Entirely one of the lobes is removed

2. HEMITHYROIDECTOMY: One of the lobes and the isthmus is removed.

3. SUB-TOTAL THYROIDECTOMY: 2 grams of thyroid remnant is kept on both sides and the rest of the thyroid gland is removed.

4. NEAR TOTAL THYROIDECTOMY: One lobe and the isthmus are removed and generally 2 gm of the other lobe is left behind.

5. TOTAL THYROIDECTOMY: Both lobes and the isthmus are removed.

Indication for surgical management of thyroid swellings:[2] (Fig 4,5 &6).

- ❖ Solitary thyroid nodule, multi nodular goiter,
- ❖ Large colloid goiter and retro sternal goiter
- ❖ All proven malignant nodule
- ❖ Cystic nodules which recur following aspiration
- ❖ Thyroid nodules producing obstructive symptoms
- ❖ Hyperfunctioning thyroid
- ❖ Cosmesis
- ❖ Patient's anxiety and desire for surgical treatment.

The common indication for Hemi thyroidectomy is a solitary cold nodule with follicular cytology or a dominant nodule in a multi nodular goiter. It is usually done for diagnostic purposes. In rare situation, in young women with low risk group of papillary or follicular thyroid carcinoma occupying less than 1 cm of diameter, hemithyroidectomy is definitely an adequate treatment.

Subtotal thyroidectomy is usually done for huge goiter, multi nodular goiter and toxic thyroid. Recently, total thyroidectomy is advocated to reduce the risk of recurrence or thyrotoxicosis.

Hyperthyroidism is mainly a medical condition. When there is a relapse subtotal thyroidectomy is indicated.

In all cases of differentiated thyroid cancers total thyroidectomy is the procedure of choice. If lymphnodes are affected by secondary deposits in case of papillary carcinoma, modified radical neck dissection is performed on the ipsilateral side.

Routine central neck node dissection is done for hurthle cell carcinoma.

In case of medullary carcinoma of thyroid, treatment of choice is total thyroidectomy with central neck node dissection and T3 replacement therapy.

In case of anaplastic carcinoma, total thyroidectomy with modified radical neck dissection is the treatment of choice.

In case of lymphoma, radical surgery is unnecessary, it well responds to radiotherapy.

The mortality rate of thyroidectomy is reported as almost zero. This can be achieved by a well performed standardized technique. The morbidity rate should be less than 5 %.[16]

INVESTIGATIONS

THYROID FUNCTION TESTS[9]

The following function tests should be done to assess the thyroid status of the patient.

1) Biochemical assessment

a). Estimation of serum TSH

Serum TSH assay is the most sensitive and specific test to identify hyperthyroidism and hypothyroidism. The normal value is 0.5-5 U/ml.

b). Estimation of total and free T3 and T4

Total T3 and T4 levels are assessed by radioimmunoassay and it measures the bound and free components of the hormones. Total T4 level reflects the output of the gland. Normal value is 55-150 nmol/L. Total T3 level reflects the peripheral thyroid hormone metabolism. Normal value is 1.5-3.5 nmol/L. Free T3 and T4 are sensitive and measures the

biologically active thyroid hormone level. These radioimmunoassay – based tests are a sensitive and accurate measurement of biologically active thyroid hormone. Free T4 (reference range: 10 to 30 nmol/l)[29]. Use of this test is confined to cases of early hyperthyroidism in which total T4 levels may be normal but free T4 levels are raised. Free T3 (reference range : 3.5 to 7.5 µmol/l)[29] .

Free T4 levels may also be measured indirectly using the T3 resin – uptake test. If free T4 levels are increased, fewer hormone – binding sites are available for binding radiolabeled T3 that has been added to the patient's serum. Therefore, more T3 binds with an ion – exchange resin and the T3 resin uptake is increased.

c). Radioactive Iodine uptake study

Oral administration of iodine I^{123} and calculated its uptake with radioscintigraphy. A normal result is 15% to 30% uptake after 24 hours. Use of I^{123} more preferable because of a shorter half life and lesser radiation than I^{131} which is used to radioablate the thyroid neoplasms.

d). Serum Thyroglobulin

The most important use for serum thyroglobulin levels is in monitoring patients with differentiated thyroid cancer for recurrence after total thyroidectomy and radioactive iodine ablation.

e). TRH Stimulation Test:

TRH stimulation test to elaborates the functional states of the hypothalamic – pituitary axis. IV dose of TRH is given, normal response is an elevation in TSH that peaks with in 15-35 mins. Patients with pituitary insufficiency demonstrate a subnormal response to TRH.

2) Isotope scanning

Both I^{123} and I^{131} are used to image the thyroid gland. The former emits low – dose radiation, has a half – life of 12 to 14 hours, and is used to image lingual thyroids or goiters.

In contrast, I^{131} use leads to higher - dose radiation exposure and has a half - life of 8 to 10 days. Therefore, this isotope is used to screen and treat patients with differentiated thyroid cancers for metastatic disease.

Areas that trap less radioactivity than the surrounding gland are termed "cold", whereas areas that demonstrate increases activity are termed " hot". The risk of malignancy is higher in "cold" lesions (15 to 20%) than in "hot" or "warm" lesions (<5%).

Technetium -99m (TC^{99m}) pertechnetate is taken up by the thyroid gland and also used for thyroid evaluation. It is particularly sensitive for nodal metastases.

More recently, 18 F-fluorodeoxyglucose positron emission tomography (FDG PET) has been used to screen for metastases in patients with thyroid cancer.

3. Fine needle aspiration cytology

It is the gold standard investigation of thyroid nodules. The accuracy rate is 95%. Sensitivity is 80-85% and specificity is 90-95%.

Role in thyroid swellings:

a) To differentiate benign and malignant diseases
b) Highly sensitive in papillary carcinoma with nodal metastasis.
c) Gives a definite diagnosis of colloid nodule, thyroiditis, papillary carcinoma, medullary carcinoma, anaplastic carcinoma and lymphoma.
d) Not useful in follicular carcinoma because it is difficult to distinguish from follicular adenoma.

4) Ultrasound of thyroid

Preoperative ultrasound should be done in all patients

- ❖ To distinguish a solid and a cystic lesion
- ❖ Complex cyst is highly suspicious of malignancy

- ❖ Can detect nodules up to 2-3 mm diameter
- ❖ For guided biopsy in impalpable nodules
- ❖ Can detect any enlarged lymph node
- ❖ May demonstrate vascular invasion

5) CT and MRI

It provides excellent imaging of the thyroid gland, nodes and are particularly very useful in evaluation of the sub-sternal goiter and their relationship to the airway and vascular structures.

PRE-OPERATIVE PREPARATION

Pre-operative preparations are mainly done for safe induction and to prevent postoperative complications.

- ❖ Thyroidectomy is done only after making the patient euthyroid
- ❖ Lugol's iodine is given for 10 days before surgery for decreasing the vascularity and making the gland firm in consistency.
- ❖ Pre-operative indirect laryngoscopy for assessment of vocal cord status
- ❖ Arrange cross matched blood
- ❖ Assessment of cardiac status by ECG
- ❖ Assessment of chest by X-ray.
- ❖ Rule out diabetes and hypertension.

POSITIONING THE PATIENT

Patient is put in supine position, with 10-20 degree of head up to prevent per-operative bleeding. Neck is extended with sandbags between the shoulders and the head is supported with a ring.

ANAESTHESIA

Endotracheal tube with general anaesthesia is used with good muscle relaxant.

INCISION

A curvilinear collar incision is used, called the Kocher's collar incision, two finger breaths above the sternal notch and placed over a skin crease.

FLAPS

The skin, subcutaneous tissue and platysma are incised in one layer.

A sub-platysmal flap is raised superiorly to the thyroid notch and inferiorly to the clavicles. Anterior jugular veins over the strap muscles are left as the flaps are raised.

DIVISION OF THE DEEP CERVICAL FASCIA

Incision is made in the midline to open the deep cervical fascia between the sternothyroid muscles. Tracheal cartilage is considered as the midline. When opening the midline inferior to the isthmus, care must be taken to avoid the injury

of inferior thyroid veins. The surgeon must also watch for the presence of thyroid ima artery which has the incidence of 1.5 – 12 %.

DIVISION OF THE STRAP MUSCLES:

The strap muscles must be separated off to deliver the lobe. Outer layer of the muscles are the sternohyoid and the omohyoid. The inner strap muscle is the sternothyroid. The medial edge of sternothyroid lies laterally, so the sternohyoid must be retracted to see the muscle.(Fig 7).

The midline fascial interval between the medial edges of sternohyoid is called as Linea Alba.

In inadequate exposure of surgical view, the strap muscles can be cut without any hesitation. During the strap muscle transection, the lateral border must be identified to avoid jugular vein and carotid artery injury, because the carotid sheath is adherent to the muscle. Occasionally small bridging vessels to the under surface of the strap muscle must be identified and cauterized. They can cause troublesome bleeding.

The true thyroid capsule is tightly adherent to the thyroid parenchyma and it divides the thyroid parenchyma into lobules. The true capsule is extensively enriched with large capsular vessels, which can cause significant bleeding during retraction.

LATERAL THYROID DISSECTION

Once the strap muscles are retracted or divided, a blunt or sharp dissection lateral to the thyroid is performed to mobilize the lobe .The lateral thyroid region is opened by the division of the middle thyroid vein and this vein should be doubly ligated laterally.

After the division of the middle thyroid vein, medial retraction of the thyroid over the laryngotracheal complex can be done. Kocher referred to this as "medial dislocation of the goiter".

Inferior thyroid vessels are identified after dissecting the posterolateral border of the thyroid and carefully ligated.

IDENTIFICATION OF RECURRENT LARYNGEAL NERVE

It is preferable to identify the entire course of the nerve in thyroid surgery. The recurrent laryngeal nerve is identified by either of the approaches and attempted to preserve it.[20]

1. Lateral approach

Here the recurrent laryngeal nerve is searched in the tracheoesophageal groove.

2. Inferior approach

Here the nerve is searched in the Lore Triangle described by Lore. The boundaries of the triangle are,

Apex by: Thoracic inlet

Medially: Trachea

Laterally: Retracted sternothyroid muscle

Another triangle is Riddle's Triangle. Boundaries are inferior thyroid artery above, carotid artery laterally and the trachea medially.

3. Superior approach

Here the nerve is searched near its termination. Most common site of injury is the last 2 cm of its course. The anatomical landmarks for identification are,

- ❖ Between the two leaves of the Berry's ligament
- ❖ Its entry point into the cricopharyngeus muscle
- ❖ 0.5-1cm below the inferior cornu of the thyroid cartilage

IDENTIFICATION OF PARATHYROIDS

Superior and inferior parathyroids must be preserved to avoid post-operative hypocalcemia. Parathyroid glands are easily identified by their appearance, split pea-sized with moulded edges, tan to brown in colour and close to the thyroid capsule.[18]

Superior parathyroids are more constant in position, at the level of the crico-thyroid articulation. They usually present at the junction of upper and middle third of the thyroid gland.

Inferior parathyroids are more variable in position, at the level of the inferior pole of the thyroid gland. They usually present below the junction of inferior thyroid artery and the recurrent laryngeal nerve. It is also present in the thyrothymic ligament (20%). In about 20% of the cases, it lies in intrathymic region or undescended in carotid sheath.

Vascularity to the gland is preserved by the medial ligation of the inferior thyroid artery.29

SUPERIOR AND INFERIOR PEDICLE LIGATION

Ligation of the inferior pole is performed first than superior pole, because the greater mobility of the gland is achieved well in the lower pole.[16]

Superior thyroid vessels should be ligated under the vision with high elevation of the strap muscles. Superior pedicle must be ligated branch wise and to spare the parathyroid branch of the superior thyroid artery. After visualization of the superior laryngeal nerve, the superior thyroid vessels should be ligated.

Medial approach to the superior pole is through the avascular space between the upper pole of the gland and cricothyroid muscle. Mass ligation of vessels should be avoided.

Inferior thyroid artery is an end artery to the parathyroids and hence ligation of the trunk of the inferior thyroid artery is not recommended. Small branches that

enter the capsule of the gland alone are ligated. Mass ligation of the lower pole may injure the recurrent laryngeal nerve.

DIVISION OF THE ISTHMUS

For complete mobilization of the thyroid gland, divide the suspensory ligament in the upper aspect of the isthmus. In the midline, isthmus of the thyroid gland is freed from trachea. Care must be given in dividing the isthmus from pre-tracheal fascia[20] (Fig 8).

WOUND CLOSURE

Haemostasis is checked after removing the sand bag. Anaesthetist may be asked to simulate a valsalva maneuver to identify the bleeding points. If the strap muscles were cut, they need to be sutured. The midline must be closed. Drain is usually brought out through the wound. Skin is approximated either by simple mattress or sub-cuticular sutures.

Anaesthesiologist should inspect the vocal cords following extubation. In the first 12 hours, the patient is kept in propped up [FOWLER'S] position and liquid diet started after 6 hours. Drain is removed after two days and the skin sutures are removed after 4days.

EARLY COMPLICATIONS IN THE POSTOPERATIVE PERIOD

1. HAEMORRHAGE

2. AIRWAY OBSTRUCTION BY

    1. COMPRESSING HAEMATOMA

    2. LARYNGEAL EDEMA

    3. TRACHEOMALACIA

3. NEURAL COMPLICATIONS

    1. RECURRENT LARYNGEAL NERVE PALSY

    2. SUPERIOR LARYNGEAL NERVE PALSY

4. HYPOCALCEMIA

    WITH OR WITHOUT HYPOPARATHYROIDISM

5. THYROID STORM OR CRISIS

6 .WOUND COMPLICATIONS

    1. SEROMA AND HAEMATOMA

    2. SKIN FLAP NECROSIS

    3. EDEMA OF THE FLAP

4. WOUND INFECTION

5. SCAR HYPERTROPHY

7. AERO-DIGESTIVE TRACT INJURIES

8. CHYLOUS FISTULA

9. COMPLICATIONS RELATED TO ANAESTHESIA

10. DEATH

HAEMORRHAGE

Post operative haemorrhage is a dangerous complication and may lead on to death. Tension haematoma usually occur on the day of surgery that is around 12-24 hours. Haemorrhage may be two types,

1. Immediate
2. Delayed

Immediate haemorrhage is the most serious and must be recognized easily. It becomes life threatening. Major haemorrhage occurring beneath the strap muscles must be recognized quickly and forms a tension haematoma which compressing the trachea causing respiratory obstruction. In an emergency

situation, the wound must be opened in the ward to relieve the tension. Dangerous tension hematoma is usually detected within 6 - 8 hours.

INCIDENCE OF HAEMORRHAGE FOLLOWING THYROIDECTOMY

Incidence of haemorrhage varies from 1-3% .[29]

Incidence of haemorrhage from the published reports are the following:

Shaha et al (1988)[31]reported that the experience of 600 thyroidectomies , 8 patients developed wound haematoma within 2-6 hours of surgery. They observed that the incidence of haematoma was 1.3%.

Tension haematoma is due to bleeding under the strap muscles to produce airway obstruction. This is observed in the Hyoung Shin Lee et al study.

Hyoung Shin Lee et al (2009)[15] showed the two clinical patterns of haematoma. There are superficial and deep haematoma. They explained the superficial haematoma to produce ecchymosis. Deep tension haematoma causes acute airway obstruction. They also observed that the incidence of the haematoma was 0.96%.

R.Promberger et al (2011) [25] reported that the incidence of haemorrhage was 1.7% among 30142 operations.

Etiology of haematoma includes:

- Slippage of ligature
- Reopening of cauterized veins
- Retching, Vomiting
- Hypertension during recovery
- Valsalva maneuver
- Huge dead space
- Ooze from the cut area.

The bleeding source for tension haematoma is from the superior, inferior thyroid arteries and from a branch of the cricothyroid artery.

Bleeding from venous origin also may occur. This statement was observed in Rosato et al study.

Rosato et al (2004)[28] reported that the incidence of the haematoma was 1.2%. Among them 0.18% needed a blood transfusion due to severe blood loss. They showed that the serious blood loss was from the superior , inferior and middle thyroid veins.

MANAGEMENT

The key factors in management of haemorrhage include close postoperative observation, early detection of haematoma and effective airway management.

In cases of bleeding from above the strap muscles, the haematoma is easily evacuated with warm saline irrigation. In cases of bleeding beneath the strap muscles, surgical exploration with evacuation is indicated.

In case of haematoma causing airway obstruction, immediate intubation should be performed by an anaesthesiologist. Agrawal et al (1997)[1] described their experiences of 396 thyroid surgeries. They reported that the incidence of haemorrhage was 2.5%. Evacuation of the haematoma was performed in 4 patients prior to intubation. They concluded that the intubation during re-exploration was difficult due to oedema of the epiglottis and the vocal cords.

Lacoste et al (1993) [17] also conducted the study in 3008 thyroid surgeries. They observed that the incidence of postoperative haematoma was 0.36%.They concluded that the tracheal intubation was strictly indicated in acute asphyxia.

Precautions to minimize the haemorrhage are,

a. Meticulous haemostasis.

b. Farrar (1983) [11] suggested that, before the wound closure the patient should be put on 30 degree head down position to look for bleeding.

c. Leaving the gap in the lower end while suturing the strap muscles .

d. Avoidance of coughing at extubation.

e. Closed suction drain may minimize the airway compression.

HYPOCALCEMIA

Hypocalcemia is one of the known complications of thyroid surgery. Hypocalcemia is usually due to hypoparathyroidism. It is divided into transient and permanent hypocalcemia.[29]

INCIDENCE OF HYPOCALCEMIA FOLLOWING THYROIDECTOMY

Incidence of hypocalcemia following thyroidectomy are about 5%.[9] Incidence of hypocalcemia after total thyroidectomy in published reports are the following:

Bhattacharyya et al (2002)[4] reported in 517 patients that the transient hypocalcemia was 6.2% and permanent was 0%. They also stated that younger patients were mainly affected in hypocalcaemia.

Rosato et al (2002)[28] studied 14934 patients. They observed that the incidence of transient hypocalcemia was 14% and permanent was 2.2%

Bron et al (2004)[6] studied 834 patients. They observed transient hypocalcemia in 14.4% cases and permanent hypocalcemia in 2.4% cases.

Causes of hypocalcemia include:

- Parathyroid injury - most common.
- Extensive resection
- Total thyroidectomy with neck dissection.
- Hungry bone disease
- Primary thyrotoxicosis
- Carcinoma and Hemodilution

Total calcium level less than 7 mg/dl and parathormone level less than10 pg/ml after surgery are documented for hypocalcemia due to hypoparathyroidism (Quiros and Richards et al).

CLINICAL FEATURES OF HYPOCALCEMIA:

- Perioral numbness or tingling sensation
- Pain abdomen
- Nervousness
- Paraesthesia of the extremities

Following signs to assess the degree of hypocalcemia:

- Chvostek's sign (Tapping the facial nerve will produce twitching at the angle of the jaw)
- Trousseau's sign (sphygmo manometer cuff applied and inflated in the arm above the systolic blood pressure will produce carpal spasm).

Severe hypocalcemia to cause seizure disorder and cardiac arrhythmias.

ECG changes in hypocalcemia:

- Lengthening of the ST segment
- Prolongation of QT interval
- 40-50% of patients have T wave abnormalities

Spurious hypocalcemia:

Occurs in the first two postoperative days following surgery including non-thyroid conditions; there is a decrease in the total calcium and albumin, hematocrit. This is as a result of the Anti Diuretic Hormone release from stress of the surgery, water retention by kidneys and hemodilution. Albumin bound total calcium is decreased. Non-protein bound calcium is normal. Estimation of free calcium is necessary to distinguish spurious from true hypocalcemia.

TREATMENT OF HYPOCALCEMIA:

Acute symptomatic hypocalcemic patients should be treated with 10% calcium gluconate infusion over the period of 10-20 minutes. Faster administration causes cardiac dysfunction and arrest. Oral calcium supplementation should be started with subsequent measured calcium.

If the calcium is above 8.0 mg /100 ml post operatively with mild symptoms, begin oral effervescent calcium in the form of calcium gluconate or calcium lactate powder mixed in a warm liquid, 4 to 6 grams daily.

If the calcium is less than 7 mg/100ml and phosphorus of over 5mg/100ml with significant symptoms as carpopedal spasm, start oral vitamin D in the form of Ergocalciferol, 50 to 100,000 units per day and oral calcium of 2 to 3 gram per day are given until normocalcemia is achieved.

PREVENTION:

Some precautions may decrease the hypocalcemia. Capsular dissection of the thyroid is done to reduce the complication. Reimplant the parathyroids in sternomastoid pouch if it is devascularized.

Following factors determine the severity of devascularization:

- Collaterals from pre and paratracheal vessels to the gland
- Remaining parathyroid glands which response to hypocalcemia

Handling of the parathyroids during surgery is described in five types:

- Grossly tan parathyroid gland with adequate blood supply –preserved type
- Grossly congested parathyroid-Colour changed type
- Implantation of the isolated parathyroid gland into the sternomastoid pouch – Auto transplantation type
- Parathyroid gland was removed and found in specimen - Removed type
- Parathyroid gland not found in the operation – Non-identified type

Attie and Khafif et al (1975) [3] stated that functioning two parathyroids were enough to avoid hypocalcemia.

RECURRENT LARYNGEAL NERVE INJURY

Recurrent laryngeal nerve injuries are dangerous and debilitating complications. Incidence of recurrent laryngeal nerve injuries varies from 15% -25%. Injuries are generally divided into Unilateral or Bilateral and Transient or Permanent.

INCIDENCE OF RECURRENT LARYNGEAL NERVE INJURY

The incidence of nerve injury is clearly related to experience of the surgeon, anatomical variation of the nerve, difficulty of procedure, benign and malignant diseases etc. The incidence is varies from 15-25%.

Incidence of recurrent laryngeal nerve injury from the published reports after total thyroidectomy is the following:

Zakaria et al (2010)[14] reported that the incidence of the temporary nerve injury was 2.9% and permanent injury was 0.3%.

Chaudhary et al (2007) [8] reported that the incidence of temporary palsy was 7.69% and of permanent palsy was 3.84%.

Nerve identification:

Crile[10], Holt , Farrar WB[11] et al and Martensson et al[21]stated the importance of nerve identification during surgery.

Crile (1929) [10]stated that the nerves were naked and easily damaged by slight pressure.

Holt (1977) had examined the problem again and stated the same.

Farrar WB et al (1983)[11] and Martensson et al (1985) [21]again favoured the identification and preservation of the nerve.

Risk factors associated with an increased incidence of RLN palsy include:

1. Incomplete exposure or dissection of the recurrent laryngeal nerve
2. Total throidectomy in thyroid Cancer
3. Re-do surgery
4. Ligature of the inferior thyroid artery

Martensson and Terins(1985)[21] reported that the rate of nerve injury was 3.6% in primary operations. They showed that the injury from re-do surgery was 9.2%.

Tomoda et al (2006) [33] showed that the rate of injury in benign disease was 2.7% and in malignant disease was 8.9%.

Wade (1955),[34]Riddell (1970)[27] and Lore (1977) [19]detailed the vulnerability of the nerve. They agreed the risk of injury in the region of the suspensory ligament.

RECURRENT LARYNGEAL NERVE AND INFERIOR THYROID ARTERY

Relation of the recurrent laryngeal nerve and the inferior thyroid artery were detailed by Fowler and Hanson(1929),Reed(1943) and Bowden(1955)[30].

Anatomical landmarks of nerve:

1. Inferior thyroid artery and nerve intersection

Inferior thyroid artery runs towards the gland at the mid level. When the artery is identified and traced medially towards the gland, the nerve will be seen to cross it. Variable crossovers are,

50% of cases - between the branches

25% of cases - anterior to the artery

25% of cases - posterior to the artery

2. Tracheo-oesophageal groove

3. Vasa nervosum

4. Tubercle of zuckerkandl (projection in the lateral lobe of the gland)

Three critical areas of nerve injury are;

1. At the site of where the inferior thyroid artery crosses the recurrent laryngeal nerve

2. At the suspensory ligament of Berry

3. At the inferior pole of the gland during mass ligation of the vessels, mainly on right side

Modes of nerve injury are the following:

1. Crushing
2. Ligature compression
3. Sharp instrument dissection
4. Stretching (neuropraxia)
5. Ischaemia
6. Involvement in fibrous tissue
7. Haematoma compression
8. Oedema
9. Diathermy injury
10. Post–operative neuritis

CLINICAL FEATURES OF NERVE INJURY:

Temporary versus permanent recurrent laryngeal paralysis:

Temporary paralysis is due to neuropraxia. Permanent paralysis is due to transection of the nerve. Neuropraxia recovers in 3 weeks to 3 months. If it does not recover even after 6 months, it is considered to be a permanent paralysis.

Unilateral recurrent laryngeal nerve injury:

Here the vocal cords do not approximate with one another and patient develops hoarseness of voice. Hoarseness of voice develops within a week of postoperative period due to cord edema. Symptoms persist after 6 months to cause permanent damage which is caused by ligation or cauterization of the nerve.

Indirect Laryngoscopy will reveal:

Paramedian position of the paralysed cord

Hyperadduction of the normal cord during phonation as a compensatory mechanism

Bilateral recurrent laryngeal nerve injury:

Bilateral Recurrent Laryngeal Nerve injury is rare and causes life threatening complications. Mundada et al (2011) reported that the both vocal cords were present in median or paramedian position and the patients may develop stridor.

MANAGEMENT

Hoarseness of voice due to edema is relieved by local anaesthetic agents. If symptoms persist, it may indicate neuropraxia.

Steroids should be started within 7 days of surgery. Prednisolone 15 mg tid for 10 days is given. Neuropraxia is reversible and recovers over a week.

Speech therapy is instituted if there is no recovery.

Medialization of the cord by Teflon injection or some other technique are also available.

In case of Bilateral nerve injury ,the tracheostomy tube needs to be retained for a longer time. In the presence of cancer, use of a Tucker valve, makes wearing of the tracheostomy tube infinitely. This flap valve may inhale through the tracheostomy tube but exhale through the larynx. So phonation may occur adequately.

Other surgical procedures are arytenoidopexy or cordectomy and arytenoidectomy. In permanent damage, exploration and resuturing of the nerve using 7 or 8-0' nylon / prolene should be done.

Now nerve grafting is feasible, anastomosis of the Ansa hypoglossi to the recurrent laryngeal nerves is possible.

If there is no improvement from above measures, permanent tracheostomy is indicated.

PREVENTION OF NERVE INJURY

1. Identify the nerve before cutting or cauterization

2. Luke warm gauge to cover the nerve

3. Avoid using unipolar diathermy

4. Identification of non-recurrent laryngeal nerve

5. Recurrent laryngeal nerve monitoring

SUPERIOR LARYNGEAL NERVE INJURY

Superior laryngeal nerve originates from the vagus nerve. It descend towards the thyroid along with internal carotid artery. At the hyoid cornu, it divides into internal and external branches.

The external branch descends on the fascia of the inferior pharyngeal constrictor and supplies the crico-thyroid muscle.

Damage to the external branch of the nerve produces loss of voice quality or strength.

Cernea et al (2003)[7] concluded that the nerves are at high risk in superior pole of the thyroid gland.

Randolph (1992)[26] reported the anatomical classification of the nerve, based on its relationship to superior pole of thyroid and the superior thyroid vessels.

Kocher did not specifically mention this nerve in his book.Then he considered the importance of this nerve in thyroid surgery and documented his personal experience in more than 3000 thyroidectomies.

The role of the nerve came into light when a most famous soprano, Amelita Galli - Curci was operated in 1935. Her voice lost that high pitched tone. She had to give up singing. Since then the superior laryngeal nerve is also known as 'The Nerve of Amelita Galli –Curci'.

The incidence of nerve injury varies according to the method of examination.

Lore reported 0.9% and Lennquists, cahlin, and smeds reported 2.6% injury based on laryngoscopic examination.

Janson reported a 58% injury rate and EMG as diagnostic tool.

Transient injury of the external branches of the nerve produces

- Vocal fatigue
- Loss of high pitch voice
- Breathy voice
- Frequent throat clearing

Indirect laryngoscopy will reveal;

- Shorter and hyperemic vocal cord
- Affected cord at a lower level
- Glottic chink is oblique.

Prevention of nerve injury:

1. Not to search for the nerve
2. Downward, outward and forward traction of upper pole to bring the pedicle away from the nerve
3. Ligation of branches of the superior thyroid artery

RESPIRATORY OBSTRUCTION

Airway obstruction following thyroidectomy is very rare but fatal. Life-threatening airway complications are reported within the first 12 -24 hours. Respiratory complications are due to neck hematoma, laryngeal edema and tracheomalacia.

Neck haematoma when it is deep to produces tracheal compression and causes airway obstruction. Pressure necrosis of the cartilaginous tracheal rings to cause tracheomalacia in large and retrosternal goiter.

Causes of post thyroidectomy stridor:

1. Haematoma
2. Laryngeal oedema due to
   - intubation
   - haematoma
   - hypothyroidism
3. Recurrent laryngeal nerve injury

Laryngeal edema also produces airway obstruction. Tension haematoma is the most important cause of laryngeal edema. Trauma to the larynx due to intubation and surgical manipulation are important contributory factors to cause airway obstruction.

Stridor in some cases are due to edema of vocal cards and uvula in patients with hypothyroidism, particularly in chronic thyroiditis or in patients with over prepared with anti thyroid drugs.

Unilateral or bilateral recurrent nerve paralysis will not cause immediate respiratory obstruction unless laryngeal edema is also present and will aggravate the obstruction.

Shaha et al (1994)[31] and Agrawal et al (1997)[1] have discussed the pathophysiology of haematoma and laryngeal and pharyngeal oedema .Critical

compression may lead to impairment of venous and lymphatic drainage leading to laryngopharyngeal oedema.

MANAGEMENT

The treatment for this complication is endotracheal intubation. If airway obstruction is due to haematoma, immediate intubation should be performed. If it is not available, then in the mean time, decompression of the wound should be done.

If there is an inability or difficult intubation, tracheostomy should be indicated.

THYROID STORM OR CRISIS

Thyroid crisis is a sudden exacerbation of thyrotoxicosis . Incidence of thyroid crisis is 1-2 %. It may occur intra operatively or 12-24 hours after surgery. The mortality rate is very high about 20 - 30%.

Nelson and Becker et al (1969) [24] conducted a study in 2329 thyrotoxic patients. They observed that the incidence of thyroid crisis was 1% (21cases).

Causes for crisis are;

- Surgical manipulation of the gland

- ❖ Inadequate preparation prior to surgery
- ❖ Trauma in thyrotoxicosis
- ❖ Surgical emergency
- ❖ Emotional stress
- ❖ Infection in thyrotoxicosis - like pharyngitis and pneumonitis
- ❖ After I^{131} therapy in thyrotoxicosis

Crisis usually occurs during surgery while the gland is being manipulated and is also reported after discontinuation of antithyroid drugs and excessive ingestion of iodine.

Burch and Wartofsky (1993)[35] were pointed a scoring system to assess the degree of disorders in central nervous, gastrointestinal, cardiovascular and thermoregulatory system.

Scoring

> 45 - thyroid storm

25– 45 - impending storm

< 25 - not related to thyroid storm

Jameson and Weetman (2008), Elisha et al (2010) reported that thyroid storm was characterised by exaggerated signs and symptoms of hyperthyroidism. Features are,

- ➢ Hyperpyrexia with flushing and sweating

- Tachycardia
- Tremor, nervousness
- Agitation, restlessness and delirium
- Psychosis
- Coma

Atrial fibrillation and Congestive heart failure

Once the thyroid storm is identified, treatment is aimed at symptomatic management. The reduction of circulatory thyroid hormone is the main goal. Drug management includes; (Jameson and Weetman 2008, Chong et al 2010)

Ensure adequate oxygenation.

- Administration of glucose-containing fluids
- Anti thyroid drugs - beta blockers, carbimazole, propylthiouracil
- Steroids
- Correction of electrolyte imbalance
- Correction of acid - base imbalance
- Antipyretics
- Apply cooling blankets

Adequate preoperative preparation to bring the patient to euthyroid status and 10 day therapy with Lugol's iodine has virtually eliminated this complication in recent times.

WOUND COMPLICATIONS

Wound infection

Wounds should be observed for signs of infection. Common causative organisms identified are Staphylococcus or Streptococcus. Post-operative thyroidectomy wound infections are relatively rare.

Rosato et al (2004) [28]reported that incidence of wound infection was 0.3-0.8%.

Osmolski et al (2006) stated that presence of an odorous discharge and temperature should be monitored closely.

Rosato et al (2004)[28] reported that use of pre-operative antibiotic prophylaxis was needed in immunocompromised or valvular cardiac disease patients.

S.N. Karamanakos et al (2010)[32] reported that infection was a major complication of thyroidectomy in 20th century. Nowadays with the benefit of antisepsis and progress of surgical techniques, the overall risk of postoperative wound infection is substantially decreased. He reported the incidence of wound infection was 0.3%.

Use of antibiotics is justified in patients with diabetes, valvular heart disease, or immunodeficiency. Disinfection and cleaning of the skin must be absolute.

Several authors proposed closed suction drainage to reduce the chance of fluid collection and abscess formation. The drain is kept until the output is less than 30 ml per day.

SEROMA

Accumulation of serous fluid in the wound forming seroma which is usually occurs on the fourth or fifth day after operation and is evident by a fluctuant swelling.

Incidence of seroma was reported between 1.5-7%. Raising of flaps during surgery will produce serum collection and form seroma. Flapless technique reduces the seroma formation.

Tariq Wahab Khanzada et al (2010) reported the incidence of seroma formation was 1.4% and that of superficial surgical site infection was 0.7%.

Seroma can be relieved by repeated aspiration or probing and compression dressing.

PROGNOSTIC SCORING SYSTEM

Various scoring systems are available for categorization of patients into low risk and high risk groups.

AGES:

Mayo clinic –Hay et al [13] described AGES scoring - Age, Grade, Extent and Size.

AMES:

Lahey clinic-Cady et al described AMES scoring - Age, Metastasis, Extent and Size.

MACIS:

Hay et al [13] described MACIS scoring - Metastasis, Age, Completeness of surgery, Invasion of extra thyroidal tissue, Size.

SLOAN-KETTERING:

Categorization of the patients into three groups:

Low risk

- Less than 45 years of age
- Less than 4 cm in size
- Favourable tumor factors

Intermediate risk

- Low risk patients with high risk tumors
- High risk patients with low risk tumors

High risk

- More than 45 years of age
- More than 4 cm in size
- Unfavourable tumor factors

These scoring systems are applied for carcinoma thyroid (Differentiated).

MINIMAL INVASIVE THYROID SURGERY

MINIMALLY INVASIVE VIDEO-ASSISTED THYROIDECTOMY

It is the most widely used minimal invasive thyroid surgery. It was first used by Miccoli et al, Italy in 1990. About 1.5 cm incision is made in the cervical skin crease and surgery is completed using a video-endoscope.

MODIFIED MINIMALLY INVASIVE VIDEO-ASSISTED THYROIDECTOMY

It is a video-assisted thyroid surgery where the anterior neck flap is lifted without using gas insufflations and tent-like spaces are created for working purposes.

MINIMALLY INVASIVE OPEN SURGERY TECHNIQUE

It is also called as small incision thyroidectomy. It does not require specialized endoscope or video assistance.

ADVANTAGES OF MINIMAL INVASIVE THYROID SURGERY

a) The post operative pain is minimal
b) Tissue trauma is reduced
c) Hospital stay is shorter
d) Cosmetically better

The rate of complications like recurrent laryngeal nerve injury, superior laryngeal nerve injury, hypoparathyroidism are similar to those seen in conventional thyroid surgery.

FOLLOW UP

The first follow up of the patient is after 2 weeks. Patients with confirmed benign disease are referred to medical endocrinologists. Patients with confirmed malignancy are followed up for once in 6 months for the next 2 years and then annually ,for the estimation of thyroglobulin level, radioactive iodine uptake scans, cervical ultrasonogram, clinical follow up for any recurrence.

OBSERVATION AND RESULTS

Table: 1 Age Incidence of Thyroid Disease:

S.No	Age	Total No of Patients	Percentage
1	21-30	48	30.76%
2	31-40	46	29.48%
3	41-50	28	17.94%
4	51-60	28	17.94%
5	61-70	6	3.85%

In the Present study, 156 patients were observed. 60% of thyroid disease occurred during the age between 20-40 years. The highest incidence of thyroid disease was recorded during the third and fourth decades of life with 30.76% and 29.48% respectively.

Table: 2 Gender Incidence of Thyroid Disease:

S.No	Sex	Total No of Pts n=156	Percentage
1	Male	18	11.53%
2	Female	138	88.46%

Out of 156 patients, 138 were females and 18 were males. From the table, male and female ratio was1:8. In the present study, females were more commonly affected by thyroid diseases.

Table: 3 Clinical Diagnosis and Types of Surgery Performed:

Diagnosis	Hemi	Subtotal	Near-total	Total	Total No of Pts n=156	Disease Incidence %
SNG	55 (100%)	_	_	_	55	35.25
MNG		16 (25%)	27 (42.18%)	21 (32.81%)	64	41.02
Toxic Goiter	1 (5%)	3 (15%)	7 (35%)	9 (45%)	20	12.82
Carcinoma Thyroid	_	_	_	12 (100%)	12	7.69
Colloid Goiter			2 (40%)	3 (60%)	5	3.20

From above observation, out of the 156 patients, 55 were diagnosed to have Solitary nodular goiter, 64 were Multi nodular goiter, 20 were Toxic goiter, 12 were Carcinoma thyroid and 5 were Colloid goiter.

Out of 55 cases of solitary nodular goiter diagnosed, all underwent hemi thyroidectomy (100%).

Out of 64 cases of multi nodular goiter, 55% of patients underwent subtotal thyroidectomy , 42% of patients underwent neartotal thyroidectomy and 33% of cases underwent total thyroidectomy.

Out of 20 cases of toxic goiter, 5% of cases underwent hemi thyroidectomy , 15% of cases underwent subtotal thyroidectomy,35% of cases underwent neartotal thyroidectomy and 45% of patients underwent total thyroidectomy.

Out of 12 cases of carcinoma thyroid, all underwent total thyroidectomy (100%).

Out of 5 cases of colloid goiter, 40% of cases underwent neartotal thyroidectomy and 60% of patients underwent total thyroidectomy.

Table: 4 Incidence of Early Post Operative Complications:

S.No	Complications	Total no of Pts n = 156	Percentage %
1	Haemorrhage	2	1.28
2	Hypocalcemia	8	5.13
3	RLN Palsy	5	3.21
4	SLN Palsy	1	0.64
5	Thyroid storm	1	0.64
6	Seroma	4	2.56
7	Wound infection	3	1.92

Above table showed the incidence of early postoperative complications following thyroidectomy.

The incidence of haemorrhage with respiratory obstruction was 1.28%.

The incidence of neural complications,recurrent laryngeal nerve and superior laryngeal nerve palsy were 3.21% and 0.64% respectively.

Incidence of hypocalcemia was 5.13%, Thyroid storm was 0.64%

Wound infections was1.92%, and incidence of seroma was 2.56%.

Table: 5 Incidence of Complications in Various Thyroid Disorders:

Complication	Colloid Goiter n = 5	SNG n = 55	MNG n = 64	Toxic Goiter n = 20	Carcinoma Thyroid n = 12
Haemorrhage	-	-	1	1	-
Hypocalcemia	-	-	7	-	1
RLNP		-	3	1	1
SLNP	-	-	-	1	-
Thyroid Storm	-	-	-	1	-
Seroma	-	-	3	1	-
Wound Infection	1	-	-	2	-
Incidence %	20%	0	21.87%	35%	16.66%

This table showed the incidence of complications was reported in various thyroid disorders.

35% of complications were observed in Toxic goiter followed by 21.87% in Multinodular goiter, 20% in colloid goiter and 16.66% in carcinoma thyroid. There was no reported complication in solitary nodular goiter.

Table: 6 Incidence of Haemorrhage with Respiratory Obstruction in Various Thyroidectomy Procedures:

Complication	Type of thyroidectomy (No. of Pts&%)				Total No of Pts n = 156
	Hemi n = 56	Subtotal n = 19	Near-total n = 36	Total n = 45	
Per op-Haemorrhage	–	–	–	–	–
Post op-Haemorrhage &Respiratory Obstruction	–	–	–	2 (4.44%)	2 (1.28%)

Above table showed the incidence of haemorrhage following various thyroidectomy procedures. The incidence of haemorrhage causing respiratory obstruction was reported in 1.28% of cases (2cases).

In the present study, haemorrhage with airway obstruction was documented only in 4.44 % of cases following total thyroidectomy. (chart 5)

Table: 7 Incidence of Hypocalcemia in Various Thyroidectomy Procedures:

Complication	Type of Thyroidectomy (No. of Pts& %)				Total No of Pts&% n = 156
	Hemi n = 56	Subtotal n = 19	Near-total n = 36	Total n = 45	
Transient Hypocalcemia	0	0	3 (8.33%)	5 (11.11%)	8 (5.13%)
Permanent Hypocalcemia	0	0	0	0	0

This table showed the incidence of hypocalcemia following various thyroidectomy procedures. The incidence of hypocalcemia was reported in 5.13% of cases (8cases). All were transient hypocalcemia and became symptomatic within 2-4 days.

In the present study, postoperative hypocalcemia was documented in 11.11% of cases following total thyroidectomy and in 8.33% of cases following near total thyroidectomy. (Chart 6)

Table: 8 Incidence of Neural Complications in Various Thyroidectomy Procedures:

Complication	Type of Thyroidectomy (No of Pts& %)				Total No of Pts n = 156
	Hemi n = 56	Sub Total n = 19	Near Total n = 36	Total n = 45	
RLNP (Transient)	0	0	2 (5.55%)	3 (6.66%)	5 (3.21%)
SLNP (Transient)	0	0	0	1 (2.22%)	1 (0.64%)

This table showed the incidence of recurrent laryngeal nerve palsy and superior laryngeal nerve palsy following various thyroidectomy procedures.

The incidence of recurrent laryngeal nerve palsy was reported in 3.21% of cases (5 cases). The incidence of superior laryngeal nerve palsy was reported in 0.64% of cases (1 case).

In the present study, recurrent laryngeal nerve palsy was documented in 6.66% of cases following total thyroidectomy and in 5.55% of cases following near total thyroidectomy. The superior laryngeal nerve palsy was documented only in 2.22% of cases following total thyroidectomy. (Chart 7)

Table: 9 Incidence of Thyroid Crisis in Various Thyroidectomy Procedures:

Complication	Type of Thyroidectomy (No of Pts&%)				Total No o f Pts n = 156
	Hemi n = 56	Subtotal n = 19	Near-total n = 36	Total n = 45	
Thyroid Storm	_	_	_	1 (2.22%)	1 (0.64%)

This table showed the incidence of thyroid crisis following various thyroidectomy procedures. The incidence of thyroid crisis was reported in 0.64% of cases (1 case).

In the present study, thyroid crisis was documented only in 2.22% of cases following total thyroidectomy. (Chart 8)

Table: 10 Incidence of Wound Complications in Various thyroidectomy procedures:

Complication	Type Of Thyroidectomy (No Of Pts&%)				Total No Of Pts n = 156
	Hemi n = 56	Subtotal n = 19	Near-total n = 36	Total n = 45	
Seroma	0	1 (5.26%)	3 (8.33%)	0	4 (2.56%)
Wound Infection	0	1 (5.26%)	2 (5.55%)	0	3 (1.92%)

This table showed the incidence of wound complications following various thyroidectomy procedures. The incidence of seroma was reported in 2.56% of cases (4 cases).The incidence of wound infection was reported in 1.92% of cases (3 cases).

In the present study,seroma was documented in 8.33% of cases following near-total thyroidectomy and in 5.26% of cases following subtotal thyroidectomy.

The wound infection was documented in 5.55% of cases following near total thyroidectomy and in 5.26% of cases following subtotal thyroidectomy. (chart 9)

DISCUSSION

In the present study, 156 patients were observed. Out of the 156, 138 patients were female and 18 patients were male. Male and female ratio was 1:8. Thyroid diseases were more commonly observed in the age group of 20-40 years. 144 patients were suffered from benign thyroid disorders and 12 patients were suffered from malignant thyroid diseases. (Table 1&2) (Chart1&2).

The present study reports were compared with published series.

In the present study, the incidence of postoperative haemorrhage with airway obstruction was reported only in 1.28% of cases (2 cases). Both these cases were reported following total thyroidectomy which was done for a case of toxic nodular goiter and multinodular goiter. Out of 45 cases of total thyroidectomy operated,only 4.44% of them developed this complication. (Table 5&6) (Chart 3, 4 &5)

The patients became symptomatic within 12 hours of postoperative period. Immediately wound exploration was done and the arterial bleed was identified in the thyroid bed and was ligated. Endo tracheal tube intubation failed due to laryngeal edema and hence tracheostomy was performed. (Fig 9&10).

Following variables were identified as risk factors in this study:

1. Bilateral thyroid surgery, which doubled the risk compared with a unilateral surgery.

2. Extensive thyroid resection.

These reports were compared with published results in 2011.

In R. Promberger et al (2011)[25] study among 30142 patients operated, 519 (1.7%) had postoperative bleeding of which 80.6% occurred in first 6 hours. 2% of cases had a twofold increased risk of bleeding in bilateral than with unilateral surgery(1%) . About 73.8% of these patients required surgical exploration.

In Hyoung Shin Lee et al (2009)[15] study, 10 patients (0.96%) with post-thyroidectomy haemorrhage required surgical evacuation. Six of them had bleeding deep to the strap muscles and the other 4 cases had bleeding superficial to the muscles. Two cases with deep haematoma were developed respiratory distress.

The incidence of post operative hemorrhage in the present study was correlated with the above studies.

In the present study, the incidence of postoperative hypocalcemia was 5.13% (8 cases). Out of 8 cases being operated, 7 cases of post operative hypocalcemia occurred in patients who were operated for multinodular goiter and

one case occurred in a patient who was operated for carcinoma thyroid. All were transient type of hypocalcemia . Out of 45 cases of total thyroidectomy operated, 11.11% of them developed hypocalcemia and 8.33% who underwent neartotal thyroidectomy were developed this complication. (Table 5&7) (Chart3,4&6).

The patients became symptomatic within the period of 2-4 days postoperatively.

Following variables were identified as risk factors in this study:

1. Middle age group

2. Multi nodular goiter and Carcinoma thyroid.

3. Bilateral thyroid surgery than unilateral surgery.

4. Extensive resection.

This study was compared with published results in 2007.

Sogutlu et al (2007) [12]conducted a study on 88 patients who underwent total thyroidectomy and reported the most common indication for total thyroidectomy was multi nodular goiter (53.4%). In their study, the incidence of temporary hypothyroidism was 26.1% and that of permanent was 3.4%.

Murat Akin et al (2009)[23] stated that the rate of temporary hypoparathyroidism in toxic goiter was 8% and 2% in malignant diseases. They stated that subtotal thyroidectomy was the treatment of choice in multi nodular goiter, but it had a high recurrent rate about 10-30%. According to their study, total thyroidectomy did not have these problems and does have high risk of complications.

Stavros N. Karamanakos1 et al (2010)[32] reported that the rate of transient hypoparathyroidism was 27.8% and permanent hypothyroidism was 4.8% following total thyroidectomy. They evaluated a multivariate analysis reported various risk factors that includes extensive surgical resection, Grave's disease, female gender and recurrent goiters.

Published Series of Postoperative Hypocalcemia after Total thyroidectomy:

Study group	Year	No of pts	Hypocalcemia Transient (%)	Hypocalcemia Permanent (%)
Wilson	2000	50	68	0
Hisham	2001	98	27	0
Rosato	2004	14934	14	2.2
Bhattacharyya	2002	517	6.2	0
Bron	2004	834	14.4	2.4
Mazhar iqbal[22]	2010	74	21.6	0
Present study		45	4.44	0

In the present study, the incidence of hypocalcemia was compared with published results. The rate of transient hypocalcemia was 4.44 % in the present study which was compared with Bhattacharyya study (6.2%) and the rate of hypocalcemia following total thyroidectomy was found to be almost same. Permanent hypocalcemia was not documented in both of these studies.

In the Present study, the incidence of Postoperative Recurrent Laryngeal Nerve Palsy occurred in **3.21%** (5cases). The postoperative recurrent laryngeal nerve palsy was reported in 3 cases operated for multinodular goiter,one case operated for toxic nodular goiter and one case of carcinoma thyroid. It was observed in 6.66% of cases who underwent total thyroidectomy and 5.55% of patients who underwent neartotal thyroidectomy. (Table 5&8) (Chart 3,4&7).

All were unilateral and transient type of nerve palsy. Temporary paralysis is due to neuropraxia. All patients developed hoarseness of voice within 24 hours after surgery.

Transient paralysis of recurrent laryngeal nerve was due to

1. Excessive nerve skeletanisation
2. Neuritis by scar tissue
3. Excessive traction
4. Diathermy heat injury
5. Viral neuritis

Following variables are identified as risk factors in this study:

1. Extensive resection in benign diseases

2. Total thyroidectomy

Martensson reported permanent nerve injury after surgeries for carcinoma thyroid or reoperations for benign disease in 14%.

Hazem M. Zakaria et al (2010)[14] conducted a study on 340 patients and reported that Unilateral and transient vocal cord paresis developed in 3.2% of cases. Permanent cord palsy developed in 0.3% of cases. Bilateral vocal cord paralysis developed in 0.58% cases. Secondary operations were done in 6.8% of cases and they were observed 12.8% of nerve palsy occurred in thyroid carcinoma and 2.9% occurred in benign diseases. They also observed that nerve injury occurred in 7.2% following total thyroidectomy and 1.9% occurred following subtotal thyroidectomy.

Incidence of Recurrent laryngeal nerve injury in other studies:

Study group	Year	No of pts	Type of thyroidectomy	Temporary	Permanent
Kasemsuwan	1997	105	Total	9.5%	4.8%
Aytac	2005	418	Total	13.6%	9%
Chaudhary	2007	310	Total	7.69%	3.84%
Zakaria	2010	340	Total	7.2%	0.3%
Present Study		156	Total	6.66.%	0

In the present study, the incidence of recurrent laryngeal nerve palsy was correlated with Zakaria study.

Incidence of Superior Laryngeal Nerve Palsy reported was 0.64% in a patient who was operated for toxic nodular goiter. Out of 45 cases of total thyroidectomy done, only 2.22% of them developed nerve palsy.(Table 5&8) (Chart 3,4&7).

The patients had increased voice pitch and vocal fatigue within a day. Incidence of nerve injury varies according to the method of examination.

Lore (1983)[19] reported 0.9% and Lennquists, cahlin, and smeds reported 2.6% injury based on laryngoscopic examination.

Janson et al reported a 58% injury rate using EMG as diagnostic tool.

No effective therapy is available. Intensive phonotherapy is recommended.

Incidence of Thyroid Storm was reported in 1 case (0.64%) of toxic multi nodular goiter for whom total thyroidectomy was done.(Table 5&9) (Chart3,4&8).

Complication was reported within 4hours.The patient was restless, agitated and hyperpyrexia with tachycardia.

In Nelson and Becker's series (1969),[24] 2,329 cases of thyrotoxicosis patients were operated. Only 21 of them developed thyroid storm (about 1%)

Scholz et al (2003) suggested that in older, chronically ill patients early total thyroidectomy should be method of choice.

According to Bindu Nayak et al (2006),[5] the incidence of thyroid crisis was less than 10%. The mortality rate was very high and ranges from 20 - 30%.

Postoperative thyroid storm was commonly documented in;

1. Young women
2. Grave s disease
3. Toxic solitary/multi nodular goiter

Precipitating factors are;

- ❖ Surgery
- ❖ Trauma
- ❖ Myocardial infarction
- ❖ Pulmonary thrombo embolism
- ❖ Severe infection.

In the present study the incidence of thyroid storm following thyroidectomy was correlated with Nelson and becker's series (1969),Bindu nayak et al (2006)series.

Incidence of seroma was encountered in **2.56%** (4 cases). Out of 4 cases were reported,3 cases were operated for multinodular goiter and one case was operated for toxic nodular goiter.Seroma developed in 8.33% of patients who underwent neartotal thyroidectomy and 5.26% of cases who underwent subtotal thyroidectomy. (Table 5&10) (Chart3,4&9) (Fig 11).

Tariq Wahab Khanzada et al (2010) reported the incidence of seroma formation was 1.4% and superficial surgical site infection was 0.7%.

Seroma was relieved by repeated aspiration and compression dressing.

Incidence of wound infection was documented in **1.92%** (3 cases). Out of 3 cases, one was operated for colloid goiter and two cases were operated for multinodular goiter. About 5.55% of patients who underwent neartotal thyroidectomy and 5.26% of patients who underwent subtotal thyroidectomy were developed this complication. (Table 5&10) (Chart3,4&9).

Rosato et al (2004)[28] observed the incidence of wound infection was 0.4% after total thyroidectomy, 0.13% after lobectomy and subtotal thyroidectomy.

The patient with wound Infection commonly presented as Cellulitis – Erythema, Warmth and tenderness around the wound. (Fig 12).

Patient was treated with appropriate antibiotics.

In the present study the incidence of wound complications was correlated with above published series.

There were no case reports of other wound complications like haematoma of the flap, edema of the flap, skin necrosis, hypertrophic scar or keloid and stitch granuloma.

COMPARISON OF POST OPERATIVE COMPLICATIONS WITH PUBLISHED REPORTS: (chart 10)

Complication	Murat Akin et al Study[23] n=922(2009)	Stavros N.Karamanakos et al Study[32] n=2043 (2010)	Present Study n=156
Haemorrhage	0.2	1.3	1.28
Transient Hypocalcemia	2.8	27.8	5.13
RLNP	0.9	1.6	3.21
SLNP	0.2	0	0.64
Thyroid Storm	0	0	0.64
Seroma	0	0	2.56
Wound Infection	0.8	0.3	1.92

Comparison of present study with published study of Murat Akin et al & N.Karamanakos et al.

Incidence of early post operative complications were analysed with above study series and concluded that the incidence of complications were almost same with the published reports.

OTHER RARE POSSIBLE COMPLICATIONS

1. Tracheo esophageal injury

Injury is due to direct trauma to the trachea or esophagus during surgery.

2. Chylous fistula

It may occur in surgery for enlarged thyroid and invasive thyroid carcinoma. It is treated conservatively by continuous suctioning to seal the fistula. Persistence over 5-7 days needs surgical exploration.

3. Bilateral arytenoids dislocation

4. Complications related to anaesthesia.

SUMMARY

In the Present study 156 patients were observed , 138 were females and 18 were males. Females were more commonly affected by thyroid diseases. Male and Female ratio was 1:8. 60% of thyroid disease occurred during the age between 20-40 years.

- The incidence of early postoperative complications were the following

The incidence of haemorrhage with respiratory obstruction was 1.28%. The incidence of neural complications, recurrent laryngeal nerve and superior laryngeal nerve palsy were 3.21% and 0.64% respectively. Incidence of hypocalcemia was 5.13%, wound infections was1.92%, thyroid storm was 0.64% and incidence of seroma was 2.56%.

- The incidence of complications in various thyroid disorders were the following

35% of complications were observed in Toxic goiter followed by 21.87% in Multinodular goiter, 20% in colloid goiter and 16.66% in carcinoma thyroid.There was no reported complication in solitary nodular goiter.

❖ The incidence of complications in various thyroidectomy procedures were following

- Haemorrhage with airway obstruction was documented only in 4.44 % of cases following total thyroidectomy.
- Postoperative hypocalcemia was documented in 11.11% of cases following total thyroidectomy and in 8.33% of cases following near total thyroidectomy.
- Recurrent laryngeal nerve palsy was documented in 6.66% of cases following total thyroidectomy and in 5.55% of cases following near total thyroidectomy.
- The superior laryngeal nerve palsy was documented only in 2.22% of cases following total thyroidectomy.
- Thyroid crisis was documented only in 2.22% of cases following total thyroidectomy.
- Seroma was documented in 8.33% of cases following near-total thyroidectomy and in 5.26% of cases following subtotal thyroidectomy.
- The wound infection was documented in 5.55% of cases following near total thyroidectomy and in 5.26% of cases following subtotal thyroidectomy.

CONCLUSION

The following conclusions are drawn from this study

- Incidence of hypocalcemia is a relatively common complication than recurrent laryngeal nerve injury after thyroidectomy.
- Relatively more complications occur after Total Thyroidectomy than near-total, subtotal thyroidectomy. No complications occurred after hemithyroidectomy.
- Multi nodular goiter, Toxic multi nodular goiter, Carcinoma thyroid are risk factors for post operative complication.
- Post operative complications can be reduced by a careful clinical evaluation, a thorough knowledge of the surgical anatomy, a systematic dissection of parathyroid gland and recurrent laryngeal nerve during the surgery.

Chart 1 Age Incidence of Thyroid Disease:

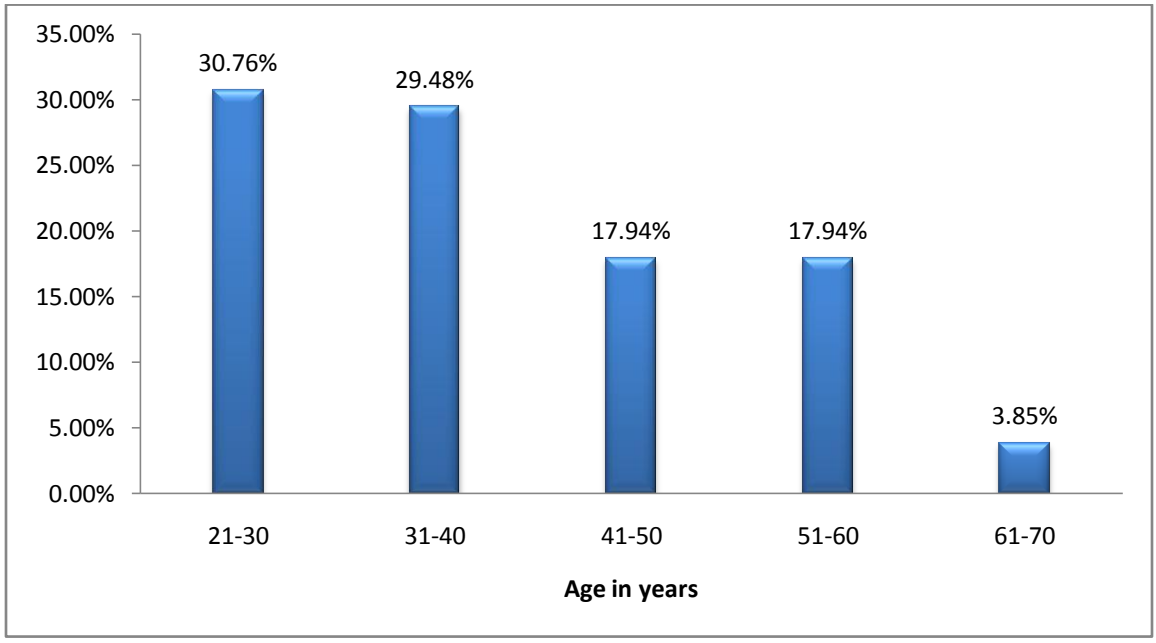


Chart 2 Gender Incidence of Thyroid Disease:

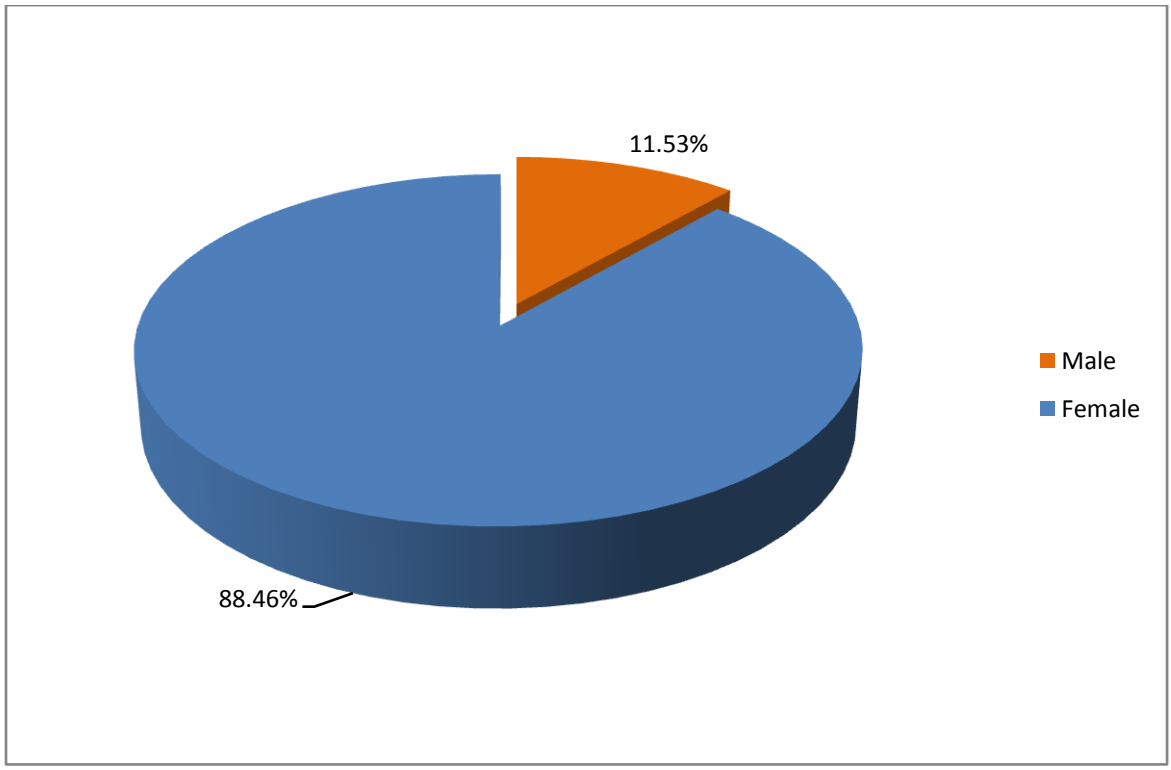


Chart 3 Incidence of Early Post Operative Complications:

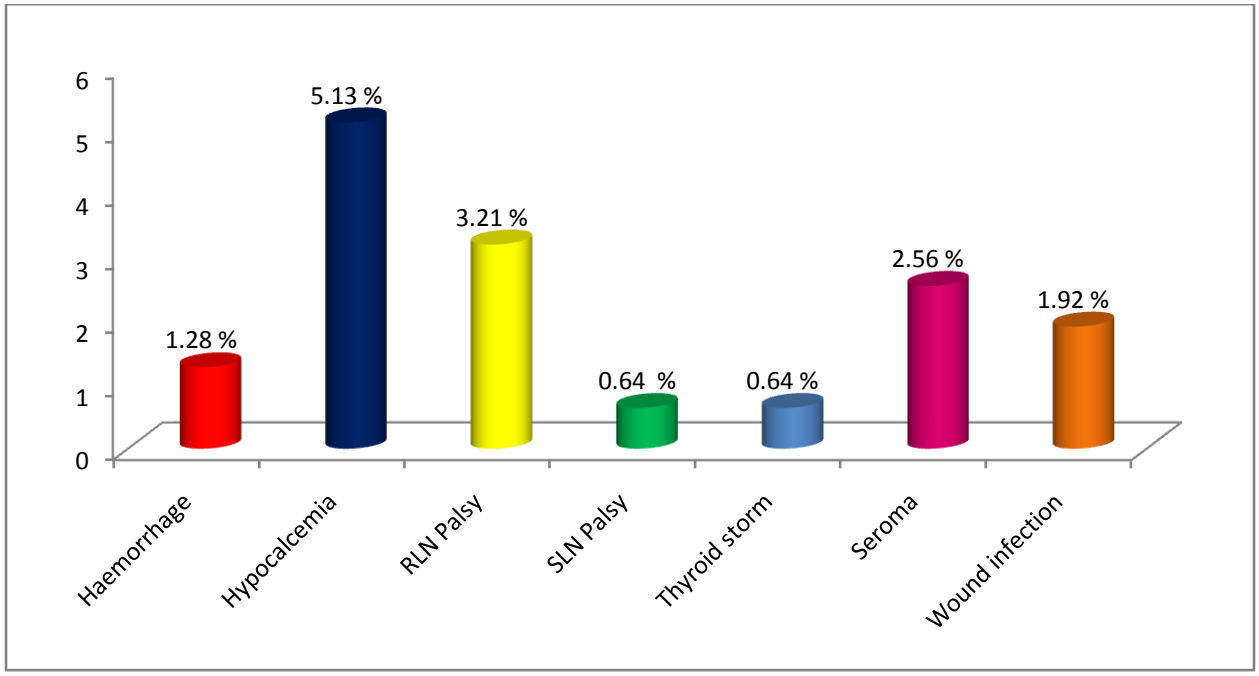


Chart 4 Incidence of Complications in Various Thyroid Disorders:

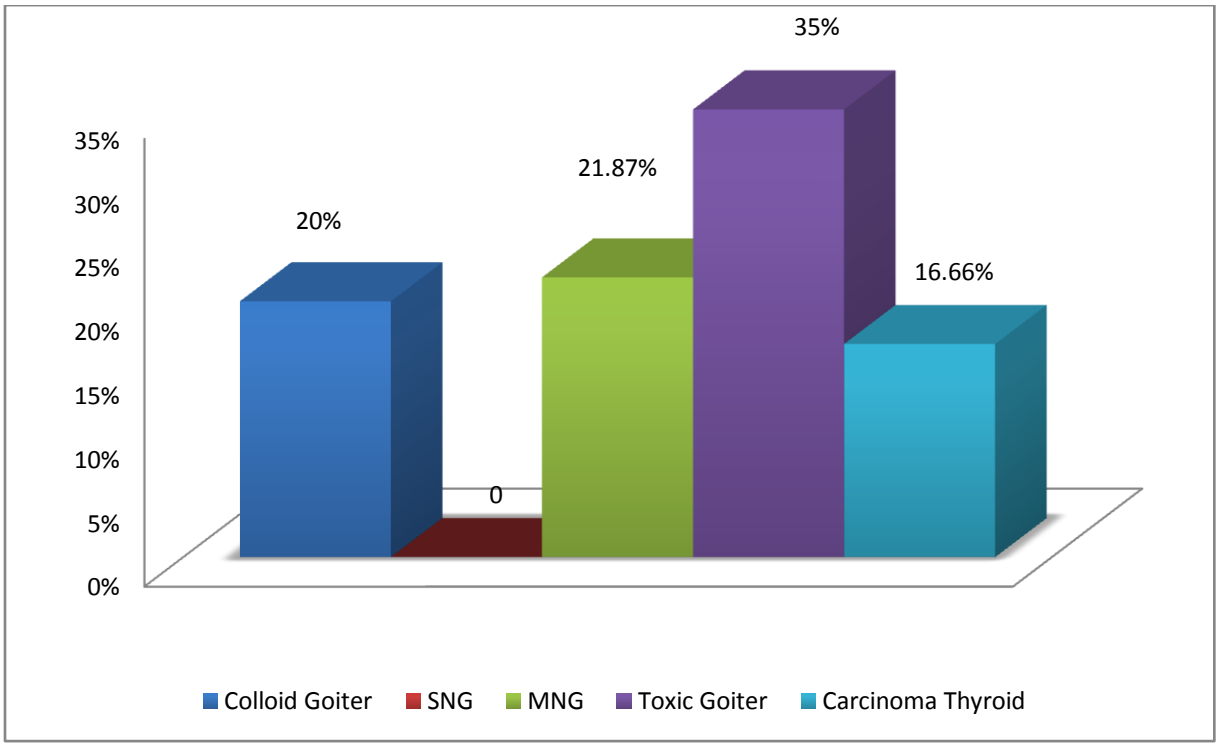


Chart 5 Incidence of haemorrhage with respiratory obstruction in various thyroidectomy procedures

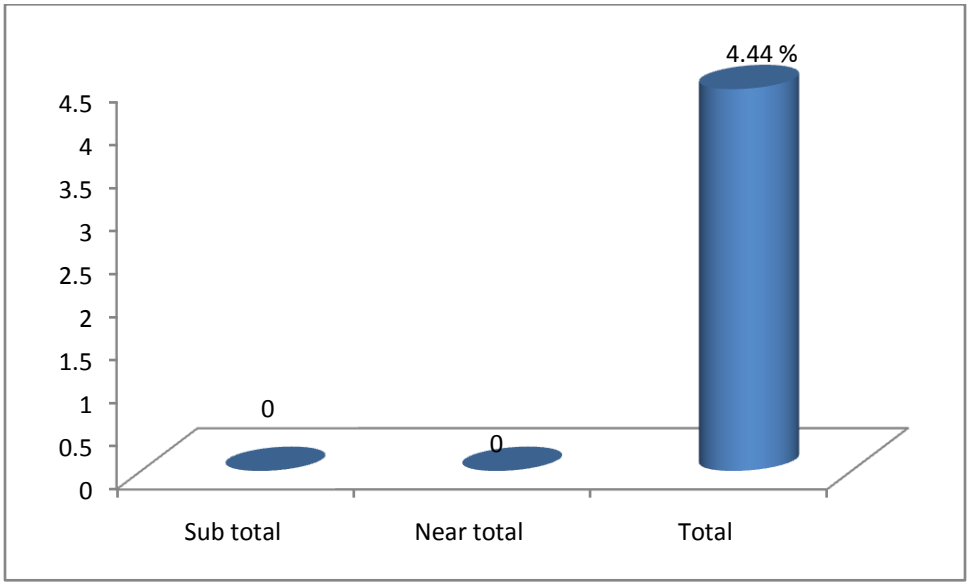


Chart 6 Incidence of hypocalcemia in various thyroidectomy procedures

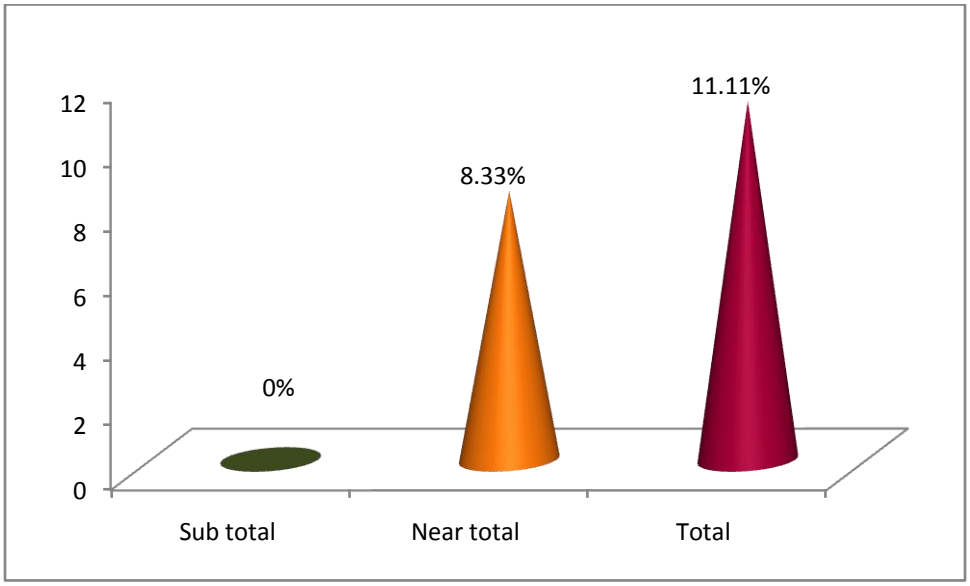
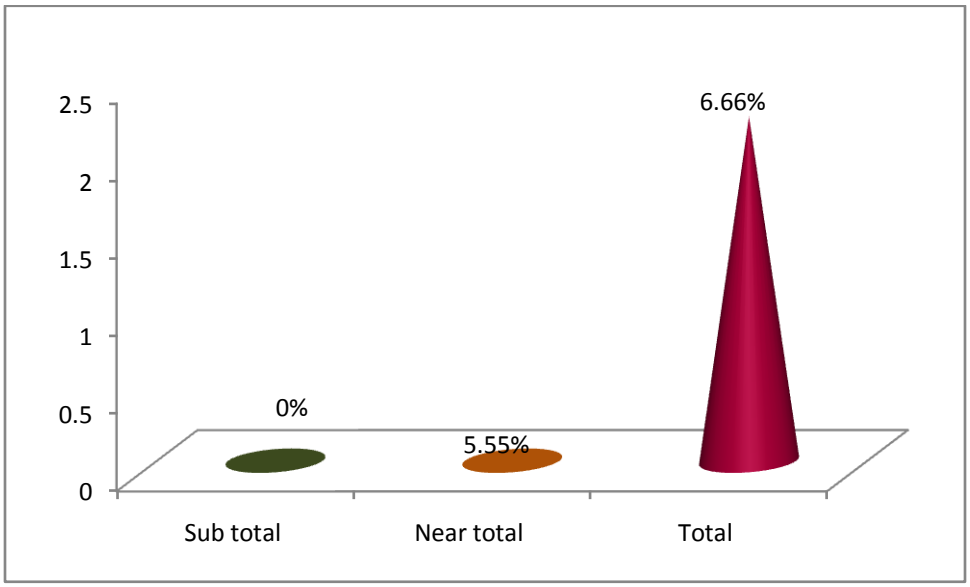
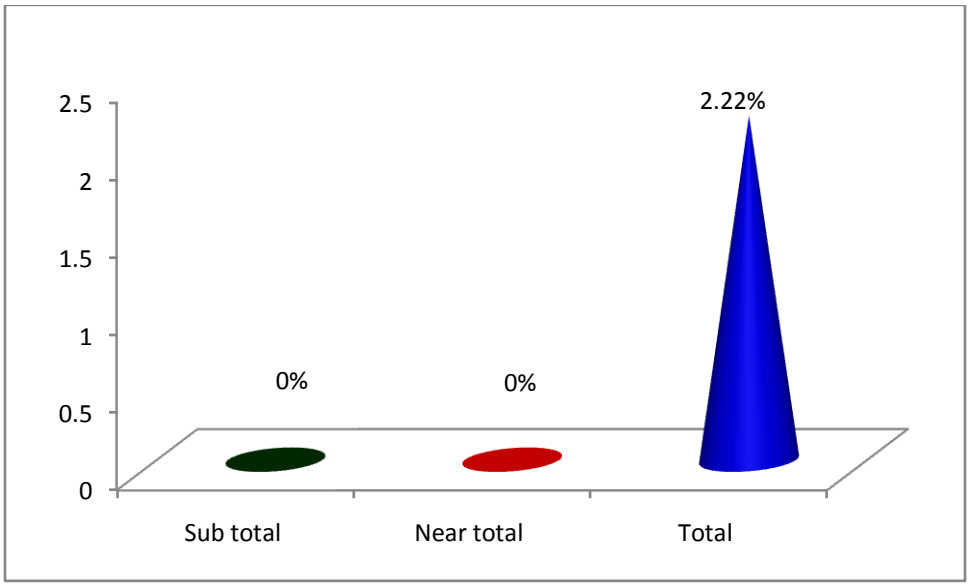


Chart 7 Incidence of neural complications in various thyroidectomy procedures



RLNP



SLNP

Chart 8 Incidence of thyroid storm in various thyroidectomy procedures

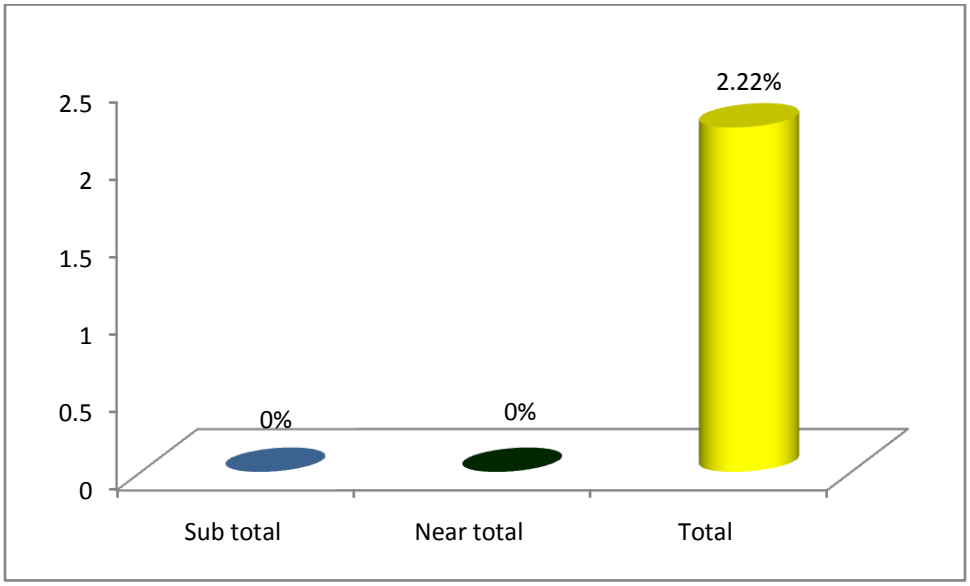
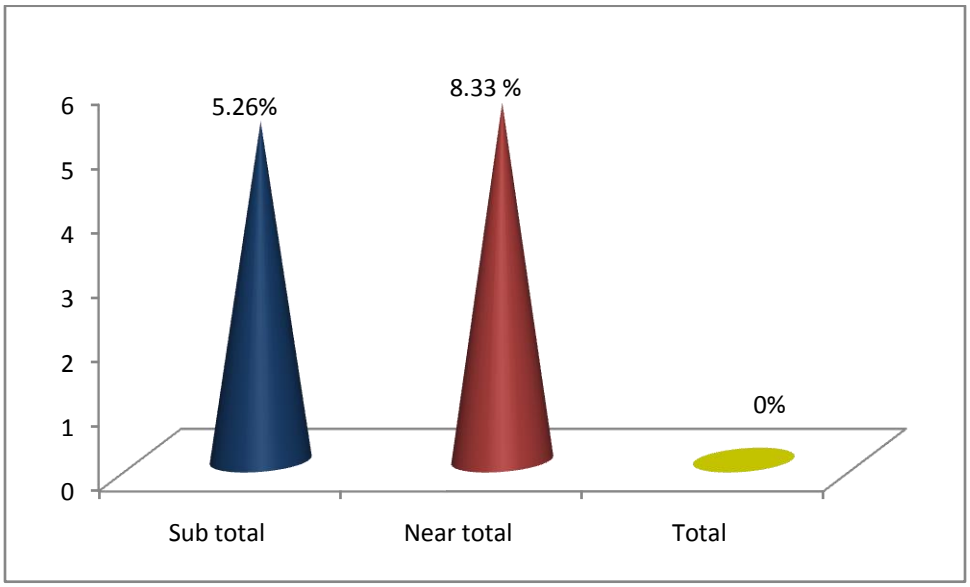
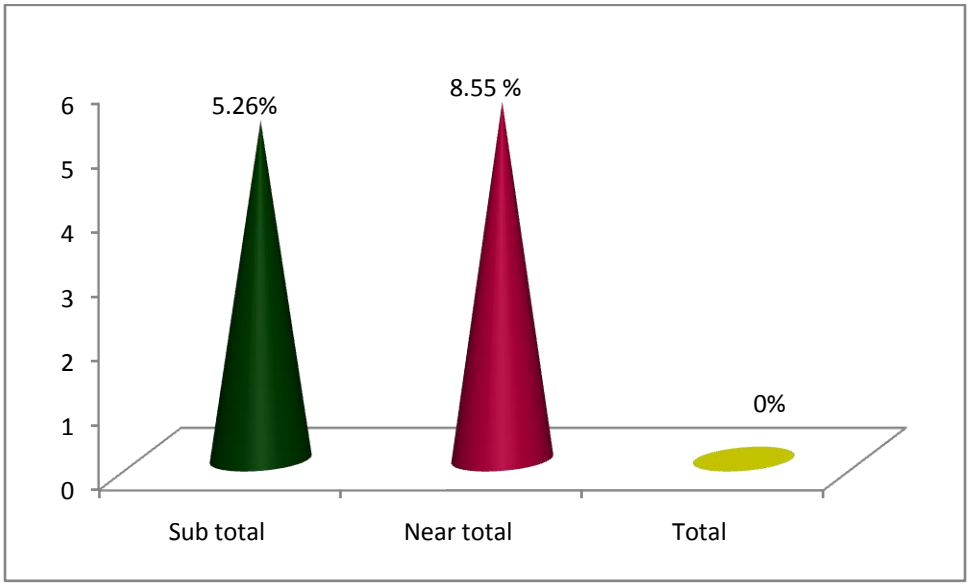


Chart 9 Incidence of wound complications in various thyroidectomy procedures



SEROMA



WOUND INFECTION

Chart 10 -Comparison of post operative complications with published reports

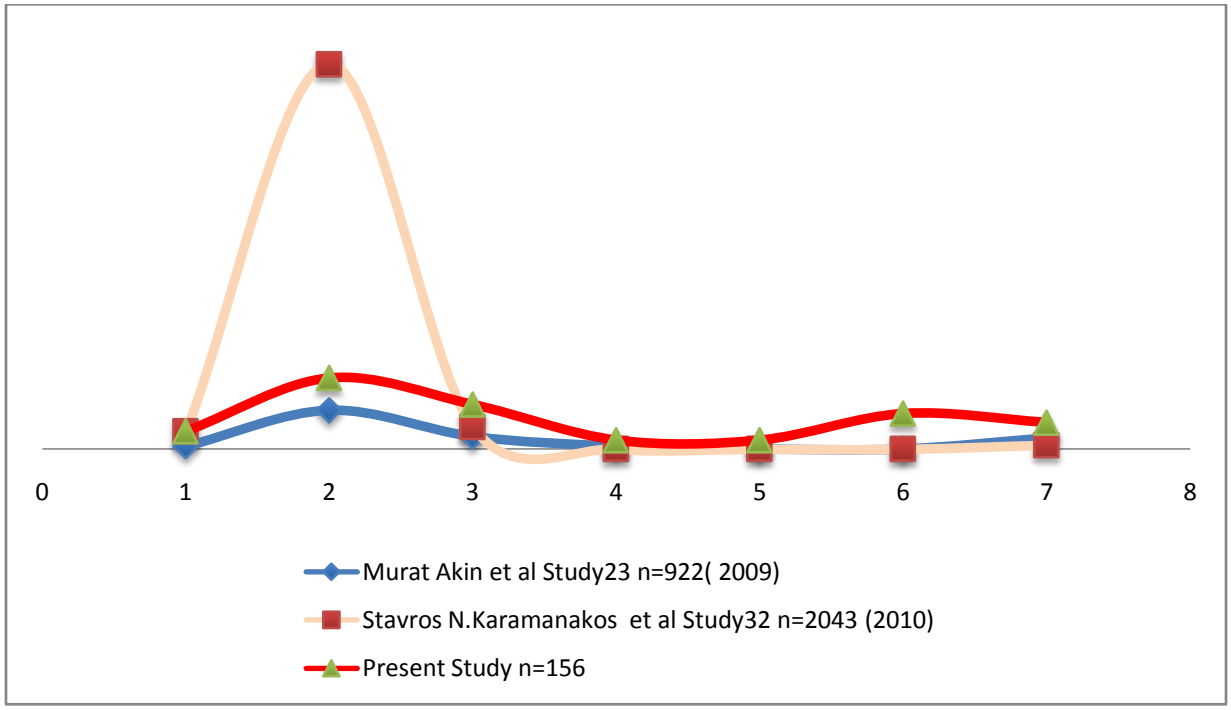


FIGURE 3 - RELATIONSHIP OF RECURRENT LARYNGEAL NERVE WITH THYROID GLAND

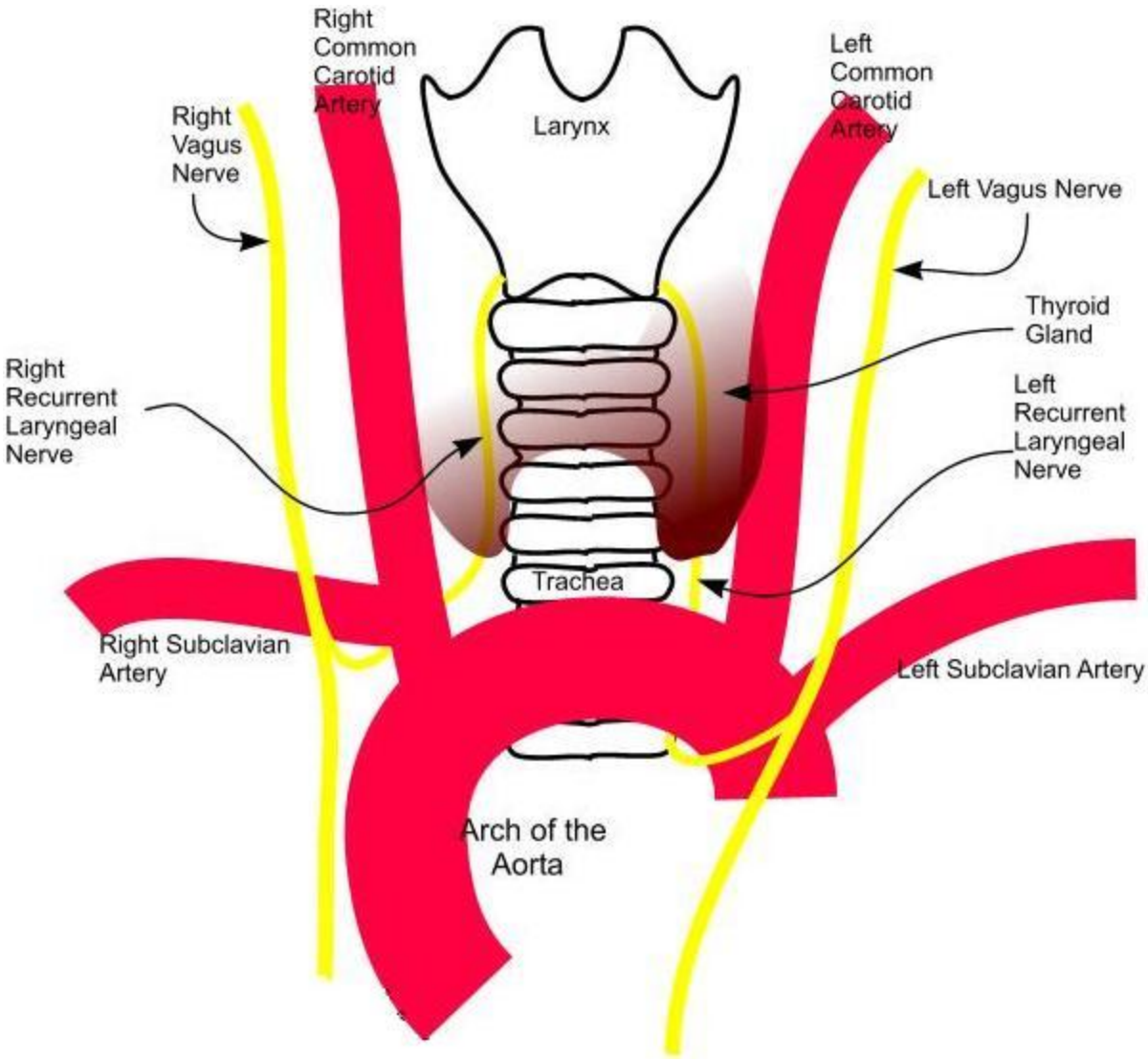
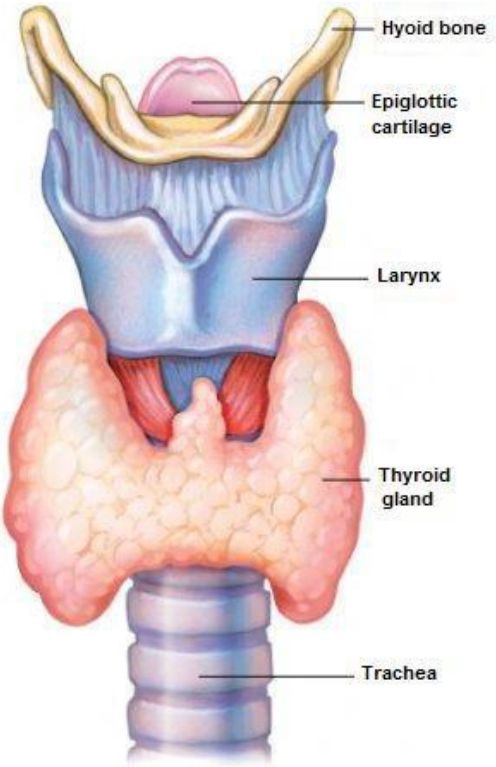


FIGURE 1 - LOCATION OF THYROID GLAND

AND PARA THYROID GLANDS


Hyoid bone
Epiglottic cartilage
Larynx
Thyroid gland
Trachea

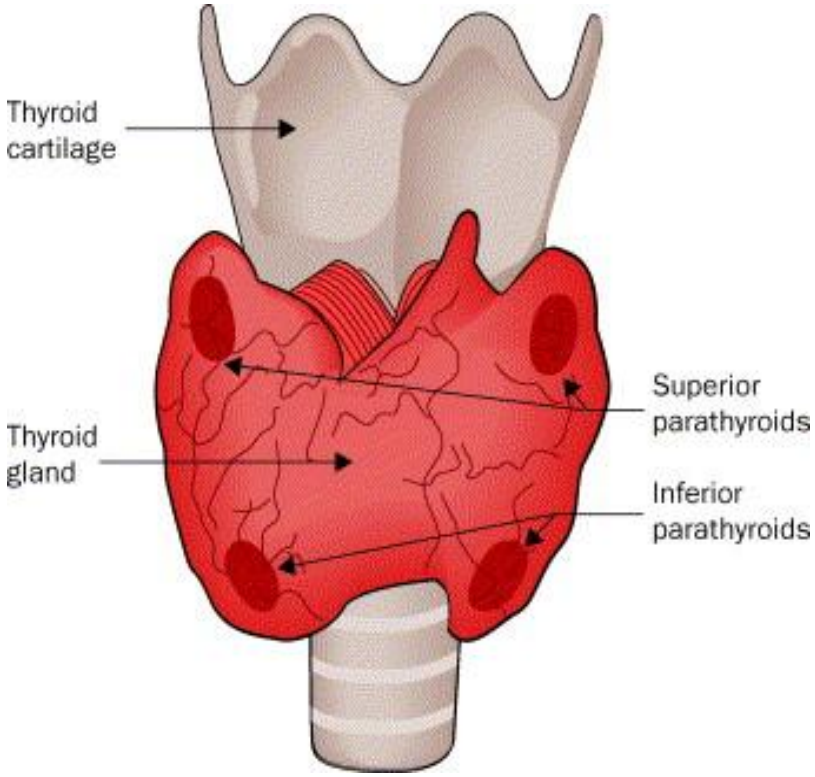

Thyroid cartilage
Thyroid gland
Superior parathyroids
Inferior parathyroids

FIGURE 7 -STRAP MUSCLES IN THE NECK

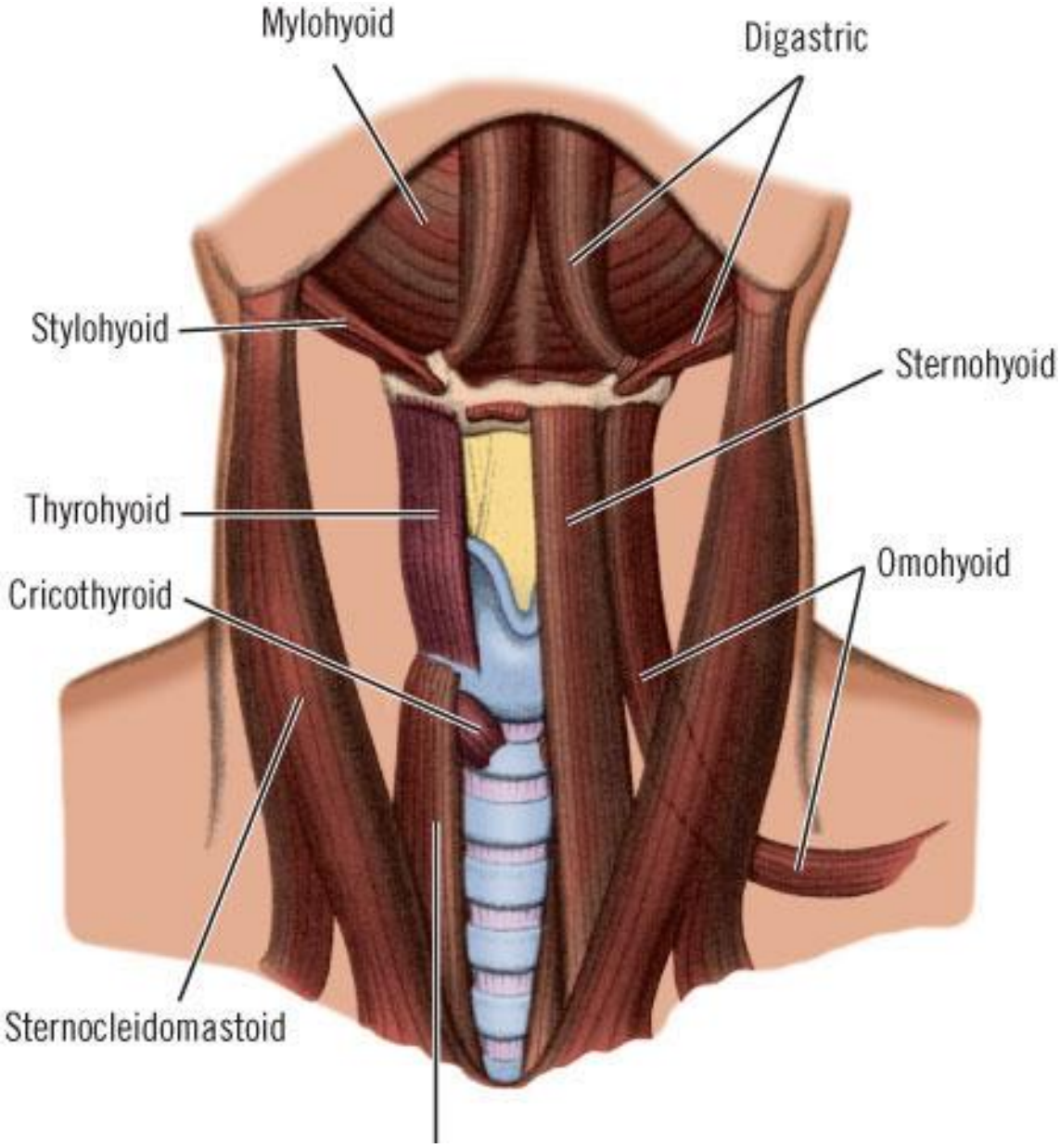


FIGURE 2 - VASCULAR SUPPLY OF THYROID GLAND

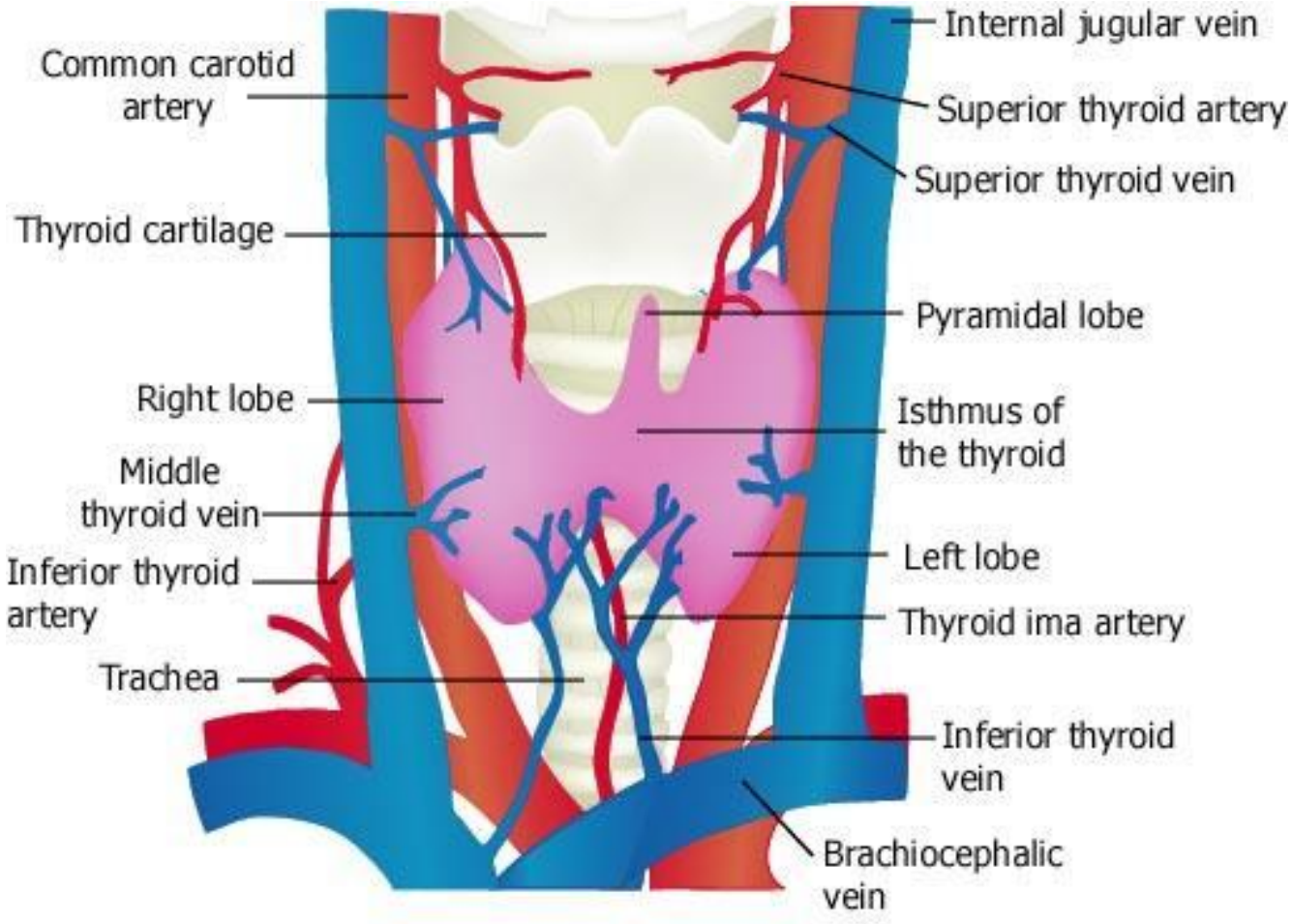


FIGURE 8- DISSECTION OF THYROID GLAND

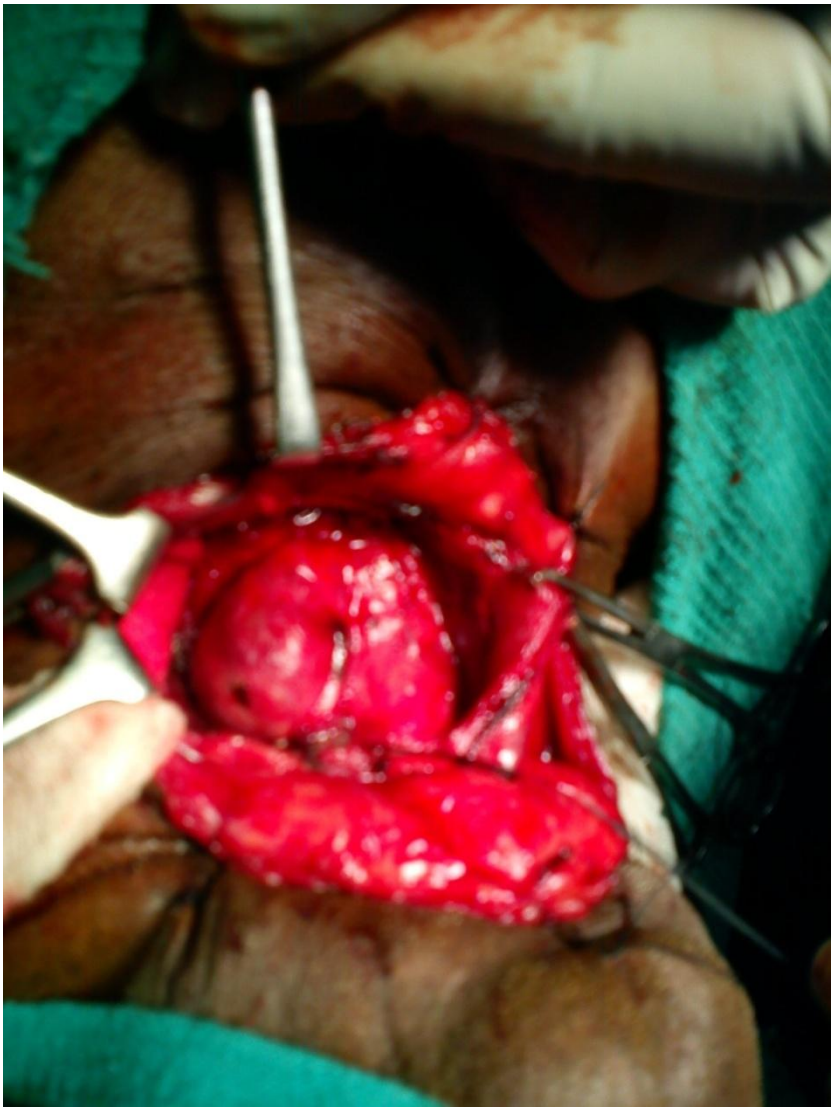


FIGURE 5 - A CASE OF MULTINODULAR GOITER

FIGURE 10 - A PATIENT ON TRACHEOSTOMY TUBE IN CASE OF TENSION HAEMATOMA CAUSING RESPIRATORY OBSTRUCTION

FIGURE 9 - A PATIENT ON TRACHEOSTOMY TUBE IN CASE OF TENSION HAEMATOMACAUSING RESPIRATORY OBSTRUCTION

FIGURE 6 - A CASE OF TOXI MULTINODULAR GOITER

FIGURE 12- A PATIENT WITH WOUND INFECTION FOLLOWING THYROIDECTOMY

FIGURE 11 - A PATIENT WITH SEROMA FOLLOWING THYROID SURGERY

FIGURE 4 - A CASE OF SOLITARY NODULAR GOITER

BIBLIOGRAPHY

1. Agrawal A, Mishra S. Postthyroidectomy haemorrhage; An analysis of critical factors in successful management. J Indian Med Assoc 1997;95(7): 418-419,433.

2. Alfred Cuscheri. Essential Surgical Practice – 4th edition; 95-109.

3. Attie J N, Khafif R A. Preservation of parathyroid glands during total thyroidectomy, improved technic utilizing microsurgery. Am J Surg 1975; 130:399-404.

4. Bhattacharyya N, Fried M. Assessment of the morbidity and complications of total thyroidectomy. Arch Otolaryngol Head Neck Surg 2002; 128: 389-92.

5. Bindu Nayak, MD, Kenneth Burman, MD. Thyrotoxicosis and Thyroid Storm; Endocrinol Metab Clin N Am 35 (2006) 663-686.

6. Bron LP, O'Brien CJ.Total thyroidectomy for clinically benign disease of the thyroid gland. Br J Surg 2004;91:569-74.

7. Cernea C, Cordeiro A, Ferraz A. Surgical anatomy of the superior laryngeal nerve.Surgery of the thyroid and parathyroid glands, ed. G. Randolph 2003; Elsevier 293-299.

8. Chaudhary IA, Masood R, Majrooh M A, Mallhi A A. Recurrent llaryngeal nerve injury: an experience with 310 thyroidectomies. J Ayub Med Coll Abbottabad 2007 jul-sep; 19(3): 46-50.

9. Courtney M Townsend. Sabiston Textbook of surgery-18th edition voluolme 1; 918-952.

10. Crile G W.The prevention of abductor paralysis in thyroidectomy. Surg. Gynecol. Obstet. 1929; 49: 538.

11. Farrar W B. Complications of thyroidectomy. Surg. Clin. North Am .1983;63: 1353-61.

12.Gokhan Soguthu, Asye Sertkaya Cikim. Post operative hypoparathyroidism in total thyroidectomy: Incidence and predictive factors. Turk Jem 2007; 11: 16-9.

13.Hay I D, Grant C S, Bargstralh E J, Van Heerden J A. Unilateral total lobectomy: is it sufficient surgical treatment for patients with AMES low-risk papillary thyroid carcinoma? Surgery 1998; 124: 958-66.

14. Hazam M.Zakaria, Naif A Awad. Recurrent laryngeal nerve injury in thyroid surgery. Oman Medical Journal; 2011; vol. 26 .No.1:34-38.

15. Hyoung Shin Lee, sung Won Kim, Young Sik Choi, Kang Dae Lee. Patterns of post thyroidectomy hemorrhage, Clin exp Otorhinolaryngol. 2009, june; 2(2): 72-77.

16. Josef E Fischer. Mastery of surgery by Lloyd M. Nyhus. 5th edition

volume 1; 388-410.

17.Lacoste l. Airway Complications in thyroid surgery; Annals of Otology, Rhinology &Laryngology;Jun 1993;102(6):441-6.

18.Lee McGregor's surgical anatomy.12th edition. 199-207.

19. Lore J M. Practical anatomical considerations in thyroid surgery. Arch Otolaryngol. 1983; 109:568.

20. Margaret Farquharson's textbook of operative general surgery 9th edition. 163-168.

21. Martensson J H, Ternins J. Recurrent laryngeal nerve palsy in thyroid gland surgery related to operations and nerves at risk. Arch surgery. 120:475, 1985.

22.Mazhar Iqbal, Mirza Sikander Baig. Frequency of hypocalcemia in total thyroidectomy; Journal of surgery Pakistan (International) 15(2) April – June 2010.

23. Murat Akin, Ahmet Ziya Anadol. Analysis of surgical complications of thyroid diseases: results of a single institution. Bratisl LekListy 2009; 110(1) 27-30.

24. Nelson N C, Becker W F 1969 Thyroid crisis: diagnosis and treatment. Ann Surg 170:263-273.

25. Promberger R, Kober F. Risk factors for post operative bleeding after thyroid surgery, British Journal of surgery 2012; 99: 373-379.

26. Randolph G W, Kobler J B, Wilkins J. Recurrent laryngeal nerve identification and assessment during thyroid surgery: laryngeal palpation. World J Surg 2004 Aug; 28(8): 755-760.

27. Riddell V. Thyroidectomy: Prevention of bilateral recurrent nerve palsy. Br. J. Surg. 57:1, 1970.

28. Rosato L, Avenia N, Bernante P, De Palma, Gulino G, Nasi P G. Complications of thyroid surgery: Analysis of a multicentric study on 14,934 patients operated on in Italy over 5 years. World J. Surg., 2004, 28:271.

29. Russell R C G, Williams N S. Bailey and Love's short practice of surgery 25th edition. 771-791.

30. Ruth E M Bowden.The surgical anatomy of the recurrent laryngeal nerve. Br J Surg 1955;43:143-63.

31.Shaha A R, Jaffe B M. Practical management of post thyroidectomy hematoma. J Surg Oncol. 1994 Dec; 57(4): 235-238.

32. Stavros N karamanakos, Kostas B Markou konstantinos Panagopoulos, Constantinos E Vagianos. Complications and risk factors related to the extent of surgery in thyroidectomy. Hormones 2010, 9(4):318-325.

33. Tomoda C, Hirokawa Y, Uruno T. Sensitivity and specificity of intraoperative recurrent laryngeal nerve stimulation test for predicting vocal cord palsy after thyroid surgery. World J Surg; 2006,30:1230.

34. Wade J S H. Vulnerability of the recurrent laryngeal nerves at thyroidectomy. Br. J Surgery. 43: 164, 1955.

35. Wartofsky L, Burch H B. Life threatening thyrotoxicosis. Thyroid storm. Endocrinol Metab Clin North Am, 1993;22:263-77.

PROFORMA

CASE NO: HOSPITAL NO:

NAME: AGE: SEX:

CHIEF COMPLAINTS:

H/o Thyroid swelling

H/o Pain over the swelling

Features of hypo/hyper-thyroidism

CLINICAL PRESENTATION:

Solitary nodule

Diffuse goitre

Multinodular goitre

SIGNS OF TOXICITY: YES / NO

SIGNS OF MYXOEDEMA: YES / NO

CLINICAL DIAGNOSIS:

INVESTIGATIONS:

Thyroid profile T3

T4

TSH

Serum calcium

Vocal cord status

Ultrasound thyroid

FNAC

DATE OF SURGERY:

SURGICAL PROCEDURE DONE:

POST OPERATIVE COMPLICATIONS:

Hemorrhage YES / NO

Respiratory obstruction YES / NO

Neural complications

RLN palsy YES / NO U / B

SLN palsy YES/ NO U / B

Hypocalcemia

Transient YES / NO

Permanent YES/NO

Thyroid storm	YES /NO
Wound complications	
Seroma and hematoma	
Skin flap necrosis	
Edema of the flap	
Wound infection	
Aero-digestive tract injuries	YES / NO
Complications related to anaesthesia	YES / NO
Death	
Others	

FOLLOW UP

Ref. No. 00216 /E4/3/2011 Govt.Rajaji Hospital,Madurai.20.
Dated: .01.2012

Institutional Review Board / Independent Ethics Committee.
Dr. A. Edwin Joe, M.D (FM), BL.,
Dean, Madurai Medical College & 2521021 (Secy)
Govt. Rajaji Hospital, Madurai 625020.
Convenor
grhethicssecy @gmail.com.

Sub: Establishment-Govt. Rajaji Hospital, aMadurai-20-
Ethics committee-Meeting Agenda-communicated-regarding.

The next Ethics Committee meeting of the Govt. Rajaji Hospital, Madurai was held at 11.00 Am to 1.00Pm on 27.01.2012 at the Dean Chamber, Govt. Rajaji Hospital, Madurai. The following members of the committee have been attended the meeting.

1. Dr.N.Vijayasankaran,M.ch(Uro.) 094-430-58793 0452-2584397	Sr.Consultant Urologist Madurai Kidney Centre, Sivagangai Road,Madurai	Chairman
2. Dr.P.K. Muthu Kumarasamy, M.D., 9843050911	Professor & H.O.D of Medical Oncology(Retired)	Member Secretary
3. Dr.I.Meena,MD 094-437-74875	Professor of Physiology, Madurai Medical College	Member
4. Dr. S. Thamilarasi, M.D (Pharmacol)	Professor of pharmacology	
5.Dr.Moses K.Daniel MD(Gen.Medicine) 098-421-56066	Professor of Medicine Madurai Medical College	Member
6.Dr.M.Gobinath,MS(Gen.Surgery) 097-871-50040	Professor of Surgery Madurai Medical College	Member
7.Dr.S. Dilshadh, MD(O&G)	Professor of OP&Gyn Madurai Medical College	Member
8.Dr.S.Vadivel Murugan., M.D, 097-871-50040	Professor of Medicine Madurai Medical College	Member
9.Shri.M.Sridher,B.sc.B.L. 099-949-07400	Advocate, 623-B.II.Floor,East II Cross, K.K.Nagar,Madurai.20.	Member
10.Shri.O.B.D.Bharat,B.sc., 094-437-14162	Businessman Plot No.588, K.K.Nagar,Madurai.20.	Member
11.Shri. S.sivakumar,M.A(Social) Mphil 093-444-84990	Sociologist, Plot No.51 F.F, K.K Nagar, Madurai.	Member

Following Projects were approved by the committee

Sl. No	Name of P.G.	Course	Name of the Project	Remarks
1.	J. Gomathy	PG, M.S (genl Surg)	Thyroid surgery with early complications; a clinical study.	Approved

Please note that the investigator should adhere the following: She/He should get a detailed informed consent from the patients/participants and maintain Confidentially.

1. She/He should carry out the work without detrimental to regular activities as well as without extra expenditure to the institution to Government.
2. She/He should inform the institution Ethical Committee in case of any change of study procedure site and investigation or guide.
3. She/He should not deviate for the area of the work for which applied for Ethical clearance.
She/He should inform the IEC immediately, in case of any adverse events pr Serious adverse reactions.
4. She/he should abide to the rules and regulations of the institution.
5. She/He should complete the work within the specific period and apply for if any Extension of time is required She should apply for permission again and do the work.
6. She/He should submit the summary of the work to the Ethical Committee on Completion of the work.
7. She/He should not claim any funds from the institution while doing the word or on completion.
8. She/He should understand that the members of IEC have the right to monitor the work with prior intimation.

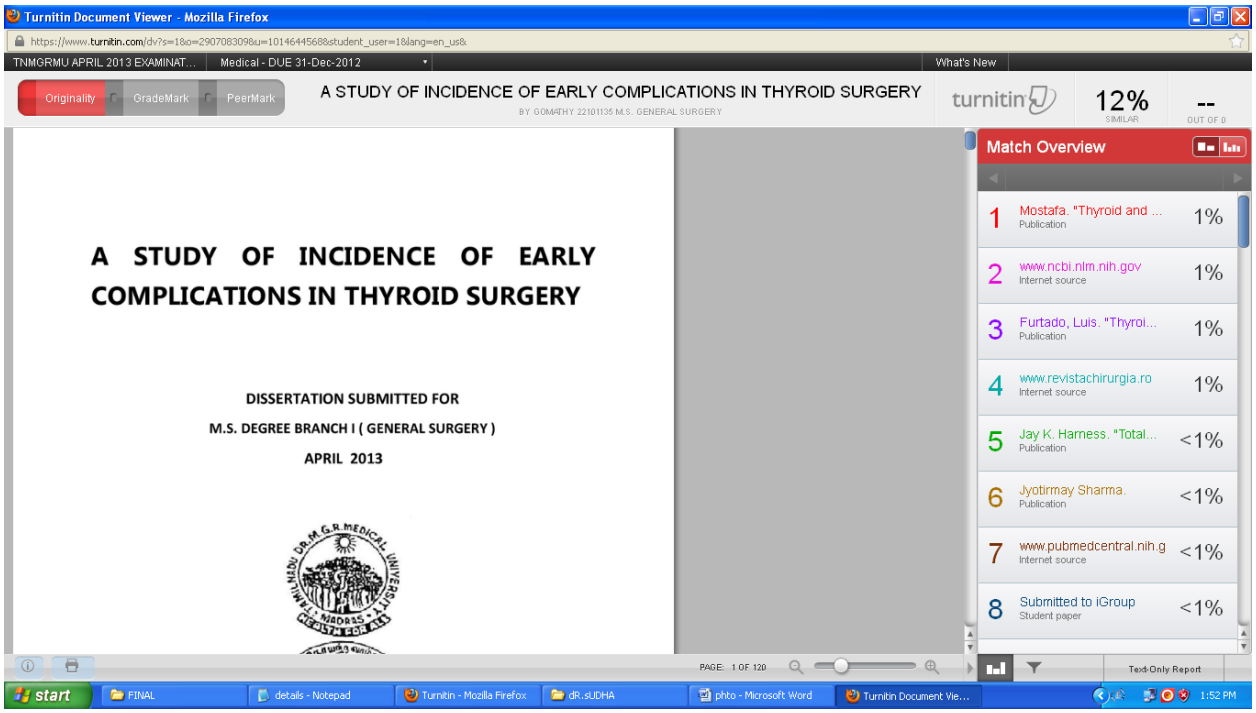
22/2/12 wk.

DEAN

To
All the above members and Head of the Departments concerned.
All the Applicants.

Forwarded
28/2

Professor and Head
Department of Surgery
MADURAI MEDICAL COLLEGE
Govt Rajaji Hospital
Madurai-20


Turnitin Document Viewer - Mozilla Firefox
A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY
BY GOMATHY 22101135 M.S. GENERAL SURGERY
12%
SIMILAR
Match Overview
1 Mostafa. "Thyroid and ... 1%
2 www.ncbi.nlm.nih.gov 1%
3 Furtado, Luis. "Thyroi... 1%
4 www.revistachirurgia.ro 1%
5 Jay K. Harness. "Total... <1%
6 Jyotirmay Sharma. <1%
7 www.pubmedcentral.nih.g <1%
8 Submitted to iGroup <1%
A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY
DISSERTATION SUBMITTED FOR
M.S. DEGREE BRANCH I (GENERAL SURGERY)
APRIL 2013
start
1:52 PM

turnitin

Your digital receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

Paper ID	290708309
Paper title	A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY
Assignment title	Medical
Author	Gomathy 22101135 M.S. General Surgery
E-mail	drcbhas@gmail.com
Submission time	18-Dec-2012 04:03PM
Total words	15795

First 100 words of your submission

A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY DISSERTATION SUBMITTED FOR M.S. DEGREE BRANCH I (GENERAL SURGERY) APRIL 2013 MADURAI MEDICAL COLLEGE, MADURAI THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY CHENNAI CERTIFICATE This is to certify that this dissertation titled “A STUDY OF INCIDENCE OF EARLY COMPLICATIONS IN THYROID SURGERY” submitted by DR.J.GOMATHI to the faculty of General Surgery, The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the requirement for the award of MS degree Branch I General Surgery, is a bonafide research work carried out by her under our direct supervision and guidance from November 2011 to October 2012....

MASTER CHART

SL.NO	NAME	AGE	SEX	IP.NO	DIAGNOSIS	SURGERY	DATE OF SURGERY	DAY OF OCCURRENCE OF COMPLICATION	HEMORRHAGE	HYPOCALEMIA	NEURAL COMPLICATION		THYROID STORM	WOUND COMPLICATION	
											RLN PALSY	SLN PALSY		SEROMA	INFECTION
1	PAPPATHY	60	F	73160	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	12/11/2011	-	-	-	-	-	-	-	-
2	DEVAKI	55	F	73817	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	12/11/2011	-	-	-	-	-	-	-	-
3	MEENA	31	F	60075	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	12/11/2011	-	-	-	-	-	-	-	-
4	SHOBHA	37	F	68078	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	14/11/2011	-	-	-	-	-	-	-	-
5	DEVAKI	24	F	57612	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	14/11/2011	-	-	-	-	-	-	-	-
6	MAHESHWARI	26	F	128763	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	20/11/2011	-	-	-	-	-	-	-	-
7	TAMILARASI	30	F	57613	TOXIC MNG THYROID	NEAR TOTAL THYROIDECTOMY	20/11/2011	-	-	-	-	-	-	-	-
8	AROCKIYARAJ	60	M	68662	MNG THYROID	TOTAL THYROIDECTOMY	23/11/2011	-	-	-	-	-	-	-	-
9	TAMILSELVI	36	F	70472	MNG THYROID	TOTAL THYROIDECTOMY	23/11/2011	-	-	-	-	-	-	-	-
10	PRIYA	30	M	73156	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	24/11/2011	-	-	-	-	-	-	-	-
11	RATHIMALA	28	F	74064	MNG THYROID	NEAR TOTAL THYROIDECTOMY	24/11/2011	-	-	-	-	-	-	-	-
12	MANIMEGALAI	47	F	2624	CA THYROID	TOTAL THYROIDECTOMY	28/11/2011	-	-	-	-	-	-	-	-
13	KAMEER NISHA	28	F	74209	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	1/12/2011	-	-	-	-	-	-	-	-
14	INDHRA	35	F	75436	MNG THYROID	NEAR TOTAL THYROIDECTOMY	7/12/2011	-	-	-	-	-	-	-	-
15	ANNALAKSHMI	43	F	76339	MNG THYROID	NEAR TOTAL THYROIDECTOMY	9/12/2011	-	-	-	-	-	-	-	-
16	NAINAR	44	M	73155	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	10/12/2011	-	-	-	-	-	-	-	-
17	MALARKODI	42	F	45216	MNG THYROID	NEAR TOTAL THYROIDECTOMY	12/12/2011								
18	ABITHA BANU	25	F	76217	MNG THYROID	NEAR TOTAL THYROIDECTOMY	14/12/2011	-	-	-	-	-	-	-	-
19	SURULIYAMMAL	50	F	83127	MNG THYROID	TOTAL THYROIDECTOMY	14/12/2011	-	-	-	-	-	-	-	-
20	CHITRA	24	F	73285	MNG THYROID	TOTAL THYROIDECTOMY	16/12/2011	-	-	-	-	-	-	-	-
21	MUTHUKUMARI	30	F	80610	MNG THYROID	TOTAL THYROIDECTOMY	21/12/2011	-	-	-	-	-	-	-	-
22	USHA	35	F	61382	MNG THYROID	NEAR TOTAL THYROIDECTOMY	30/12/2011	-	-	-	-	-	-	-	-
23	PALANIAPPAN	48	M	81531	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	31/12/2011	-	-	-	-	-	-	-	-
24	VEERAMMAL	55	F	81397	CA THYROID	TOTAL THYROIDECTOMY	13/1/2012	-	-	-	-	-	-	-	-
25	MOOKAN	41	M	2222	MNG THYROID	NEAR TOTAL THYROIDECTOMY	19/1/2012	-	-	-	-	-	-	-	-
26	PANDIYAMMAL	60	F	2254	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	19/1/2012	-	-	-	-	-	-	-	-
27	RAMZAN	43	F	2953	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	19/1/2012	-	-	-	-	-	-	-	-

28	MAREESHWARI	34	F	3632	MNG THYROID	NEAR TOTAL THYROIDECTOMY	19/1/2012	-	-	-	-	-	-	-	-
29	SARASWATHY	51	F	3815	MNG THYROID	SUBTOTAL THYROIDECTOMY	28/1/2012	-	-	-	-	-	-	-	-
30	PANDIYAMMAL	22	F	5213	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	1/2/2012								
31	UDHAYAKUMAR	58	M	7981	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	14/2/2012	-	-	-	-	-	-	-	-
32	SUBHASHINI	23	F	9951	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	15/2/2012	-	-	-	-	-	-	-	-
33	MALLIGA	34	F	9997	MNG THYROID	SUBTOTAL THYROIDECTOMY	15/2/2012	-	-	-	-	-	-	-	-
34	MUTHIAH	40	M	5424	MNG THYROID	NEAR TOTAL THYROIDECTOMY	15/2/2012	-	-	-	-	-	-	-	-
35	VIJAYALAKSHMI	49	F	7511	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	15/2/2012	-	-	-	-	-	-	-	-
36	SELVI	33	F	3808	MNG THYROID	TOTAL THYROIDECTOMY	16/2/2012	-	-	-	-	-	-	-	-
37	LATHA KAMATCHI	32	F	9202	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	18/2/2012	-	-	-	-	-	-	-	-
38	RUKMANI	24	F	11894	TOXIC NODULAR GOITRE	NEAR TOTAL THYROIDECTOMY	20/2/2012	-	-	-	-	-	-	-	-
39	SELVI	28	F	10804	MNG THYROID	TOTAL THYROIDECTOMY	21/2/2012	-	-	-	-	-	-	-	-
40	AMUDHA	36	F	11787	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	22/2/2012	-	-	-	-	-	-	-	-
41	RAKKU	30	F	9261	MNG THYROID	SUBTOTAL THYROIDECTOMY	22/2/2012	-	-	-	-	-	-	-	-
42	SURYA KUMARI	21	F	11867	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	27/2/2012								
43	RAJESHWARI	54	F	11587	MNG THYROID	TOTAL THYROIDECTOMY	28/2/2012	1	-	-	+	-	-	-	-
44	NAGAMMAL	40	F	11048	COLLOID GOITRE	NEAR TOTAL THYROIDECTOMY	29/2/2012	-	-	-	-	-	-	-	-
45	DEVI	54	F	9961	MNG THYROID	NEAR TOTAL THYROIDECTOMY	14/3/2012	2	-	+	-	-	-	-	-
46	PANCHAVARNAM	45	F	17233	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	15/3/2012	-	-	-	-	-	-	-	-
47	SHANTHI	40	F	14354	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	17/3/2012	-	-	-	-	-	-	-	-
48	AMIRTHAM	36	F	16915	MNG THYROID	SUBTOTAL THYROIDECTOMY	19/3/2012	-	-	-	-	-	-	-	-
49	RAMACHANDRAN	65	M	18724	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	21/3/2012	-	-	-	-	-	-	-	-
50	IRULAYEE	60	F	16978	CA THYROID	TOTAL THYROIDECTOMY	26/3/2012	-	-	-	-	-	-	-	-
51	KAVITHA	36	F	16152	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	29/3/2012	-	-	-	-	-	-	-	-
52	SURULI	35	M	3496	TOXIC MNG THYROID	NEAR TOTAL THYROIDECTOMY	29/3/2012	1	-	-	+	-	-	-	-
53	AKKAMMAL	23	F	17765	CA THYROID	TOTAL THYROIDECTOMY	4/4/2012	1	-	-	+	-	-	-	-
54	RAMYA	27	F	22878	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	14/4/2012	-	-	-	-	-	-	-	-
55	MOHANA	44	F	22182	TOXIC MNG THYROID	SUBTOTAL THYROIDECTOMY	19/4/2012	-	-	-	-	-	-	-	-
56	MUTHUMEENA	24	F	22664	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	19/4/2012	-	-	-	-	-	-	-	-
57	KATHIJA BANU	42	F	22888	CA THYROID	TOTAL THYROIDECTOMY	21/4/2012	-	-	-	-	-	-	-	-
58	LAKSHMI	35	F	22881	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	21/4/2012	-	-	-	-	-	-	-	-
59	VIJAYA	60	F	24327	MNG THYROID	SUBTOTAL THYROIDECTOMY	21/4/2012	-	-	-	-	-	-	-	-
60	RAJAMANI	69	F	24913	MNG THYROID	SUBTOTAL THYROIDECTOMY	21/4/2012	-	-	-	-	-	-	-	-
61	REVATHI	22	F	28273	MNG THYROID	SUBTOTAL THYROIDECTOMY	25/4/2012	-	-	-	-	-	-	-	-
62	NAGAMMAL	55	F	23697	MNG THYROID	TOTAL THYROIDECTOMY	26/4/2012	3	-	+	-	-	-	-	-
63	SARASWATHY	36	F	25177	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	28/4/2012	1	+	-	-	-	-	-	-
64	MUTHULAKSHMI	29	F	20968	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	30/4/2012	-	-	-	-	-	-	-	-
65	JANAKI	45	F	1261	MNG THYROID	TOTAL THYROIDECTOMY	3/5/2012	2	-	+	-	-	-	-	-
66	KARUPAYEE	55	F	24317	MNG THYROID	NEAR TOTAL THYROIDECTOMY	4/5/2012	3	-	-	-	-	-	+	-

67	ANANDHIAMMAL	67	F	29981	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	9/5/2012	-	-	-	-	-	-	-	-
68	CHANDRA	55	F	22636	CA THYROID	TOTAL THYROIDECTOMY	9/5/2012	3	-	+	-	-	-	-	-
69	VELLATHAI	33	F	68741	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	11/5/2012	-	-	-	-	-	-	-	-
70	KALAVATHI	22	F	30516	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	12/5/2012	-	-	-	-	-	-	-	-
71	RAJESHWARI	30	F	32810	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	16/5/2012	-	-	-	-	-	-	-	-
72	MALATHI	25	F	33909	MNG THYROID	NEAR TOTAL THYROIDECTOMY	22/5/2012	-	-	-	-	-	-	-	-
73	NALLAMMAL	47	F	30885	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	23/5/2012	-	-	-	-	-	-	-	-
74	NATHIYA	23	F	33593	TOXIC MNG THYROID	NEAR TOTAL THYROIDECTOMY	25/5/2012	5	-	-	-	-	-	-	+
75	CHANDRA	37	F	34490	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	26/5/2012	-	-	-	-	-	-	-	-
76	JOTHI	25	F	32442	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	26/5/2012	-	-	-	-	-	-	-	-
77	DHANAM	27	F	36229	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	29/5/2012	-	-	-	-	-	-	-	-
78	LAKSHMI	40	F	5020	MNG THYROID	NEAR TOTAL THYROIDECTOMY	3/6/2012	3	-	+	-	-	-	-	-
79	POORNAM	25	F	38513	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	4/6/2012	1	-	-	-	+	-	-	-
80	MOHAN KUMAR	30	M	14936	MNG THYROID	SUBTOTAL THYROIDECTOMY	6/6/2012	-	-	-	-	-	-	-	-
81	GEETHA	28	F	37737	TOXIC MNG THYROID	NEAR TOTAL THYROIDECTOMY	7/6/2012	2	-	-	-	-	-	+	-
82	VISALAKSHI	60	F	34789	MNG THYROID	TOTAL THYROIDECTOMY	9/6/2012	-	-	-	-	-	-	-	-
83	AMIR JOHN	35	F	40156	MNG THYROID	NEAR TOTAL THYROIDECTOMY	12/6/2012	-	-	-	-	-	-	-	-
84	MUTHULAKSHMI	35	F	33971	CA THYROID	TOTAL THYROIDECTOMY	14/6/2012	-	-	-	-	-	-	-	-
85	LOGAMANI	40	F	39571	COLLOID GOITRE	TOTAL THYROIDECTOMY	21/6/2012	-	-	-	-	-	-	-	-
86	MAHESHWARI	40	F	39578	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	23/6/2012	-	-	-	-	-	-	-	-
87	PANDIYAMMAL	65	F	38306	MNG THYROID	TOTAL THYROIDECTOMY	23/6/2012	-	-	-	-	-	-	-	-
88	KALEESHWARI	22	F	6433	TOXIC MNG THYROID	SUBTOTAL THYROIDECTOMY	3/7/2012	-	-	-	-	-	-	-	-
89	VASANTHA	48	F	14173	MNG THYROID	NEAR TOTAL THYROIDECTOMY	3/7/2012	-	-	-	-	-	-	-	-
90	NALLAMMAL	60	F	21260	CA THYROID	TOTAL THYROIDECTOMY	4/7/2012	-	-	-	-	-	-	-	-
91	PUSHPAVATHI	32	F	21261	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	4/7/2012	-	-	-	-	-	-	-	-
92	THANGAMANI	44	F	21486	MNG THYROID	TOTAL THYROIDECTOMY	4/7/2012	-	-	-	-	-	-	-	-
93	PALANIAMMAL	53	F	38042	MNG THYROID	TOTAL THYROIDECTOMY	4/7/2012	-	-	-	-	-	-	-	-
94	RAMU	28	M	46205	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	6/7/2012	-	-	-	-	-	-	-	-
95	SENTHAMILSELVI	27	F	35900	MNG THYROID	TOTAL THYROIDECTOMY	6/7/2012	-	-	-	-	-	-	-	-
96	JEYALAKSHMI	56	F	43834	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	9/7/2012	-	-	-	-	-	-	-	-
97	MEENATCHI	55	F	43878	TOXIC NODULAR GOITRE	TOTAL THYROIDECTOMY	9/7/2012	-	-	-	-	-	-	-	-
98	KOTHAI	57	F	43354	MNG THYROID	NEAR TOTAL THYROIDECTOMY	10/7/2012	3	-	-	-	-	-	+	-
99	NAGAMMAL	45	F	47074	MNG THYROID	SUBTOTAL THYROIDECTOMY	12/7/2012	-	-	-	-	-	-	-	-
100	SUBBAMMAL	55	F	46686	MNG THYROID	NEAR TOTAL THYROIDECTOMY	13/7/2012	-	-	-	-	-	-	-	-
101	PANDISELVI	21	F	48635	TOXIC MNG THYROID	SUBTOTAL THYROIDECTOMY	14/7/2012	3	-	-	-	-	-	-	+
102	MANJAMMAL	30	F	47209	MNG THYROID	SUBTOTAL THYROIDECTOMY	16/7/2012	-	-	-	-	-	-	-	-
103	YASHODHA	31	F	28644	MNG THYROID	NEAR TOTAL THYROIDECTOMY	16/7/2012	1	-	-	+	-	-	-	-
104	RAMASAMY	40	M	6429	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	20/7/2012	-	-	-	-	-	-	-	-
105	SELVARAJ	51	M	46152	MNG THYROID	TOTAL THYROIDECTOMY	21/7/2012	3	-	+	-	-	-	-	-

106	RAJENDRAN	35	M	4934	CA THYROID	TOTAL THYROIDECTOMY	23/7/2012	-	-	-	-	-	-	-	-
107	VELLAYAMMAL	60	F	44122	COLLOID GOITRE	TOTAL THYROIDECTOMY	24/7/2012	-	-	-	-	-	-	-	-
108	MALARKODI	32	F	50072	TOXIC MNG THYROID	NEAR TOTAL THYROIDECTOMY	25/7/2012	-	-	-	-	-	-	-	-
109	RAMASAMY	40	M	45116	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	26/7/2012	-	-	-	-	-	-	-	-
110	NAVEENA	25	F	50550	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	27/7/2012	-	-	-	-	-	-	-	-
111	ARUNA	23	F	52049	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	28/7/2012	-	-	-	-	-	-	-	-
112	THEIVARANI	43	F	50348	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	28/7/2012	4 HRS	-	-	-	-	+	-	-
113	SHANTHI	35	F	52052	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	28/7/2012	-	-	-	-	-	-	-	-
114	PANCHAVARNAM	45	F	37119	COLLOID GOITRE	NEAR TOTAL THYROIDECTOMY	30/7/2012	2	-	-	-	-	-	-	+
115	PALANIAMMAL	60	F	50581	MNG THYROID	SUBTOTAL THYROIDECTOMY	30/7/2012	-	-	-	-	-	-	-	-
116	MURUGESAN	62	M	49461	MNG THYROID	NEAR TOTAL THYROIDECTOMY	2/8/2012	-	-	-	-	-	-	-	-
117	JOTHI	32	F	6414	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	2/8/2012	-	-	-	-	-	-	-	-
118	NIRMALA	30	F	6503	MNG THYROID	SUBTOTAL THYROIDECTOMY	2/8/2012	-	-	-	-	-	-	-	-
119	RAJESHWARI	36	F	14365	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	3/8/2012	-	-	-	-	-	-	-	-
120	KALAISELVI	45	F	53942	MNG THYROID	SUBTOTAL THYROIDECTOMY	6/8/2012	-	-	-	-	-	-	-	-
121	NILOFUR	26	F	51837	MNG THYROID	NEAR TOTAL THYROIDECTOMY	8/8/2012	4	-	+	-	-	-	-	-
122	JEYANTHI	37	F	53742	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	9/8/2012	-	-	-	-	-	-	-	-
123	SAMUTHIRAM	45	F	53662	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	9/8/2012	-	-	-	-	-	-	-	-
124	MUTHULAKSHMI	31	F	53520	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	10/8/2012	-	-	-	-	-	-	-	-
125	RAJESHWARI	25	F	47435	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	14/8/2012								
126	PUSHPAM	60	F	53440	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	16/8/2012	-	-	-	-	-	-	-	-
127	SAROJA	55	F	53439	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	17/8/2012	-	-	-	-	-	-	-	-
128	MUTHULAKSHMI	31	F	35584	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	22/8/2012	-	-	-	-	-	-	-	-
129	SARATHA	30	F	55100	TOXIC MNG THYROID	NEAR TOTAL THYROIDECTOMY	24/8/2012	-	-	-	-	-	-	-	-
130	PARAMESHWARI	45	F	55517	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	25/8/2012	-	-	-	-	-	-	-	-
131	SHAKILA	37	F	55486	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	25/8/2012	-	-	-	-	-	-	-	-
132	BOMMIYAMMAL	36	F	53009	MNG THYROID	NEAR TOTAL THYROIDECTOMY	28/8/2012	-	-	-	-	-	-	-	-
133	VELLAYAMMAL	52	F	52533	MNG THYROID	TOTAL THYROIDECTOMY	31/8/2012	1	+	-	-	-	-	-	-
134	ALAGI	55	F	5395	MNG THYROID	NEAR TOTAL THYROIDECTOMY	10/9/2012	-	-	-	-	-	-	-	-
135	PRABHA	30	F	68775	COLLOID GOITRE	TOTAL THYROIDECTOMY	11/9/2012	-	-	-	-	-	-	-	-
136	PARAMESHWARI	29	F	64473	MNG THYROID	NEAR TOTAL THYROIDECTOMY	14/9/2012	-	-	-	-	-	-	-	-
137	SELVI	50	F	57410	MNG THYROID	NEAR TOTAL THYROIDECTOMY	14/9/2012	-	-	-	-	-	-	-	-
138	VASANTHA	35	F	61010	MNG THYROID	TOTAL THYROIDECTOMY	15/9/2012	1	-	-	+	-	-	-	-
139	VASANTHA	30	F	61552	MNG THYROID	SUBTOTAL THYROIDECTOMY	18/9/2012	-	-	-	-	-	-	-	-
140	AMUDHA	45	F	53061	MNG THYROID	NEAR TOTAL THYROIDECTOMY	20/9/2012	-	-	-	-	-	-	-	-
141	THILLAIVANAM	50	F	62522	MNG THYROID	NEAR TOTAL THYROIDECTOMY	24/9/2012	-	-	-	-	-	-	-	-
142	RAJALAXMI	24	F	62955	CA THYROID	TOTAL THYROIDECTOMY	25/9/2012	-	-	-	-	-	-	-	-
143	RAMU	45	M	2164	TOXIC NODULAR GOITRE	RIGHT HEMITHYROIDECTOMY	25/9/2012	-	-	-	-	-	-	-	-
144	MANICKAVALLI	26	F	5442	MNG THYROID	NEAR TOTAL THYROIDECTOMY	2/10/2012	-	-	-	-	-	-	-	-

145	DHANALAKSHMI	33	F	13271	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	3/10/2012	-	-	-	-	-	-	-	-
146	MUTHAIAMMAL	45	F	12647	MNG THYROID	TOTAL THYROIDECTOMY	3/10/2012	-	-	-	-	-	-	-	-
147	JOTHIMANI	55	F	67874	MNG THYROID	SUBTOTAL THYROIDECTOMY	5/10/2012	-	-	-	-	-	-	-	-
148	KARPAGAM	30	F	68788	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	5/10/2012	-	-	-	-	-	-	-	-
149	LAKSHMI	26	F	67786	CA THYROID	TOTAL THYROIDECTOMY	5/10/2012	-	-	-	-	-	-	-	-
150	BHARANIDARAN	37	M	62341	TOXIC MNG THYROID	TOTAL THYROIDECTOMY	10/10/2012								
151	BANU	33	F	68771	MNG THYROID	TOTAL THYROIDECTOMY	10/10/2012	-	-	-	-	-	-	-	-
152	MARIAMMAL	37	F	5805	MNG THYROID	TOTAL THYROIDECTOMY	10/10/2012	4	-	+	-	-	-	-	-
153	PETCHIAMMAL	50	F	82908	CA THYROID	TOTAL THYROIDECTOMY	12/10/2012	-	-	-	-	-	-	-	-
154	THANGAMMAL	64	F	15136	RIGHT SNG THYROID	RIGHT HEMITHYROIDECTOMY	12/10/2012	-	-	-	-	-	-	-	-
155	VALARMATHI	30	F	70563	LEFT SNG THYROID	LEFT HEMITHYROIDECTOMY	24/10/2012	-	-	-	-	-	-	-	-
156	VIJAYA	40	F	53030	MNG THYROID	SUBTOTAL THYROIDECTOMY	24/10/2012	2	-	-	-	-	-	+	-