A STUDY OF POST OPERATIVE COMPLICATIONS OF THYROID SURGERY

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CERTIFICATE

This is to certify that this dissertation titled "Post operative complications of thyroid surgery" is a bonafide work of Dr.P.Anbalagan, and has been prepared by him under our guidance, in partial fulfillment of regulations of The Tamilnadu Dr. M.G.R. Medical University, for the award of M.S. degree in General Surgery during the year 2006.

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CONTENTS

INTRODUCTION

Thyroidectomy is a common operation with an extremely low mortality[1]. It is associated with specific morbidities which are related to the experience of the surgeon, however[2]. Very low surgical morbidity rates for thyroidectomy are reported in specialised centers.

In competent hands, thyroid surgery is associated with few complications and no fatality. Post operative complications may be as insignificant as edema of the flap or as dangerous and life threatening as hemorrhage or respiratory obstruction. The majority are avoidable with sound surgical technique and good preoperative preparation. With proper preoperative management, the patient will be euthyroid at the time of surgery. If the patient is hyperthyroid, laryngeal edema may result, producing respiratory obstruction. Careless technique may result in massive haemorrhage, recurrent laryngeal nerve paralysis, or both, causing respiratory embarrassment. Lack of experience or of attention to technical details may involve removal of too little or too much thyroid tissue or possibly all parathyroids, resulting in myxedema, recurrent hyperthyroidism, or parathyroid deficiency.

Complication rates associated with thyroid surgery can be evaluated only through analysis of case studies and follow up data.

The present study reports the clinical audit of thyroid surgery for adult patients undertaken at the Tirunelveli Medical college hospital Tirunelveli. The complications of Thyroidectomy are highlighted and compared to published data.

AIMS AND OBJECTIVES

1. The aim of the study is to compare complication rates of Bilateral sub total thyroidectomy (SBT) , near total thyroidectomy (NTT) Hemithyroidectomy (Total lobectomy and isthmusectomy), and Total thyroidectomy (TT) in cohort of patients undergoing surgery for various thyroid disorders.
2. To compare complication rates after thyroidectomy for benign diseases and malignant diseases.
3. To identify ways to avoid the post operative complications.

MATERIALS AND METHODS

One hundred and seventeen patients who underwent thyroid surgery, for various thyroid disorders, at the Tirunelveli Medical College Hospital, Tirunelveli, Tamilnadu, India between August 2003 to December 2005 were studied.

Operations were performed by various professors, Assistant professors and also by surgical post graduates supervised by senior surgeons using various surgical techniques.

Indications for surgery in this study group include forty five patients with non toxic multinodular goitre (MNG), twenty two patients with toxic multinodular goitre, thirty four patients with nontoxic solitary nodular goitre, thirteen patients with carcinoma, two patients with recurrent goitre and one patient with colloid goitre.

Of these one hundred and seven patients were female and ten patients were male.

These patients were broadly divided in to two categories based on the diagnosis and treatment modality.

For all selected patients a thorough history was elicited followed by a complete physical examination. The basic biochemical and hematological investigations were done for all patients. It was decided to request special investigations like thyroid hormone profile and serum calcium estimation only in selected cases, where a disturbance in the functional status was suspected.

Vocal cords were examined pre operatively by indirect laryngoscope in all the patients, whereas post operative vocal cord examination was performed only when hoarseness occurred.

Patients were classified as having hypocalcaemia (hyperparathyroidism) if both clinical and biochemical (a fall in corrected serum calcium concentration below 8 mg/dl and or the need for calcium supplementation)[23] supportive evidence were present .

FNAC was done for all patients. Based on the Final diagnosis, the treatment was given as advised by the experts.

The details of each patient was documented as shown in the proforma (ANNEXURE I).

COMPLICATIONS OF THYROID SURGERY

HISTORICAL ASPECTS

Thyroid gland derives its name from its proximity to the thyroid cartilage, which resembles a shield (throes=shield). Discribed in the first century AD by Celsus and later by Galen,the accurate description of the gland was given by Vesalius. Names associated with thyroidology are those of Robert graves (1835), physician from Ireland,for describing primary thyrotoxicosis. Bernhard moritz karl ludwig riedel(1890) for his description of Riedel's thyroiditis, Fritz dequervain(1902) and Hakaru hasimoto(1912) for their description of thyroiditis, which still bears their names. Adams and Purtes of Newzealand discovered LATS in 1956. Halsted in his "The operative surgery of goiter" recorded the first sucessful thyroidectomy by Moorish surgeon Al-Zahrawi, in 952 AD.

Theodor kocher (1841-1917), a Swiss surgeon, perfected thyroidectomy. He stressed the need for meticulous dissection and preservation of the recurrent laryngeal nerves and noted the myxoedematous changes following total thyroidectomy. Kocher hence concluded that it was unsafe to remove the entire thyroid.

Isolation of Thyroxin in 1914 by Kendell and its subsequent availability in an oral form changed the scenario.Harrington Barger in 1927 synthesised T4.

Henry stanley plummer (1874-1937), physician from USA was the first to use iodine in the preparation of patients for thyroidectomy. Water ellis sistrunk jr (1880-1933) from USA,performed surgery for thyroglassal cyst.Thomas peel dunhil (1876-1957) initially treated throtoxicosis with a total lobectomy and subtotal lobectomy.

Von eiselsberg in 1890 had noted tetany in humans after operations for goiter and for the first time distinguished it from “cachexia strumipriva”.

Nobel prize in medicine was awarded to Theodor kocher in 1909 for his outstanding contributions to the understanding of thyroid disease through both clinical surgery and research.

THYROID EMBRYOLOGY

It is essential that the surgeon dealing with thyroid abnormalities must be familiar with their embryologic antecedents, for only through this knowledge can variations in glandular location, shape or number and rationale for surgical maneuvers be appreciated. The thyroid gland develops as an endodermal bud of cells at the foramen caecum at the junction of the anterior two-third of the tongue with its posterior one-third. In the floor of the pharynx, between the levels of the first and second pharyngeal pouches, gradually a median diverticulum is formed in the later half of the fourth week. It grows caudally as a tubular thyroglassal duct, which bifurcates and subsequently divides into a series of double cellular

plates from which the isthmus and the lateral lobes of thyroid gland are developed.

As the thyroid primordium descends, it acquires mesodermal contributions such as the parafollicular C –cells which ultimately secrete calcitonin. These parafollicular C cells are derived from a bud which is known as Ultimo-bronchial body which arises from a diverticulum of the fourth pharyngeal pouch of each side and amalgamates with the corresponding lateral lobe of thyroid. Except the distal part of the thyroglossal duct which usually differentiates to form the pyramidal lobe of thyroid, the rest of the duct disappears or sometimes replaced as a muscle-levator, glandulae thyroidea. Occasionally a portion of the thyroglossal duct may persist and give rise to the formation of cyst in the midline of the neck, which is called thyroglossal cyst. Sometimes thyroglossal fistulas or ectopic thyroid tissue may develop. Total agenesis of one thyroid lobe may occur. This is rare but can be clinically important, leading to confusion in diagnosis, especially in toxic glands, when it could be diagnosed as a secreting nodule.

SURGICAL ANATOMY

Surgeons attempting operations on the thyroid gland must be well informed on the anatomy of the neck, including the thyroid gland, its blood supply and its nerve supply, as well as its adjacent structures- the trachea, the larynx, the esophagus and the parathyroids. This chapter deals with the gross description of the thyroid gland along with the surgical anatomy of the thyroid as it applies to surgical procedures to be discussed. It is presented in a topographic manner, describing the anatomy as it is encountered in thyroidectomy.

GROSS ANATOMY

The thyroid gland occupies an important position in the centre of the visceral compartment of the neck, lying astride the trachea just above the thoracic inlet. It has an average weight of about 25grams. It is convex anteriorly and concave posteriorly as a result of its relation to the anterolateral portions of the cervical trachea from the level of the thyroid cartilage to the fifth or sixth tracheal ring. They reside in a bed between the trachea and larynx medially and the two carotid sheaths and the sternocleidomastoid muscles laterally.

The right lobe is often larger than the left and the lobes are joined together across the midline by a thin isthmus plastered quite firmly to the anterior surface of the trachea at the level of the 2nd and 3rd tracheal rings.

A variable sized, but usually small, pyramidal lobe arises from the isthmus somewhere along its upper border near the midline. It represents a vestige of the embryonic thyroglossal duct and can be demonstrated in about 80 percent of patients at operation.

The thyroid gland is enveloped by a thickened fibrous capsule. The deep cervical fascia divides into an anterior and posterior sheath, creating a loosely applied false capsule for the thyroid.

Anteriorly, the thyroid lobes are in relation to the strap muscles. Situated on the posterior surface of the lateral lobes of the gland are the parathyroid glands and the recurrent nerves, which lie in a cleft between the trachea and esophagus just medial to the lateral lobes.

THE SKIN

The skin of the neck may reveal several transverse folds that may be of value in deciding the site of incision. Of the folds just above the sternum and clavicle, one may be ideal for a low collar incision.

THE MUSCULOFASCIAL COVERINGS

The platysma is a thin, sheet like muscle immediately beneath the skin in the subcutaneous area, spreading fan like from below the clavicle laterally to the mandibles above, leaving a space in the midline. When the skin flaps are turned up to expose the underlying muscles, the skin, subcutaneous fat, and platysma should be dissected as a single layer. By this means, unnecessary bleeding will be avoided, since the fascial plane between the platysma and the fascia covering the prethyroid muscles is quite avascular. The muscle that must be dealt with during thyroid surgery are the two lateral sternocleidomastoid muscles, forming the boundaries, and the strap muscles namely the sternohyoid and sternothyroid muscles, forming the superficial and anterior boundaries. Both the sternohyoid, lying more anterior, and the sternothyroid, just beneath and covering the thyroid capsule, arise from the sternum. The sternohyoid attaches above to the hyoid, and the sternothyroid attaches to the thyroid cartilage. The fascia of the anterior medial border of the sternocleidomastoid fuses with fascia of the lateral border of the sternohyoid. This is divided longitudinally during exposure of the thyroid to allow retraction of the sternocleidomastoid laterally and the sternohyoid medially. The nerve supply to the sternohyoid and sternothyroid is the ANSA CERVICALIS (Ansa hypoglossi). This nerve descends along the lateral border of the sternohyoid and enters the muscles low in the neck .If

Fig 1: A case of ADENOMA of THYROID

The sternohyoid and sternothyroid are to be divided transversely to facilitate access to the gland, they must be transected high to preserve the motor function of this nerve.

The other important implication of the musculofascial covering of the gland is that at the end of the thyroid operations the divided fascial envelope is resutured in the midline and this again closes the visceral space. If there is post operative haemorrhage into this closed space, respiratory embarrassment from the tracheal compression results and requires immediate release of the sutures to restore the airway.

THE VASCULAR SUPPLY

As would be expected from its endocrine function, the blood supply of the thyroid gland is very rich in the hyperthyroid state and there may be an enormous increase in the volume of blood circulating through the gland.

The principle blood vessels to and from the thyroid gland are external to the capsule and can be ligated before the gland is entered. The superior and inferior thyroid arteries constitute the main arterial supply. Occasionally a branch from the aorta or innominate artery, the lowest thyroid artery (arteria thyroidea ima) and the occasional vein formed by the inferior thyroid veins (vena thyroidea ima) enter from below. The veins, in general, drain the corresponding arteries.

THE ARTERIES

THE SUPERIOR THYROID ARTERY

Superior thyroid artery arises as the first branch from the external carotid artery at about the level of the bifurcation of the common carotid artery. It runs downward and medially on the surface of the inferior constrictor muscles, entering the upper pole of the thyroid on its anterosuperior surface. In its downward course it is just inferior and lateral to the superior laryngeal nerve. The superior laryngeal nerve usually turns medial from the superior thyroid artery about one cm above the pole. Then, care must be taken in ligating the superior thyroid artery close to its entrance to the gland to avoid injury to the superior laryngeal nerve.

In many pathologically enlarged thyroid glands there is a lingula of thyroid tissue above and lateral to the point of entry of the superior thyroid artery and the superior laryngeal nerve. If this lingual is mistaken for the upper pole, the artery may be ligated high with possible damage to the superior laryngeal nerve. Occasionally a branch of the superior thyroid artery to the pyramidal lobe and isthmus may arise high and bleeding may occur from the upper pole after ligation of the superior thyroid artery simply because the artery was ligated below the origin of this branch to the pyramidal lobe.

Fig 2: A case of multinodular Goitre

THE INFERIOR THYROID ARTERY

It arises from the thyrocervical trunks shortly after their origin from the subclavian arteries. They ascend upward behind the jugular veins and carotid arteries to a level above the inferior pole of the thyroid. Then they make a loop downward and medially and enter the gland at its mid position, not at the inferior pole as frequently stated in some texts[43].

The surgeon's first glimpse of the inferior thyroid artery is usually when the thyroid gland is retracted medially and the jugular vein laterally. It appears from beneath the carotid artery opposite the mid section of the thyroid. Before entering the thyroid, the inferior thyroid artery may be divided into one or more branches and be intimately associated with one or more branches of the superior laryngeal nerve. One branch of the inferior thyroid artery may supply the inferior parathyroid. Great care must be used in ligating the inferior thyroid artery in this region to avoid injury to the recurrent laryngeal nerve. It should not be ligated until the recurrent nerve and its branches are visualized; then it should be ligated as far laterally as possible.

THE LOWER THYROID ARTERY (Arteia thyroidea ima)

Lower thyroid artery may be present in some. It arises from the aorta or innominate artery and passes directly upward in front of the trachea to enter the lower border of the isthmus. It is usually ligated with the inferior thyroid veins. A few unnamed arteries from the trachea also supply the thyroid gland. After partial thyroidectomy, they maintain the blood supply of the remaining glandular tissue.

THE VEINS

THE SUPERFICIAL VEINS lies beneath the platysma. They are easily visualized and should present no problem for the thyroid surgeon. The EXTERNAL JUGULAR VEINS are lateral and cross over the belly of the sternocleidomastoid. The ANTERIOR JUGULAR VEINS immediately overlie the sternohyoid muscles. A plexus of communicating veins may be present between the external and anterior jugular veins. In large goiters the superficial veins may be of considerable size. Care should be exercised in turning up the skin flaps with platysma so that the veins are not cut. If the surgeon carefully divides the fascia between the sternocleidomastoid and the sternohyoid, the communicating veins may be ligated and divided. The external jugular vein may then be retracted laterally along with the sternocleidomastoid. The anterior jugular is divided when the sternohyoid and sternothyroid are transected.

A venous plexus forms under the capsule and contribute to confluences forming the superior thyroid vein at the upper pole, the middle or lateral thyroid vein in the middle of the lobe, arising from the lower pole are the inferior thyroid veins. THE DEEP THYROID VEINS leave the gland in relationship to the thyroid arteries mainly at the superior and inferior poles and the lateral aspect of the gland. They are less constant than the arteries in number, position and size. The deep veins may be a serious threat during thyroid surgery because they are numerous and may easily be torn with ensuing hemorrhage. This is particularly true in patient with a large, substernal goiter. In such patients the clavicle may act as a tourniquet and produce great dilatation and increased pressure in the veins. If uncontrolled hemorrhage occurs, the lower pole and the substernal extension of the goiter must be quickly mobilized out of the mediastinum. Release of the tourniquet effect of the clavicle will allow the veins to collapse and the hemorrhage will be brought under control.

THE SUPERIOR THYROID VEINS leaves the gland at the superior pole just anterior and lateral to the superior thyroid artery. It empties into the cricothyroid tributary of the internal jugular vein. It is ligated along with the superior thyroid artery during thyroidectomy.

THE MIDDLE or LATERAL THYROID VEINS vary greatly in number. They pass directly from the lateral border of the lobes and enter into the

Fig 3: A case of Multinodular Goitre

internal jugular vein. During thyroidectomy they must be divided to allow access to the lateral compartment. In pathologically enlarged, the jugular vein and the lateral thyroid veins may be pushed close to the capsule of the thyroid. In such instances they may be mistaken for veins in the thyroid capsule, and the fascial plane between the thyroid and the jugular vein may be difficult to find. The lateral veins may override the capsule and must be identified and divided before an attempt is made to enucleate the gland. THE INFERIOR THYROID VEIN leaves the lower pole in one or more trunks, frequently forming a plexus of veins. The inferior thyroid vein is not adjacent to the inferior thyroid artery, which is in the region of the middle third of the gland. The inferior thyroid artery is more closely associated with the lateral thyroid vein. The inferior thyroid vein empties into the internal jugular vein and occasionally directly into the innominate vein. Occassionaly, a vein (vein of thyroidea ima) drains the isthmus, passing downward on the trachea to enter the left innominate vein. The inferior thyroid veins may be closely interwoven with the recurrent nerve as it ascends. This is a vulnerable area for injury to the recurrent laryngeal nerve.

THE LYMPHATIC SYSTEM

Knowledge of the lymphatic vessels draining the thyroid is essential in planning radical surgical procedures. In general, the lymphatics accompany the veins. Collecting lymph channels draining the intra glandular capillaries are found beneath the thyroid capsule. These channels drain into the lymph vessels associated with the capsule and may cross-communicate with the isthmus and opposite lobe.

THE SUPERIOR LYMPH VESSALS drain the isthmus and the medial superior portion of the thyroid lobes, ascending in front of the larynx and terminating in the sub digastric lymph nodes of the internal jugular chain.

THE MEDIAN INFERIOR LYMPH VESSELS descend with the inferior vein to the pretracheal nodes. The lateral collecting group, above, follows the superior thyroid vessels to the anterior and superior nodes of the internal jugular chain and, below, follows the lateral thyroid and inferior thyroid veins to the lateral and inferior nodes of the internal jugular vein. These internal jugular pretracheal and anterior jugular nodes can usually be excised surgically by a radical neck dissection. Tumor invading the pretracheal nodes, may spread downward into the anterosuperior mediastinal nodes out of reach of the usual radical neck dissection[44].

Another group of lymphatics draining the posterosuperior aspect of the thyroid leaves the posterior capsule and passes to the retropharyngeal nodes Rouviere [45] found this to be present in one fifth of his dissections. Obviously, if the retropharyngeal nodes are involved in tumor, they are not eradicated by a radical neck dissection[44,45].

A consideration of the complexity of this lymphatic drainage and the anatomical distribution of the regional nodes becomes important in management of metastatic papillary thyroid cancer. Because of wide distribution of the nodes, standard radical neck dissection has been abandoned in favuor of 'Regional node' removal.

THE NERVES

The gland receives its innervation from sympathetic and parasympathetic divisions of the autonomic nervous system. The sympathetic fibers arise from the cervical ganglion and enter with blood vessels, while the parasympathetic fibers are derived from the vagus and reach the gland via branches of the laryngeal nerves.

THE RECURRENT LARYNGEAL NERVES arise from the vagus at different levels on the two sides. The right recurrent laryngeal nerve arises where the vagus crosses the first portion of the subclavian artery. The nerve hooks around the lower and posterior aspect of the subclavian artery

and ascends lateral to the trachea, entering the larynx posterior to the thyroid at the cricothyroid articulation. The left recurrent laryngeal nerve leaves the vagus as the vagus crosses over the arch of aorta; it hooks around the aorta and ascends again, as the right recurrent nerve does, lateral to the trachea to its terminal branches within the laryngeal muscles. The nerves usually lie in the tracheo-esophageal groove and then bear a variable relationship to the branches of the inferior thyroid artery before entering the larynx. In the majority of cases, the nerve is found easily in the tracho-esophageal groove just below the thyroid gland, but its course may be anomalous and it may be much more lateral as emphasized by Fowler and Hanson [46]. In very rare instances, because of failure of development of the 4th arch vessel and a resultant anomalous right subclavian artery, the nerve on that side will be non-recurrent and then passes directly medially at a much higher level from the vagus to the larynx. In this position it could be in danger at the time of ligation of the middle thyroid vein, though the difference between these two structures should be easily apparent.

THE SUPERIOR LARYNGEAL NERVE arises from the vagus close to the base of the skull, descends medially to the carotid vessels, and at the level of the hyoid cornu, divides into two branches. The internal branch is sensory; it penetrates the thyrohyoid membrane and may anastomose with the sensory branch of the recurrent laryngeal nerve to complete the LOOP OF GALEN. The external branch of the superior laryngeal nerve lies on the lateral surface of the inferior pharyngeal constrictor muscle and

descends to innervate the cricothyroid muscle. Both branches lie immediately adjacent to the superior thyroid artery and may be injured if the superior thyroid artery is ligated “in bulk” too high above its entrance into the thyroid gland. If the recurrent nerve is injured, paralysis of the vocal cord occurs on the ipsilateral side. The laryngeal muscles (five on each side) controlling motion of vocal cords are the abductors (the internal arytenoids and the thyroarytenoid) and the adductors (the lateral and the posterior cricoarytenoids) and are innervated by the recurrent laryngeal nerve. The Cricothyroid muscle, which determines the range of voice (the tensors of the vocal cord), is innervated by the internal branch of superior laryngeal nerve. Semon-Rosenbach law postulated that the abductor fibers of the recurrent nerve are more susceptible to pressure than the adductor fibers[47,48]. The Wagner-Grossmann theory stated that paralysis of the vocal card in the paramedian position was the result of injury of the recurrent laryngeal nerve and paralysis of the vocal card in the intermediate position was the result of injury of the recurrent laryngeal nerve and the superior laryngeal nerve[49,50].

Fig 4: A case of Anaplastic Carcinoma with Ulceration

OPERATIVE SURGERY ON THE THYROID GLAND

The mortality rate of thyroidectomy as reported in several large series approaches zero. This can be accomplished only by a well performed standardized technique. The morbidity rate should be less than 5 percent. A well-executed thyroidectomy will keep this morbidity to a minimum. The step-by-step technique of thyroidectomy is recommended for satisfactory procedure.

Surgery plays only one part in the successful treatment of thyroid disease. No matter how technically perfectly thyroidectomy is performed, if the patient is brought into the operation theater in either a hypo thyroid or hyper thyroid state, disaster may follow. If the patient is thyrocardiac the services of the cardiologist are mandatory. If the patient is euthyroid but proper anaesthesia is not available, complications may occur. If an expert in diagnosing thyroid pathology from a frozen section is lacking, the wrong procedure may be elected. For the best results, treatment of the thyroid patient demands the services not only of the surgeon but also of the internist, the cardiologist, the anaesthesiologist and the pathologist- all experienced with thyroid disease.

PRE OPERATIVE PREPARATION

Preparation is directed to ensure safe induction of anaesthesia and a trouble free intra and post operative course.

Haemoglobin estimation, chest radiography,and an electrocardiogram are mandatory. Blood transfusion is rarely required; grouping and saving of serum is all that required.

If thyroid enlargement is massive or retrosternal and if the patient shows clinical signs of respiratory embarrassment or superior vena caval obstruction, a CT scan of the neck and thoracic inlet will indicate the possible need to enter the chest and potential problems that may be encountered on intubation.

The vocal cords should always be examined by indirect laryngoscopy; this is especially important when the voice is compromised, malignancy is suspected, or when previous thyroid surgery has been undertaken. A small proportion of patients have unsuspected palsy of the recurrent laryngeal nerve; it is of clinical and medico legal importance to both the patient and the surgeon to determine before surgery whether or not the vocal cards are moving normally.

Thyrotoxic patients need to be rendered euthyroid or the peripheral effects of high circulating concentrations of thyroxin blocked. The majority of thyrotoxic patients referred for surgery have already received one or more courses of anti thyroid drugs, but their conditions remain unstable.

Where residual toxicity is modest and surgery can be undertaken quickly, it is standard practice in many centers to stop anti thyroid drugs 10 days before operation and switch to oral propranolol in a dose of 30 to 120 mg every 6 to 8 hrs. the dose is adjusted to keep the patients sleeping pulse at around 70 beats/minute. Since the effective duration of proparanolol is approximately 6hrs, it is important to administer medication right up to induction of anaesthesia and to continue thereafter, especially if the patient develops tachycardia. B-blockers are contraindicated in patients with bronchial asthma, sinus bradycardia, or congestive heart failure. Patients with severe thyrotoxicosis who require relatively early surgery should receive a 6 to 8 week course of carbimazole (Neo-mercazole 10 to 15 mg 8 hourly). In the event of an adverse drug reaction, propylthiouracil (100 mg three times daily) may be substituted for carbimazole. Extended use of thiourea drug may cause prothrombin deficiency (hence the advisability of stopping the drug 10 days before surgery), leucopenia or profound bone marrow depression. Full blood count and the international normalized ratio should be checked if reduced resistance to infection or impaired haemostasis are suspected.

STANDARD SURGICAL APPROACH TO THE THYROID

ANAESTHESIA AND POSITION ON THE OPERATING TABLE

General anaesthesia is administered through an endotracheal tube and good muscle relaxation obtained.

The patient is supine on the operating table with the table tilted up 15 degree at the head end to reduce venous engorgement. A geipad or sand bag is placed transversely under the shoulders and the neck is extended (with care particularly in the elderly) to make the thyroid gland more prominent and apply tension to skin, platysma and strap muscles, which makes dissection easier. The patient head is supported on a ring to avoid rotation of the head. Surgical aspect of the neck from the chin to the suprasternal notch is exposed.

THE INCISION

The skin incision can be marked by pressing a length of thread onto the skin just before using the scalpel. A gently curved skin crease low collar kocher incision is made, 2-3 cm above the sternum, extending to the lateral borders of the two sternomastoids. with large goiters the incision is made a little higher so as to provide better access to the superior thyroid pole.

ELEVATION OF THE FLAP

The skin, subcutaneous fat, and platysma are elevated as one layer. In order to give a neater scar, the platysma is divided at a slightly higher level than the skin. The fascial plane between the posterior sheath of the platysma and the sheath of the sterno hyoid muscle is relatively avascular and permits the flap to be raised with little, if any, bleeding. The platysmal fibers are most easily identified at the lateral margins of the incision and its fibers divided exposing the fascia of the prethyroid muscles. The superficial veins are not elevated with the flap, and thus they act as a deep landmark to keep the proper fascial plane.

By applying upward traction, the upper flap is raised well above the thyroid notch by a combination of sharp and blunt dissection in a relatively avascular plane. The lower flap may be freed from the underlying fascia down to the level of the suprasternal notch.

DIVISION OF THE PRETHYROID MUSCLES

Although this maneuver is not universally accepted, the prethyroid muscles should be divided in all cases to obtain adequate exposure and to perform a thyroidectomy safely. If the muscles are severed high, preserving their innervation from the ascending branch of the ansa hypoglossal nerve, which enters the muscle low, and if they are later carefully sutured, no disability or disfigurement results. Disfiguring atrophy of the prethyroid muscles, with the sunken neck and prominent trachea, is

the result of dividing the prethyroid muscles and their innervation too low in the neck.

The prethyroid muscles are mobilized for transaction by freeing their lateral and medial fascial attachments. The fascia of the lateral border of the sternohyoid is attached to the fascia of the medial anterior border of the sternocleidomastoid muscle. If this fascia between the two muscles is divided along the medial edge of the sternocleidomastoid muscle, the anterior jugular and external jugular veins can easily be visualized, ligated, and divided. The medial borders of the sternohyoid and sternothyroid muscles are best identified in the midline low in the neck. The midline of the trachea above the suprasternal notch should be determined by palpation and this area explored. Often a small amount of free fatty tissue is a clue to the midline. The finding of the midline before the midline fascia is divided is important in order to visualize, ligate, and divide the communicating veins crossing the midline from the anterior jugular of one side to the anterior jugular of the other.

With the borders of the prethyroid muscle mobilized by blunt dissection, their posterior sheaths are separated from the underlying thyroid capsule. This procedure is accomplished better and bleeding is avoided if it is started over the lower section of the thyroid rather than in the region of the upper poles. A common error is to separate only the

sternohyoid and leave the sternothyroid attached to the thyroid capsule. Both prethyroid muscles are then separated from the gland by blunt dissection. While the medial border of the sternocleidomastoid is retracted downward and outward by the assistant to push the anterior jugular out of the way, the surgeon applies kocher clamps across the upper aspects of the prethyroid muscle from the median side toward the lateral side. The prethyroid muscles are then divided between clamps.

Then retract the upper portion of the divided prethyroid muscles to expose the upper pole and the superior thyroid vessels. This is aided by gentle downward traction on the gland. The lower divided prethyroid muscles are freed laterally and retracted downward. Both lobes are exposed in the same manner, and the anterior exposure of the thyroid completed.

If the anterior exposure has been performed properly, the remainder of the operation should go smoothly. Difficulty encountered with mobilization, hemorrhage, and identification of the recurrent nerves and the parathyroids is usually due to the result of poor anterior exposure.

MOBILIZATION OF THE GLAND

The mobilization of the thyroid gland involves the division of the lateral thyroid veins so that the internal jugular vein and carotid artery can be retracted laterally and the thyroid displaced up and out of its bed. This gives access to the inferior thyroid aspect of the gland so that the inferior thyroid artery can be isolated and the recurrent laryngeal nerve identified. The numbers of lateral veins are variable. Gentle upward and medial traction on the gland places the lateral veins on the stretch so that by meticulous dissection they may be clamped and severed. As the lateral veins empty directly into the internal jugular vein, an inadvertent tear may flood the lateral compartment, making later identification of the inferior thyroid artery and the recurrent laryngeal nerve more difficult. In large goiters the lateral veins should be divided close to the capsule. If the gland is rotated anteriorly and medially, the cleavage plane will be apparent, the internal jugular vein visualized and retracted laterally, and the remaining lateral veins severed.

ISOLATION OF THE INFERIOR THYROID ARTERY

The most vulnerable location for injury to the recurrent laryngeal nerve is the point at which the inferior thyroid artery approaches the lateral aspect of the thyroid. Before entering the thyroid gland, the inferior thyroid artery may divide into one or more branches and be intermittently associated with the recurrent laryngeal nerve and its branches. For easy

identification of the inferior thyroid artery and the recurrent laryngeal nerve, the entire posterior lateral edge of the thyroid is exposed and this compartment should be free of blood and blood stained tissue. By meticulous scissors dissection in this avascular field, the inferior thyroid artery will be visualized coming from beneath the carotid artery, in most instances at the level of the mid portion of the thyroid gland. As the inferior thyroid artery is followed to the capsule of the gland, attention is directed to the recurrent laryngeal nerve; in most cases, this passes inferior to the artery, but it may be above or between the branches of the artery.

To prevent damage to the recurrent laryngeal nerve the inferior thyroid artery is not ligated until the nerve is isolated and out of the way. The artery is then ligated in continuity,free of surrounding tissue as far laterally as possible.

Tying the inferior thyroid artery in continuity reduces the risk of a blown-off tie, a serious complication. Although tying the inferior thyroid artery laterally may occlude the branch of the artery supplying the inferior parathyroid, most of the surgeon have not experienced any parathyroid deficiency.

Hemorrhage from a torn inferior thyroid artery is inexcusable. Obviously it cannot be controlled with pressure on the carotid artery. If this

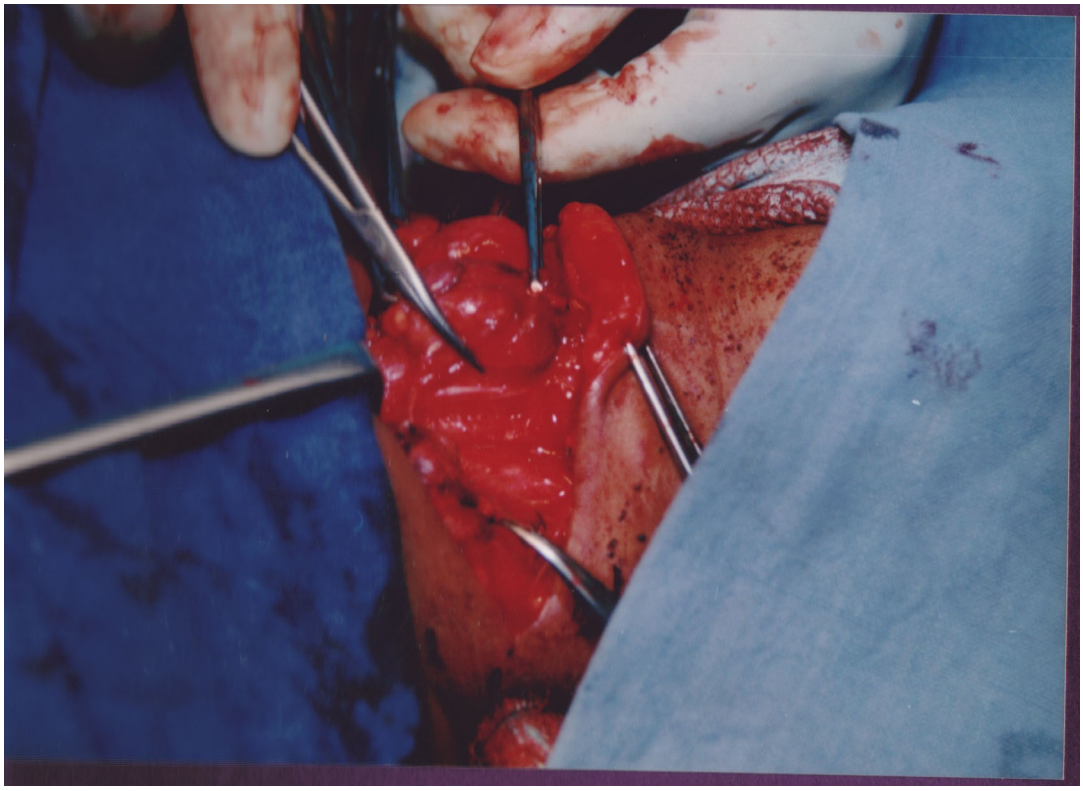


Fig 5: Total thyroidectomy on progress. Recurrent laryngeal nerve shown with pointer.

catastrophe occurs, the carotid sheath must be retracted laterally and anteriorly and the proximal end of the artery clamped and ligated.

ISOLATION OF THE RECURRENT LARYNGEAL NERVE

Most often the recurrent nerve is identified at the time the inferior thyroid artery is isolated. If not, it is sought low in the neck in its usual position in the groove between the esophagus and the trachea. As it approaches the lower border of the thyroid it may, as it ascends, turn as much as one cm, lateral to this groove and be intimately associated with a plexus of delicate inferior thyroid veins. Bleeding is avoided by meticulous scissors dissection; the scissors are always opened in the direction of the course of the nerve. The recurrent laryngeal nerve may have one or more extralaryngeal branches. Only one, however, contains the motor fibers supplying the laryngeal muscles. From a practical point of view, all ranches must be considered as possible motor branches and spared injury. Once identified, the nerve is followed to its junction with the inferior thyroid artery. The inferior thyroid artery is then ligated in continuity.

MOBILIZATION OF THE INFERIOR POLE

With the inferior thyroid artery ligated and the recurrent nerve visualized, the lower pole may be mobilized safely. The midline of the trachea is demonstrated below the isthmus. The entire plexus of vessels below the isthmus and inferior poles may be cross-clamped. The clamps

are applied from the midline out. Use two hemostats below and one above and divide between the upper one and the lower two to prevent any possibility of the vessels slipping from one clamp and escaping into the mediastinum, where they may be difficult to retrieve with the vessels divided, the lower pole is gently detached from the trachea and pulled upward.

DIVISION OF THE SUPERIOR THYROID VESSELS AND MOBILIZATION OF THE UPPER POLE.

The superior thyroid vessels must be ligated under direct vision. With high elevation of the prethyroid muscle and downward and inward traction of the superior pole, they can be separated from the inferior constrictor muscle. They may be hidden beneath a few fibers of the divided sternothyroid. It is best to ligate the vessels with a ligature passing from inside out. The vessels are doubly ligated above and divided between the ligatures and a clamp placed below.

In hypertrophic glands a lingual or tongue of the tissue may ascend high, lateral to the entry of the vessels into the gland. In such instances two mistakes may be made.

1. A blind attempt may be made to pass a ligature around the vessels around the lingual.

2. The lingula may be transected with the vessels leaving remaining thyroid tissue intact, a possible and frequent focus for recurrence in Graves' disease and a difficult problem to remedy at a later date. This may be avoided by isolating and dividing the superior thyroid vessels at a lower level; then, by excising the thyroid capsule, this extension of thyroid tissue made by inward and downward traction may be enucleated. Before complete enucleation, small posterior veins entering the gland should be clamped.

IDENTIFICATION OF THE PARATHYROIDS

Every attempt is made to preserve at least one parathyroid on each side. As familiarity is gained with their appearance –split pea-sized, molded edges, tan to mahogany brown in color, appearing as distinct organs close to the thyroid capsule – they become more readily identified. Operative trauma or bruising of the parathyroids or adjacent lymphnodes may result in some capsular hemorrhage, staining the tissues so that the thyroid, parathyroid fat and lymphatic tissues are not clearly differentiated.

Once the superior pole is rotated downward and inward, the superior parathyroid may usually be seen at about the junction of the upper and middle thirds of the thyroid glands along its lateral posterior aspect.

The inferior parathyroids are usually found just below the junction of the inferior thyroid artery and the recurrent laryngeal nerves. Frequently a branch of the inferior thyroid artery leads to the inferior parathyroid. Clamps should be inserted into the thyroid capsule anterior to the parathyroids and the capsule and the parathyroids should be gently dislodged from the thyroid gland so that they are not excised with the resected gland.

DIVISION OF THE ISTHMUS

The isthmus is freed from its attachment to the trachea in the midline from below upward by blunt dissection and divided between a series of hemostats. Care must be excised in separating the isthmus from the underlying pretracheal fascia to avoid puncture of the trachea by the sharp points of this straight clamp.

At the upper aspect of the isthmus, the suspensory ligament is divided to complete the mobilization of the gland. A series of clamps is placed along the medial capsule and the capsule is incised above the clamps, producing a cuff that outlines the medial border of the resection.

At this moment in thyroidectomy, it is necessary to determine the amount of gland to resect or, conversely, the amount of gland to be left. This is determined by the pathologic condition for which thyroidectomy is being performed.

With the superior and inferior poles mobilized and the gland retracted medially, hemostats are applied to the lateral capsule, outlining the amount of thyroid to be removed. The capsule is incised above the line of hemostats. The thyroid tissue will appear to bulge out of the capsule. The incised lower edge of the capsule is pushed downward to help to preserve the parathyroids and their blood supply. A cup of thyroid capsule and thyroid tissue is developed that will clearly establish the lateral border of the remnant and will later be sutured to the medial cuff to reconstruct the remnant.

The thyroid tissue between the lateral and medial lines of hemostats now outlines the boundaries of the thyroid to be excised. By the clamp and cut technique within the thyroid capsule, the gland is excised to free it from the remaining remnant. All vessels are tied and hemostasis is assured. The remnant is reconstructed by suturing the lateral thyroid capsule to the medial capsule. If the medial capsule is not well defined, the suture may be placed in the pretracheal fascia to buttress the cut edge of the gland against the trachea. To avoid injury to the recurrent laryngeal nerve, sutures should not be placed deep in the tissue of the remnant.

CLOSURE OF THE WOUND

The head is slightly flexed to remove tension on the prethyroid muscles. The prethyroid muscles are sutured with mattress sutures. The

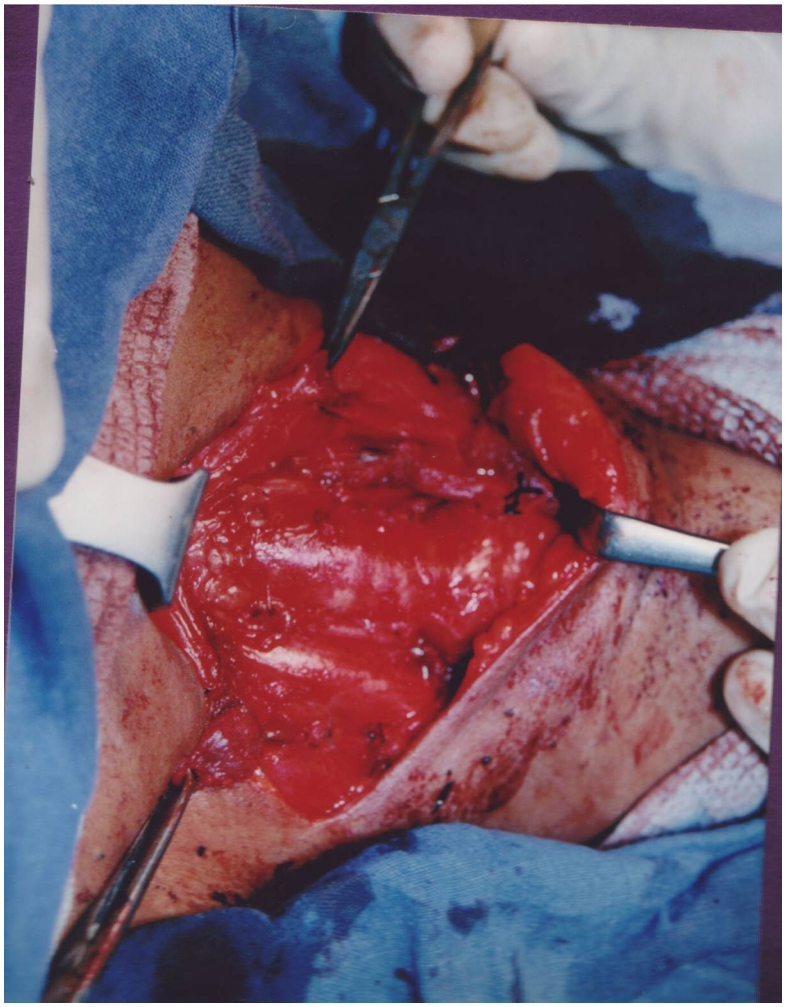


Fig 6: After completion of total thyroidectomy

anterior jugular vein, if unusually large, should be ligated separately. After proper hemostasis and positioning suction drainage to the deep cervical fascia {for any sero sanguineous collection}, the wound is closed in layers. The excellence of the scar depends upon careful approximation of the skin edges.

As a routine the anaesthesiologist should inspect the vocal cords following extubation and record the findings in his notes, for future reference.

For first 12 hours, the patient is kept in propped up [FOWLER'S] position and liquid diet started after 6 hours or on the first post operative day. The drain is removed after 48 hours and the skin sutures [or clips] after 96 hours.

POST OPERATIVE COMPLICATIONS AND THEIR MANAGEMENT

ANATOMICAL ENTITIS

Vascular structures - Arteries

Veins

Nerves - Superior laryngeal

Recurrent laryngeal

Thyroid parenchyma

Parathyroid

Aerodigestive tract -Trachea

Oesophagus

DURATION

Early complication

Late complication

CLINICAL ENTITIS

Non metabolic complication

A) Neural

B) Non neural

Metabolic complication

A) Hypocalcaemia without hypoparathyroidism

i) Temporary

ii) Permanent

iii) Spurious

B) Hypoparathyroidism

i) Temporary

ii) Permanent

Thyrotoxic crisis / storm

HAEMORRHAGE

This is typically reactionary and is a potential problem in the first twenty four hours after surgery. Failure to secure the superior thyroid vessels efficiently, preferably with a transfixation suture, is associated with the risk of serious blood loss. Inadequate control of the inferior and middle thyroid vein may also have serious consequences. Haemorrhage may be of two types (1).Immediate or (2).Delayed. (1).Immediate haemorrhage is the more serious and must be recognized easily. It frequently occurs during the post anesthetic period when the endotracheal tube is removed. Its origin may be arterial or venous, such as from a tear in a large vein. The patient may cough or vomit, producing increased venous pressure, which allows insecure ligatures to dislodge or insignificant vessels to bleed profusely. The surgeon or the assistant must be remains with the patient until the endotracheal tube is removed and the patient is breathing quietly.

Profuse haemorrhage may also occur during the several hours after surgery. It becomes apparent from swelling of the neck and from strider.

Major hemorrhage deep to the strap muscles must be recognized

quickly; this causes pressure on the airway within a confined space and may lead to rapid laryngeal and subglottic oedema. Medical and nursing staff needs to be aware of the significance of pallor, respiratory difficulty, stridor, and swelling of the wound. The absence of blood loss from drains is not a reliable indicator of haemostasis since these can block easily.

TREATMENT

Any haematoma should be evacuated immediately, and intubation or tracheostomy may be necessary to avert a potentially life-threatening situation. Clip removers and a pair of artery forceps should be readily available at the bedside of all patients after thyroidectomy. These will allow the incision and the strap muscles to be opened. If strider persists, skilled anaesthetic help is needed to perform intubation, which may be difficult in the presence of oedema. In the absence of such help a mini tracheostomy or large Medicut needle and cannula (no. 12 blue) inserted percutaneously through the cricoid membrane or between the tracheal rings should stabilize the patient until haemorrhage can be arrested. The patient should be returned to the operating room if respiratory embarrassment is present.

Delayed bleeding may occur two or three days after operation and is usually the result of oozing from small veins. The neck will appear swollen, and the patient may complain of tightness in the neck. Usually, respiratory difficulty is not evident. Serum and whole blood may be evacuated through

an opening in the incision at its lateral aspects. The potential disasters that may arise from such post-thyroidectomy haemorrhage can almost be eliminated by meticulous attention to haemostasis at operation, careful monitoring in the recovery room, appreciation of the subtle signs of respiratory distress and hypoxia (restlessness and mild degrees of strider), willingness to admit that complications occur, and return of patients to the operating room promptly when necessary.

Two further technical features useful in evaluating and managing patients after thyroid operations are the omission of both drains and dressings. The presence of drains tends to decrease the concern of the recovery room and surgical teams about haemorrhage and hematoma; their absence heightens concern about the patient's status and thus leads to earlier willingness to reexplore the operative area as well as to stimulate a more thorough attention to haemostasis by the surgeon. Frequently a clot forms and prevents egress of blood below the area of the drains. Many patients returned to the operating room for haemorrhage have had drains in place. The usual penrose drains are not effective in allowing blood to exit and are a pathway for the ingress of bacteria. If concerns arise about the completeness of operative haemostasis, use medium Redivac suction catheters brought out through separate stab wounds at the ends of the collar incision and placed beneath the muscles and into the deep compartment of the neck.

The second technical modification is to avoid all dressings so that the incision and the contour of the neck may be inspected and evaluated quickly, closely, and repeatedly. Wound infections originate not from the incision once sutures or clips have been placed but from the nasopharynx or the skin of the operating team or from the resident or circulating bacteria of the patient while the wound is open. So the absence of dressings has major advantages and no theoretic or practical disadvantage. Of course, the absence of dressings is only practical in the absence of drains- another rational behind the elimination of drains.

RESPIRATORY OBSTRUCTION

Respiratory obstruction may result from collapse or kinking of the trachea, the wall of which has become softened due to chondromalacia, occasionally occur after removal of a long-standing goiter , especially if retrosternal. Most cases are due to laryngeal edema and also edema of vocal cards and uvula in patients with hypothyroidism, particularly secondary to chronic thyroiditis, or in patients who have been over prepared with anti thyroid drugs. The most important cause of laryngeal edema is a tension hematoma. However trauma to the larynx by anaesthetic intubation and surgical manipulation are important contributory

Fig 7(a): A case of anaplastic carcinoma of thyroid who underwent preoperative radiotherapy for respiratory difficulty.

Fig 7(b): The same patients on endotracheal tube with oxygen supplementation post operatively.

Fig 7(c) : Patients recovered well, on the day of discharge.

factors, particularly if the goiter is very vascular, and may cause laryngeal edema without a tension hematoma. Unilateral or bilateral recurrent nerve paralysis will not cause immediate post operative respiratory obstruction unless laryngeal edema is also present, but they will aggravate the obstruction. If releasing the tension hematoma does not immediately relieve airway obstruction, the trachea should be intubated at once. An endotracheal tube can be left in place for several days; steroids are given to reduce edema and a tracheostomy is rarely necessary. Intubation in the presence of laryngeal edema may be very difficult and should be carried out by an experienced anaesthetist. Repeated unsuccessful attempts may aggravate the problem and, in a crisis, it is safer for the inexperienced surgeon to perform a needle tracheostomy as a temporary measure; a Medicut 12G needle (diameter 2.3 mm) is highly satisfactory. Whenever the trachea is markedly shift and narrow, an elective tracheostomy should be performed. On occasion, a patient will be anxious and nervous and will complain of difficulty in breathing with no evidence of strider. Steam inhalation and sedation may be all that is required.

A patient with thyrocardiac disease will not tolerate any degree of respiratory embarrassment. In such instances, prophylactic tracheostomy should seriously be considered.0

Fig 8: A post operative patient with respiratory difficulty, on endotracheal tube with oxygen supplementation.

NEURAL COMPLICATIONS

A). RECURRENT LARYNGEAL NERVE DAMAGE

The other early complications relate to operative injury is injury to laryngeal nerves. Recurrent laryngeal nerve is most commonly involved. Recurrent nerve paralysis may be unilateral or bilateral, transient or permanent. Transient paralysis [23] occurs in about 2-3% of nerves at risk and recovers in 3 weeks to 3 months. Permanent paralysis[23] is extremely rare (less than 0.1 %). It is largely avoidable if the surgeon routinely seeks to identify the nerve on each side during all operations on the gland.

Mechanism of injury of the nerves are, ligation of the nerve, transaction of the nerve, clamping (crushing) of the nerve, stretching of the nerve, and using diathermy. Three most common areas of recurrent laryngeal nerve injury (TRIPLE STRUCTURE CONCEPT) are inferior thyroid vein (since recurrent nerve may be anteriorly displaced to it), ligament of Berry (since tunneling of the recurrent nerve within the ligament), and inferior thyroid artery (since recurrent nerve can be lie between branches). By proceeding with meticulous care, deliberate exposure of the nerves to locate them anatomically; and avoidance of routine total thyroidectomies, recurrent nerves can be protected from injury.

In the presence of cancer, if preoperative inspection of the vocal cards demonstrates that paralysis is already present, presumably from

nerve involvement, the nerve may be sacrificed for the sake of more complete surgical removal of cancer, if paralysis does not exist, however, every attempt should be made to preserve both recurrent laryngeal nerves, even if this means slightly less thorough resection of cancerous tissue.

Loss of vocal power and huskiness is often evident for 2 or 3 days after surgery; this is most likely to be due to edema and is relieved by local anaesthetic lozenges and/ or humidified air. Persistence of symptoms may indicate neuropraxia, caused by stretching or crushing of the nerve; this is reversible and recovers over several weeks or months. Permanent damage will result if the nerve is divided or ligated and is more likely to occur when the anatomy is distorted, for example with recurrent or malignant goiters.

Unilateral injury may be asymptomatic and pass undetected due to compensatory hyper adduction of the unaffected cord unless routine post operative laryngoscopy is performed. Symptomatic unilateral paralysis improves if the affected cord is stabilized in adducton by the submucous injection of Teflon under direct laryngoscopy. The effects of bilateral nerve injury are likely to be temporary but pose an immediate problem when the patient is extubated at the end of surgery since the unopposed adductor action the cricothyroid muscles closes the glottis to such an extent that the least exertion results in obstruction. So look for inspiratory strider, dyspnoea and minimal dysphonia and the patient should be returned promptly to the operating room and emergency endotracheal intubation

should be done and ventilated whilst hydrocortisone is given, 100 mg three times daily, to combate the edema and inflammatory response. The patient can usually be successfully extubated within 48 hrs; if this extubation fails tracheostomy is required. Once a tracheostomy tube has been placed for unilateral paralysis, it may be plugged when the immediate accompanying post operative edema has subsided; in most patients the tracheostomy tube can be removed within 1 or 2 weeks if respiratory distress is not persistent.

If the tracheostomy tube needs to be retained for a longer time, as in case of bilateral nerve injury, particularly in the presence of cancer, use of a TUCKER valve makes wearing of the tracheostomy tube infinitely more acceptable. Patients with this flap valve may inhale through the tracheostomy tube but exhale through the larynx so that adequate phonation may occur, so he can speak adequately.

Other surgical options available are arytenoidopexy or cordectomy and arytenoidectomy. The permanent nature of laryngeal damage should not be accepted unless it lasts for more than 9 months. Exploration and resuture of the nerve using microsurgical anastomosis with 7 or 8:0' nylon /prolene will prevent cord atrophy. Epineural anastomosis is superior to perineural anastomosis. When necessary, nerve grafting, is now feasible,as in the anastomosis of the Ansa hypoglossi to the recurrent

laryngeal nerves. Alternatively Ansa neuromuscular pedicle may also be transfered to re innervate the thyroarytenoids.

B). SUPERIOR LARYNGEAL NERVE PARESIS

True incidence of this injury is unknown, owing to the lack of any objective test of function until recently. A change in the voice, such as loss of high pitch, huskiness, voice fatique and inability to make explosive sounds, makes damage likely. Voice analysis using a visipitch oscilloscope will help to confirm this damage, which may occur in up to 25% of patients. The majority will recover, since the nerve has only been stretched. If no improvement is evident after 3 months, it is unlikely to occur. Isolated injury to external branch will lead to no interference with cord function. To prevent superior laryngeal nerve injury, upper pole pedicle should be identified and downward traction on the gland applied, when ligating it. Leave alone if isolated injury occurred.

C).CERVICAL SYMPATHETIC DAMAGE

This rare complication results from deep, forceful retraction on the carotid sheath, producing Horner's syndrome. This is notable by the absence of the vascular dilatation component. The resulting myosis and ptosis are frequently permanent.

HYPOPARATHYROIDISM

Parathyroid insufficiency is due to removal of the parathyroid glands or infarction through damage to the parathyroid end artery; often, both factors occur together. Vascular injury is probably far more important than inadvertent removal. The incidence of this condition should be less than 0.5%, when a total thyroid lobectomy is performed on oneside, exceeding caution is utilized on the opposite lobe, if operated on at all, to identify and to preserve the parathyroid glands. Current enthusiasm for total thyroidectomy for all cancers or even for all thyroid disease will inevitably lead to large increases in this most debilitating and difficult to control iatrogenic physiologic complication. The ability to transport parathyroid glands into muscle with some success should not alter this philosophy, as no data indicate that total removal of the thyroid gland is either desirable or necessary except for medullary carcinoma. Thus, the mere ability to compensate for an iatrogenic disaster should not remove our obligation to prevent such problems by means of more limited but still altogether

successful surgery. (Pathogenesis of temporary hypocalcaemia- is given as a flow chart).

Most cases present dramatically 2-5 days after operation but, very rarely, the onset is delayed for 2-3 weeks or a patient with marked hypocalcaemia is asymptomatic. The serum calcium concentration should be monitored post operatively as patients without overt hypoparathyroidism may develop vague lethargy,depression, insidious cataract, mental deterioration, and psychosis. Hypocalcaemia due to parathyroid deficiency will usually be evident within one week of operation and should be suspected if the patient appears unduly agitated or depressed, or hyperventilates. Circum oral tingling is generally the first and most sensitive indicator of low serum calcium; parasthesia in the fingers and toes preceding frank tetany is seen when hypocalcaemia is profound. Tapping over the fascial nerve will cause contraction of the facial muscles (Chvostek-weiss sign); however this phenomenon may also be observed in 10 to 15 % of normal individuals. Carpo pedal spasm, provoked by occlusion of the circulation to the arm by inflating the sphygmomanometer around the brachial, above the systolic pressure for 3 minutes, (Trousseau's sign), indicates severe hypocalcaemia.

The major decision in post operative hypo parathyroidism is in distinguishing transient from permanent deficiency[23]. In the immediate post operative period, every attempt is made to avoid intravenous calcium administration, and only rarely is the calcium fall so rapid or early

symptoms so severe that parenteral calcium salts are required. If intra venous calcium is given, the hypocalcaemia should be documented by a preliminary blood sample drawn for later calcium demonstration. Once exogenous calcium is started, the decision to stop may be difficult; therefore, documentation is required, as episodes of hyperventilation may symptomatically mimic hypothyroidism. After collecting a blood sample for calcium estimation, 10 ml of 10 % calcium gluconate (given slowly to avoid cardiac arrest in systolic) should be given intra venously, which immediately relieves the symptoms.

Subsequently, if the calcium is above 8.0 mg /100 ml by the sixth post operative day but shows no signs of improvement and is accompanied by mild symptoms. We would begin oral effervescent calcium alone in the form if glubionate calcium or calcium lactate power mixed in a warm liquid, 4 to 6 grams daily, depending on response. If the calcium is over 8.0 mg/100ml, gradually increasing or stable, and not accompanied by significant symptoms, no medication is given, since the best stimulus to resumption of parathyroid haemostasis is transient hypocalcaemia. The patients should be evaluated later in follow up studies, however, to ensure that permanent hyper parathyroidism has not developed.

If the calcium is less than 7.5mg/100ml on the sixth post operative day, particularly if accompanied by a phosphorus of over 5mg/100ml, and such significant symptoms as carpopedal spasm, we would begin oral vitamin D in the form of Ergocalciferal (calciferal), 50,000 to 100,000 units

per day, as well as the oral calcium 2 to 3 gram per day are given until a normocalcaemic state is achieved. Signs and symptoms of hypocalcaemia will recur in these patients at times of metabolic stress, such as pregnancy or the menopause. Since most hypoparathyroidism will be transient, patients given vitamin D should stop receiving that medication and the oral calcium after about 3 months, and they should be observed for a prolonged period. Vitamin D activity may persist for several months; therefore, repeated calcium and phosphorus determinations should be performed over a period of atleast a further 6 months before final determination is made regarding permanent hypoparathyroidism.

THYROID CRISIS OR STORM

Fortunately thyroid storm is a rarity nowadays, thanks to effective and the improved methods of control of thyrotoxicosis. It is an acute exacerbation of hyperthyroidism, due to sudden release of thyroid hormones into circulation, with secondary effects of increased catacholamines, explaining the whole spectrum of clinical features, such as high fever, extreme tachycardia (atrial fibrillation), extreme restlessness, dehydration, hypertension, delirium, high output cardiac failure, pulmonary edema, etc, ultimately leading to coma.

It occurs if a thyrotoxic patient has been inadequately prepared for

thyroidectomy. It can also occur, rarely, during non thyroid surgery in a thyrotoxic patient as a result of infection, such as pneumonitis or pharngitis

and following 131 I therapy for thyrotoxicosis. This usually occurs during surgery, while the gland is being manipulated (hence it is first noticed by the anesthesiologist), or in the immediate post operative period.

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. Once recognized during surgery, handling of the gland should be stopped and intense therapy initiated to counter various manifestations, with the following agents given parentrally

1. High doses of anti thyroid drugs, carbimazole (neomercazole) 30 mg immediately and then 10-20 mg 6 to 8 hourly, plus Lugol's iodine 10 drops 8 hourly by mouth or 1 gram of sodium iodide intravenously, to block the release of T3 and T4 into circulation, should be given promptly.
2. Alfa /beta-blockers to bring down blood pressure and pulse rate. Propranolol 40 mg 6 hourly orally will block adverse β-adrenergic effects. This agent may be given by careful intravenous administration (1-2 mg) under precise electrocardiographic control.

3. Other symptomatic and supportive treatment modalities are

   a).The administration of intravenous fluids to correct dehydration.

   b). cooling the patient with ice packs and antipyretics to bring down the temperature

c). administration of oxygen, diuretics (frusemide) and theophyllin, to treat cardiac failure and pulmonary edema.

d). digoxin for uncontrolled atrial fibrillation.

e). intra venous hydrocortisone to prevent peripheral failure and to help lower body temperature

f). sedation if necessary.

Usually thyroid surgery may be completed without any problem, once the 'storm' has subsided and the drug therapy tailored according to the requirements. Prognosis is excellent if prompt therapy is instituted, for this potentially fatal complication.

WOUND COMPLICATIONS

Wound complications include edema of the flap, skin flap necrosis, accumulation of serum, hematoma, infection and hypertrophic scar / keloid formation.

i). Edema of the flap

It is secondary to trauma and division of the prethyroid muscles. It occurs most often after thyroidectomy for chronic thyroiditis and is treated by application of hot, moist soaks.

ii). Seromas and hematoma

Accumulation of serum or hematoma usually occurs on the fourth or fifth day after operation and is evident by fluctuant swelling; it may be relieved by repeated aspiration or probing and compression dressing.

iii).Skin flap necrosis

Skin flap necrosis is a rare complication but may occur if flaps are elevated in subplatysmal plane and extended incision for neck dissection or mediastinal dissection increases the risk, also the prior x-ray radiotherapy compromises the flap viability.

iv). Wound infection

Frank infection is an uncommon complication except when associated with tracheostomy, when it occurs a foreign body should be suspected; the most common offender is non absorbable suture material. Rarely, sensitivity to the nickel clips used for skin closure results in blistering and breakdown. A subcutaneous or deep cervical abscess should be drained

v). Stitch granuloma

This may occur with or without sinus formation and is seen after the use of non absorbable suture material. Absorbable ligature and sutures must be used throughout thyroid surgery. Some surgeons use a subcuticular absorbable skin suture rather than the traditional skin clips or staples. Skin staples, if used, can be removed in less than 48 hours because the skin closure is supported by the platysma stitch.

vi). Hypertrophic scar / keloid

The deposition of excessive collagen in the scar to form a keloid is an unpredictable complication, but is said to more prevalent in blacks, red heads, and in those under going surgery during pregnancy. This is more likely to form if the incision overlies the sternum. Unless the scar can be excised and adopted to conform more readily to langer's line, reoperation is unlikely to confer any improvement. Intradermal injections of corticosteroids should be given at once and repeated monthly if necessary. Topical steroids and low dose irradiation may prevent recurrence.

Fig 9: A case of Multinodular goiter who underwent sub total thyroidectomy and developed Esophageal injury

OTHER VERY RARE POSSIBLE COMPLICATIONS ARE

A).Compromise of tracheo esophageal blood supply

Since inferior thyroid artery supplies anterior cervical esophagus and posterior tracheal wall, surgical separation of tracheo esophageal plane can compromise blood supply.

B). Bilateral arytenoids dislocation

This may occur due to traumatic intubation resulting in vocal cord fixation. It can be identified by weak and breathy voice and odynophagia. It is treated by resection of the arytenoids.

C). Chylous fistula

It may occur while doing surgery for markedly enlarged thyroid, invasive thyroid carcinoma, and doing concurrent neck dissection. Conservatively, continuous closed suction will seal the chylous fistula. Persistent chylous fistula over 3 to 5 days warrants surgical exploration and ligation.

D). Complications related to anaesthesia.

LATE COMPLICATIONS

HYPOPARATHYROIDISM AND RECURRENT HYPERTHYROIDISM

Complication is an unexpected adverse result caused by thyroidectomy. So according to some surgeon hypothyroidism is not a complication of thyroidectomy because it is an expected result. Hypothyroidism is inevitable after total thyroidectomy or malignancy but is less predictable after, for example, a thyroid lobectomy for removal of benign solitary nodule. Hypothyroidism can occur as a consequence of the original disease process, before surgery, like graves disease and associated Hashimoto's thyroiditis, which represents a change in the autoimmune response from stimulation to destruction of the thyroid cells. Thyroid insufficiency is rare after surgery for a toxic adenoma, because there is no autoimmune disease present.

So the ability of the thyroid to produce sufficient thyroxin after thyroidectomy reflects not only the size of the remnant but also the pre existing pathological process within the gland. Avoiding hypothyroidism is one of the main challenges when operating for thyrotoxicosis. Factors affecting post operative thyroid function include the severity of disease before surgery; the age of the patient; the presence of high concentrations of antithyroid auto antibodies before surgery; the size of the gland and histological evidence of lymphoid infiltration; all of these influence how much of the gland is to be removed. Hypothyroidism usually occurs within

2 years, but it is sometimes delayed for 5 years or more. An experienced surgeon can expect resultant hypothyroidism rates of 10 to 15 % and persistent hyperthyroidism below 5%. It is often insidious and difficult to recognize. Hypothyroidism with rising TSH concentrations should be allowed to develop over 6 weeks after total thyroidectomy for malignancy (notably follicular lesion). A radio iodine scan will then identify possible distant metastasis, which can be ablated. There after, T3 (50-100 mg/day) is administered in preference to T4 as its shorter biological half life (1 week) enables repeat scans to be performed with minimal delay. Once isotope ablation of residual disease has been achieved, conversion to T4 is appropriate. The dose required varies but the majority of patients only require 0.1 to 0.2 mg/day. Nearly all patients undergoing surgery for thyrotoxicosis become biochemically hypothyroid for 2 to 3 months after surgery; no correction is necessary as the majority will then stabilize in a euthyroid state. Clinical assessment should be maintained for at least 2 years, during which serum thyroxin and TSH concentrations should be monitored; a small percentage of patients will become clinically hypothyroid and require T4 supplementation (0.1 to 0.2 mg daily). Routine administration of T4 (0.1 mg daily) is recommended for all patients undergoing surgery for non toxic, diffuse, or multi nodular goiters since failure to suppress TSH drive can result in recurrent goiter, even if hypothyroidism is sub clinical. Some surgeons have left between 8 and 10 grams of thyroid tissue in an attempt to reduce the rate of hypothyroidism

without generating recurrent hyperthyroidism. Hypothyroidism requires only oral medication for treatment, but recurrent hyperthyroidism generally requires further operation, since the reasons for avoiding use of radio iodine still exist. Thus, any initial bias in surgical resection in Grave's disease should be towards preventing recurrence.

DEATH

Deaths are very rare after thyroidectomy in the entire history and generally unrelated to the operation itself.

OBSERVATION AND RESULTS

Table1. Histopathological Diagnosis And Types Of Surgery Performed

DIAGNOSIS	TOTAL NO OF PATIENTS	MALE + FEMALE	DISEASE INCIDENCE (%)	HEMI THYROIDECTOMY (NO OF PTS & %)	BILATERAL SUBTOTAL THYROIDECTOMY	NEAR TOTAL THYROIDCTOMY	TOTAL THYROIDECTOMY	OTHERS
COLLOID & RECURRENT GOITRE	3	1+2	2.56	-	-	-	3(00%)	-
SOLITARY NODULE	34	3+31	29.06	31(91.18%)	3(8.82%)	-	-	-
MULTINODULAR GOITRE	45	2+43	38.46	2(4.44%)	40(88.89)	1(2.22)	2(4.44)	-
TOXIC MULTI NODULAR GOITRE	22	3+19	18.8	-	20(90.91)	-	2(9.09)	-
THYROID CANCER	13	1+12	11.11	1	-	1	10	1
TOTAL	**117**	**10+107 (8.55%) (91.45%)**		**34(29.06%)**	**63(53.85%)**	**2(1.71%)**	**17 (14.53%)**	**1(0.85%)**

Chart.1. Sex distribution in Thyroid diseases

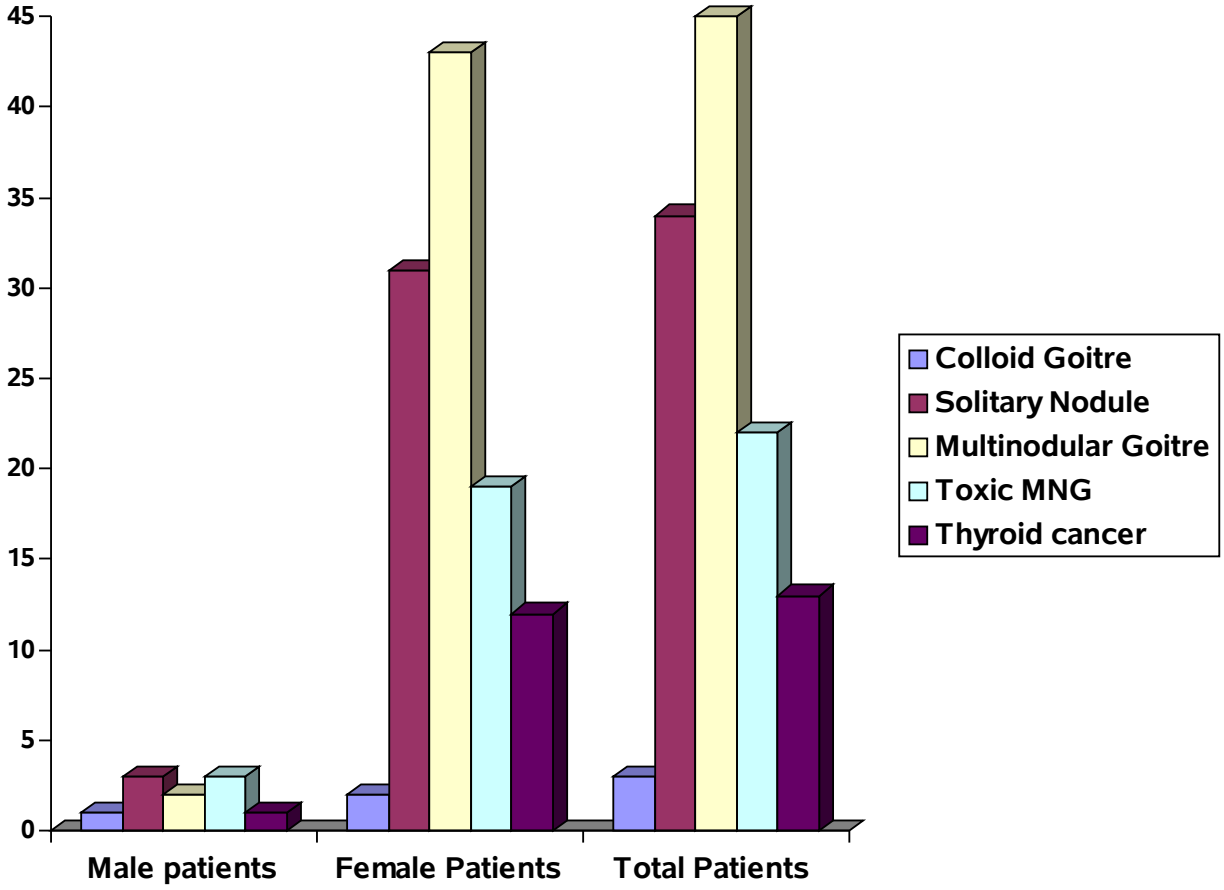


Chart.2. Comparison of Histopathological Diagnsos and Types of Surgery Performed

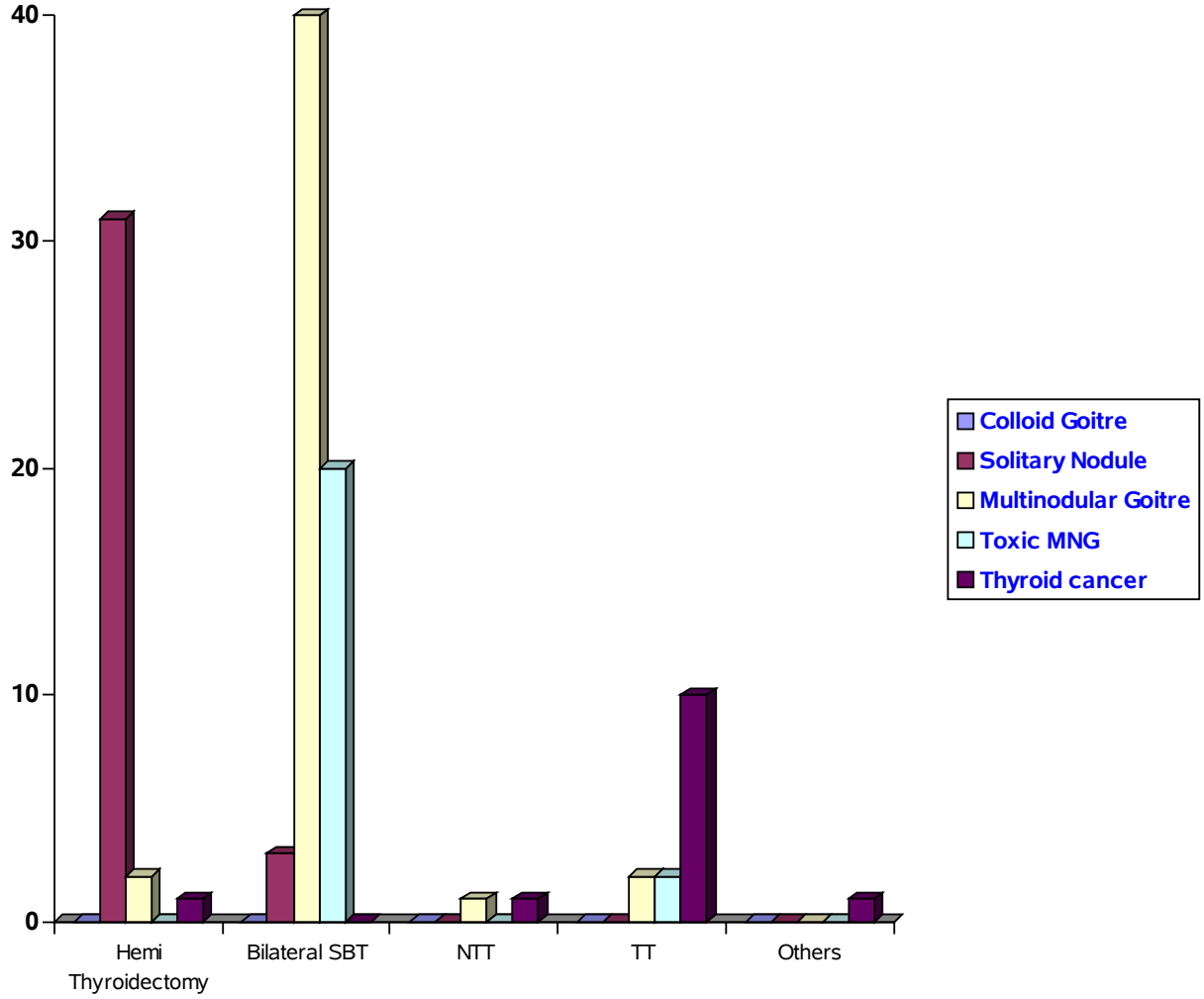


Table 2. Histopathological Diagnosis With Complications Of Each Operative Procedure

HISTOLOGICAL DIAGNOSIS	TOTAL NO OF PATIENTS	NUMBER OF COMPLAICATIONS OCCURRED			
		HEMITHYROIDECTOMY	BILATERAL SBT	NEAR TT	THYR
COLLOID AND RECURRENT GOITRE	3	-	-	-	
SOLITARY NODULE OF THYROID	34	1	-	-	
MULTINODULAR GOITRE	45	-	8	-	
TOXIC MULTINODULAR GOITRE	22	-	7	-	
THYROID CARCINOMA	13	-	-	1	
TOTAL	**117**	**1(0.85%)**	**15(12.82%)**	**1(0.85%)**	**15**

Table 3. Operative Morbidity

Sl.No	COMPLICATIONS	INCIDENCE
1	HAEMORRHAGE – IMMEDIATE	3.42% (4)
2	RESPIRATORY OBSTRUCION	1.71 %(2)
3	TEMPORARY RECURRENT LARYNGEAL NERVE PALSY	4.27%(5)
4	SUPERIOR LARYNGEAL NERVE PALSY	1.17 %(2)
5	HYPOPARATHYROIDISM- TRANSIENT	7.69%(9)
6	THYROID STORM	0.85%(1)
7	EDEMA OF FLAP	0.85%(1)
8	SEROMA	0.85%(1)
9	WOUND INFECTION	3.42%(4)
10	OESOPHAGEAL INJURY	0.85%(1)
11.	DEATH	1.71% (2)

Chart.3.Operative Morbidity in percentage

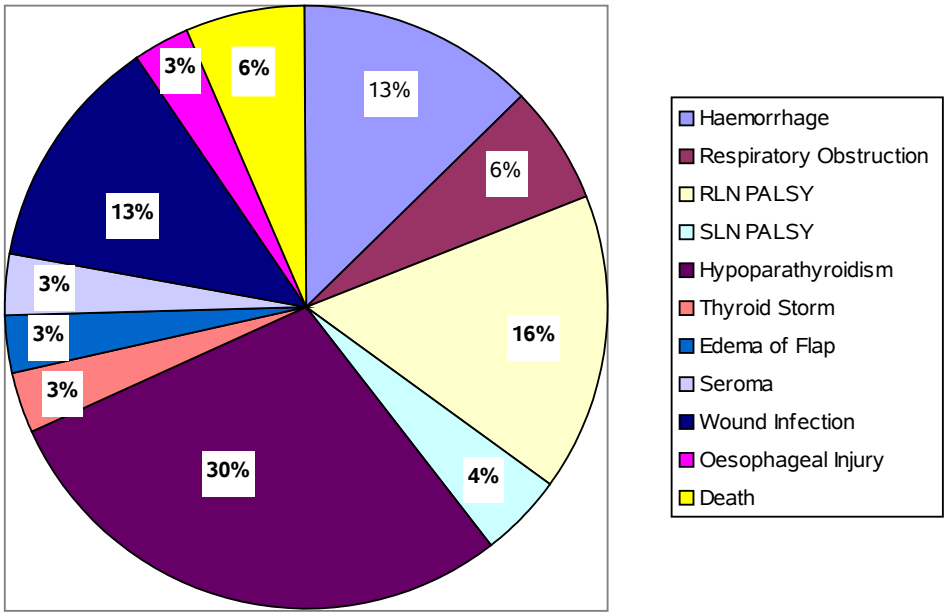


Table 4. Complications After Each Operative Procedure

OMPLICATIONS	HEMITHYROIDECTOMY	BILATERAL SBT	NEAR TT	TOTAL THYROIDECTOMY
F PATIENTS	34	63	2	17
HAGE – IMMEDIATE	-	1(1.59%)	-	3(17.65%)
RY OBSTRUCION	-	1(1.59%)	-	1(5.88%)
Y RECURRENT L NERVE PALSY	-	3(4.76%)	1	1(5.88%)
LARYNGEAL NERVE	-	-	-	2(11.76%)
THYROIDISM-	-	2(3.17%)	-	7(41.18%)
TORM		1(1.59%)	-	-
FLAP		1(1.59%)	-	-
		1(1.59%)	-	-
FECTION	1(2.94%)	3 (4.76%)	-	-
EAL INJURY		1(1.59%)	-	-
		1(1.59%)	-	1(5.88%)
	1	15	1	15

Table 5. Complications After Thyroidectomy For Various Thyroid Disorders

COMPLICATIONS	COLLOID & RECURRENT GOITRE	SOLITARY NODULE	MULTI NODULAR GOITRE	TOXIC MULTI NODULAR GOITRE
NUMBER OF PATIENTS	3	34	45	22
HAEMORRHAGE – IMMEDIATE	-	-	1	2
RESPIRATORY OBSTRUCION	-	-	1	-
TEMPORARY RECURRENT LARYNGEAL NERVE PALSY	-	-	2	1
SUPERIOR LARYNGEAL NERVE PALSY	-	-	1	-
HYPOPARATHYROIDISM- TRANSIENT	3	-	2	1
THYROID STORM	-	-	-	1
EDEMA OF FLAP	-	-	-	1
SEROMA	-	-	1	-
WOUND INFECTION	-	1	2	1
OESOPHAGEAL INJURY	-	-	1	-
DEATH	-	-	-	1

TOTAL	**3**	**1**	**11**	**8**

Chart 4. Complication after Thyrodectomy for various THyroid disorders

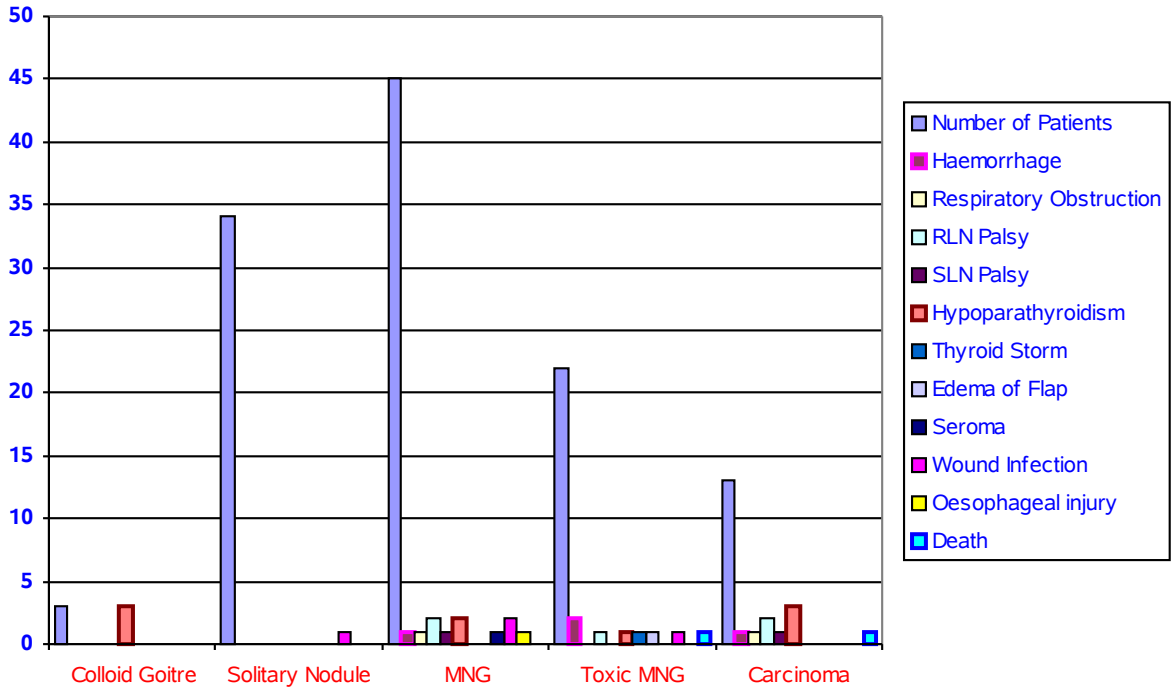
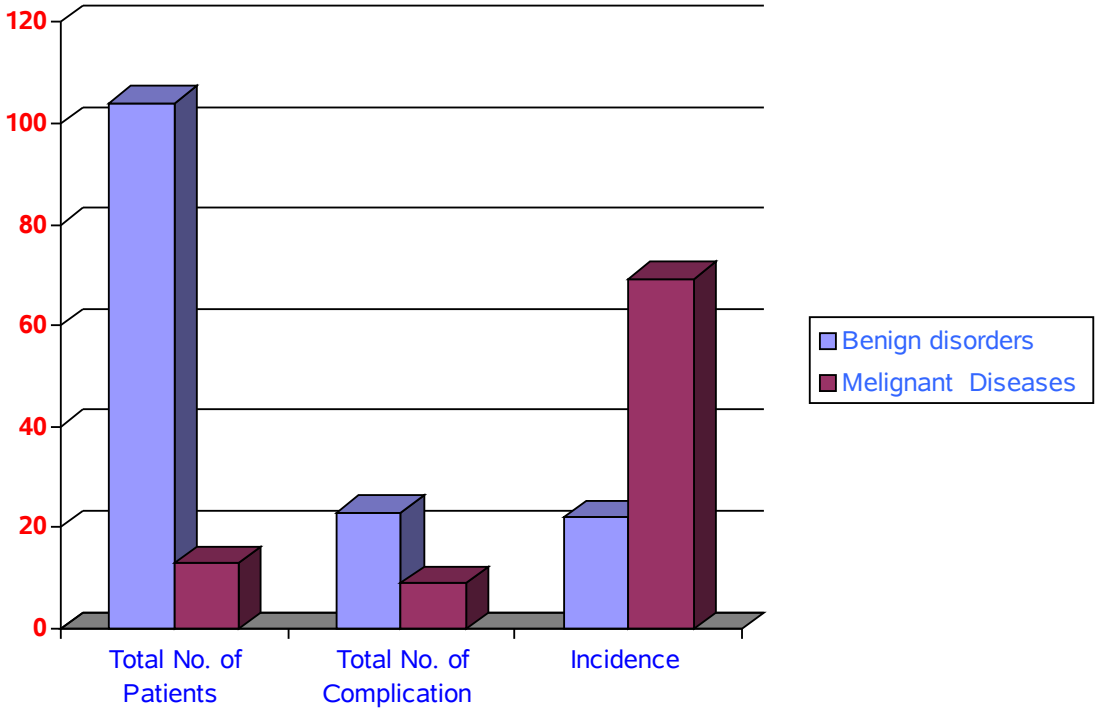


Table . 6 Complication rate after thyroidectomy for benign and malignant Disorders

SL.NO	HISTOPATHOLOGICAL DIAGNOSIS	TOTAL NO.OF PATIENTS	TOTAL NO.OF COMPLICA
1.	BENIGN DISORDERS	104	23
2.	MELIGNANT DISEASE	13	9
	TOTAL	117	32

Chart.5. Comparison of complication rate after thyroidectomy for benign and maligant Disorders



OBSERVATION AND RESULTS

A total of one hundred and seventeen patients, aged between sixteen and sixty one years underwent thyroid surgery during the study period. Patients included one hundred and seven women and ten men (Females : Male, 10.7:1)

Histopathological diagnosis for each case and the number of patients undergoing each type of operation is detailed in table 1. Surgical morbidity associated with thyroidectomy undertaken during the study period is detailed in table 3.

Post operative hemorrhage occurred in four patients (3.42%) in which three patients, had total thyroidectomy (3/177 , 2.56%) and another one patient (0.85%) under went bilateral subtotal thyroidectomy of which two patients (1.71%) required urgent re exploration and others resolved spontaneously without drainage.

Two patients where shifted to Intensive surgical care unit with endotracheal tube insitu due to respiratory difficulty (1.71%) and both of them were recovered well and extubated within 24 hours without any respiratory distress.

The incidence of temporary recurrent laryngeal nerve palsy was found to be one each (0.85%) in total thyroidectomy and near total thyroidectomy, and three patients (2.56%) in bilateral subtotal thyroidectomy. No patients in this study group developed bilateral recurrent laryngeal nerve palsy.

There were two patients (1.71%), who underwent total thyroidectomy, developed superior laryngeal nerve paresis.

The incidence of temporary hyperparathyroidism was high at 5.98% (7) and 1.71% (2) of patients treated by total thyroidectomy and bilateral subtotal thyroidectomy respectively. Those patients who underwent hemithyroidectomy and near total thyroidectomy did not have hypoparathyroidism.

Post operative wound infection occurred in four patients (3.42%) of which three patients (2.56%) underwent bilateral subtotal thyroidectomy and one patient (0.85%) underwent Hemithyroidectomy. After surgical drainage the wound was resutured several days later when the infection had resolved.

Seroma occurred in one patient (0.85%) who underwent bilateral subtotal thyroidectomy for nontoxic multinodular goiter.

Edema of flap occurred in one patient (0.85%) who underwent bilateral subtotal thyroidectomy for toxic goitre.

Oesophageal injury occured in only one patient (0.85%) who underwent bilateral subtotal thyroidectomy for nontoxic multinodular goiter. (Patient had coexistent para pharyngeal pouch).

There were two deaths (1.71%) noted in this series and out of which one is due to thyroid storm (0.85%) associated with hemorrhage ad respiratory obstruction in female patient who underwent bilateral subtotal thyroidectomy for toxic goiter. Another death occurred in a male patient who underwent total thyroidectomy for carcinoma thyroid.

DISCUSSION

The results in this study are in correlation with published results of similar hospitals around the world.

Hemorrhagic complications where more frequent in total thyroidectomy (2.56%) when compared to bilateral subtotal thyroidectomy (0.85%) When compared to the results published by Rosato L et al[3]. Though the hemorrhagic complication is considerably lower in bilateral subtotal thyroidectomy group (2.1%)[3] , it was higher in total thyroidectomy (1.6%) [3] . It frequently occurs during the post anaesthetic period when the end tracheal tube is removed. The prevention of post operative bleeding is dependent on good intra operative haemostasis. Sound surgical technique is essential.

The 4.27% incidence of recurrent laryngeal nerve (vocal cord) palsy seen in this series is in concordance with reported incidence figures (0.1% - 4.5 %)[4-7]. Complications of thyroidectomy are largely related to the magnitude of the operation and the experience of the surgeon involved. The majority of thyroid operations at the Tirunelveli Medical college Hospital, Tirunelveli are performed by senior surgeons or by advanced

trainees under supervision. This may account for the desirable paucity of vocal cord palsy seen.

Every effort should be made to preserve parathyroid glands with their own blood supply however, this may not be sufficient to prevent the occurrence of transient hypoparathyroidism and transient post – thyroidectomy hypocalcaemia, secondary to hypoparathyroidism, is common [8,9]. Delbridge et al [10] state that transient hypoparathyroidism should be an accepted outcome of bilateral thyroid surgery rather than a complication. It is noted that the degree and duration of hypocalcemia increase with the extent of thyroid surgery [11]. Permanent hypoparathyroidism has been reported to occur after total thyroidectomy is between 0.1 % and 32 % of patients overall[1, 2, 5-7, 12, 13.] The risk is higher for cancer surgery and ranges from 3 to 32 % [1, 2, 5-7, 13.] Most published reports in the last five years, however quote a figure below 10%. Our results (7.69%) concur with the literature with an incidence of temporary hypopara thyroidism increased with extent of surgery (table)

The non –capsular dissection technique may be the cause for the 7.69% incidence of hypoparathyroidism, as the parathyroid gland is vulnerable to devascularisation or inadvertent removal with the thyroid gland during such a procedure. The capsular dissection technique may be useful in reducing this complication.

This study also reveals complication rate was identical to both bilateral subtotal thyroidectomy (15/117, 12.82%; 15/63, 23.81%) and in total thyroidectomy (14/117, 11.97%; 14/17, 82.35%)

The greater incidence of complications with TT is attributable mainly to the greater incidence of transient hypocalcemia and to a lesser extent to the slightly higher incidence of hemorrhage, whereas, the incidences of recurrent laryngeal nerve injuries were slightly higher in bilateral subtotal thyroidectomy. Incidences of other complications are also higher in bilateral subtotal thyroidectomy. Our results concur with the study report published by Rosato et al[3].

Bearing in mind that total thyroidectomy is the absolute indication in the more demanding thyroid disease (tumours, retrosternal goitre, Basedow's disease, and recurrences) and in view of its fairly low complication rate; we believe that total thyroidectomy is a safe, reliable procedure, provided it is performed in a technically scrupulous manner. Bilateral subtotal thyroidectomy is a technique which should be abandoned owing to the fact that its complication rate is comparable to that of total thyroidectomy and to the recurrences it may give rise to[3].

This study reveals that the hemithyroidectomy is an extremely safe procedure without any complication.

This series also reveals higher incidence of complication rates after thyroidectomy for malignant thyroid disease 69.23% (9/13) than benign thyroid disease 22.12% (23/104).

Post operative mortality has been reported to occur in between NIL to ONE percent. The highest reported incidence was 1% by Haider A et al. In contrast to most published data, the incidence of mortality in this series is 1.71% (two patients). Out of two patients one died due to an unusual complication of thyrotoxic storm. Adequate pre operative preparation to bring the patient to euthyroid status and ten days therapy with Lugol's iodine, will eliminate this complication.

CONCLUSION

The following conclusions are drawn from this study

1. This study shows that the total thyroidectomy or hemithyroidectomy can be done with very low complication rate in cases of benign thyroid disease affecting the whole gland.
2. Hypoparathyroidism however, is a relatively common and significant complication than the recurrent laryngeal nerve injury after surgery for thyroid disorders.
3. Thyroid carcinoma, recurrent goiter, toxic goiter and total thyroidectomy are risk factors for post operative complication.
4. Complication rates are similar for bilateral subtotal thyroidectomy and total thyroidectomy, and there is a risk of recurrence with bilateral subtotal thyroidectomy. Because total thyroidectomy carries a risk of complication similar to that for bilateral subtotal thyroidectomy, it is not logical to avoid total resections. Therefore near total or total thyroidectomy may be the operation of choice for multinodular goiter.
5. Complications and sequelae of thyroid surgery can yet be reduced by careful evaluation of the surgical and medical therapeutic options have more precise surgical indications, a thorough knowledge of the surgical anatomy, a rigorous surgical technique, a systematic dissection of recurrent laryngeal nerve and parathyroid gland in case of bilateral operation and meticulousness during the procedure.

6. I conclude that the operative skills and experience determine the complication rates rather than the type of operative procedure.

ANNEXURE I

PROFORMA

Case No hospital No:

Name : Age: Sex: M/F

Address :

COMPLAINTS

- Swelling in the thyroid region – Duration
    - Progress
- Pain over the swelling
- Change in voice
- Difficulty in breathing
- Difficulty in swallowing
- Tremors
- Sweating
- Insomnia
- Palpitation / chest pain
- Appetite
- Weight loss / gain
- Bowel habits
- Difficulty in closing Eyelids / Double vision/ diplopia

- Any other complaints with details

PAST HISTORY

- Previous treatment history
- H/o Medications
- H/o irradiation in the childhood
- HT,IHD, TB, DM

PERSONAL HISTORY

- Diet
- Menstrual history

FAMILY HISTORY

Incidence of thyroid swelling / Malignancy yes / No

GENERAL EXAMINATION

- Built
- Nutrition
- Weight
- Temperature
- Anaemia
- Pulse rate / rhythm / Volume/ character
- Tremors/ Fasciculation

- Eye signs
- Mask like face
- Mental state intelligence
- Most skin / palmar Erythema / pretibial myxoedema
- Tendon reflexes

SYSTEMIC EXAMINATION

- CVS Murmurs YES / NO

  Atrial fibrillation YES / NO
- Respiratory system
- Abdomen – Liver palpable / Non palpable
- CNS

LOCAL EXAMINATION

- Visible swelling
- Movement with deglutition
- Size
- Location right lobe / left lobe / isthmus / whole gland
- Surface smooth / nodular / irregular
- Consistency soft / cystic / firm / hard
- Mobility yes / no
- Position of Trachea : Normal / deviated laterally / not felt

SIGNS OF TOXICITY

- Exophthalmos YES / NO
- Eye signs YES / NO
- Hyperkinetic movements YES / NO
- Excessive perspiration YES / NO
- Bruit YES / NO
- Thrill YES / NO

SIGNS OF MYXOEDEMA YES / NO

CERVICAL LYMPHONODES YES / NO

- Consistency: soft / firm / hard

EXAMINATION OF SKELETAL SYSTEM

Bony tenderness / swelling/ fracture YES/NO

Indirect Laryngoscopy

CLINICAL DIAGNOSIS

INVESTIGATIONS

- Sleeping pulse rate
- Thyroid function test TSH

  T_3

  T_4
- Serum calcium
- Serum cholesterol

- X-ray chest PA calcification YES / NO
- X ray neck AP /Lat Tracheal Deviation YES / NO
  Tracheal Compression YES / No
- USG neck – Thyroid – solid / cystic / Not done
- FNAC
- ECG in all leads

Date of surgery

Surgical procedure done

Post operative complications

- Haemorrhage YES / NO if yes 1. immediate
  2 Delayed
- Respiratory obstruction YES / NO
- Neural Complications
  - Recurrent laryngeal nerve palsy YES/ NO
  - Superior laryngeal nerve palsy YES / NO
  - Cervical sympathetic Damage YES / NO
- Hypocalcemia
  - Symptoms
    - mild
      - Pins & needle in Extremities YES / NO
      - Twitching of facial muscle YES / NO
      - Muscle cramps YES / NO

- Circum oral numbness YES / NO
  - Severe
    - Carpopedal spasm YES / NO
    - Stridor YES / NO
    - Chvostek's sign YES / NO
    - Trousseau's sign YES / NO
    - ERB'S SIGN YES / NO
- Thyroid Storm YES / NO
- Wound complications
  - Edema of the flap
  - Seromas and hematoma
  - Skin flap necrosis
  - Wound infection
  - Snitch granuloma
  - Hypertrophic scar / keloid
- Aerodigestive tract injuries
  - Tracheal injury YES / NO
  - Esophageal injury YES / NO
- Bilateral Arytenoid dislocation YES / NO
- Chylous Fitula YES / NO
- Complications related to Anaesthesia YES/ NO
- Late complications

- Hypothyroidism YES / NO
- Recurrent Hyperthyroidism YES / NO

- Death
- Post operative treatment & Investigations
  - IDL
  - X-ray chest
  - Thyroid function test
  - Serum calcium
- Follow up
- Remarks

ANNEXURE – II Master Chart

SL. NO	NAME OF THE PATIENT	AGE	SEX	I.P. NUMBER	DIAGNOSIS	SURGERY DONE	DATE OF SURGERY	HAEMORRHAGE IMMEDIATE	RESPIRATORY OBSTRUCTION	RLN PALS
1	PONNUMANI	27	F	195930	TOXIC GOITRE	SUB TOTAL THYROIDECTOMY	18.8.2003			
2	SANKARASUBBU	45	M	197713	CARCINOMA THYROID	TOTAL THYROIDECTOMY	20.8.2003			
3	LEELA	33	F	197770	TOXIC MULTI NODULAR GOITRE	SUB TOTAL THYROIDECTOMY	20.8.2003			
4	KOTHAI	42	F	202839	SOLITARY CYST - LEFT LOBE	HEMITHYROIDECTOMY	1.9.2003			
5	THANGAMMAL	50	F	200984	ADENOMA THYROID	HEMITHYROIDECTOMY	15.9.2003			
6	VALIAMMAL	55	F	210561	MULTI NODULAR GOITRE	TOTAL THYROIDECTOMY	10.12.2003			
7	SANKARAMMAL	35	F	218153	MNG	SUB TOTAL THYROIDECTOMY	13.2.2004			
8	MAHESWARI	19	F	221729	SOLITARY NODULAR GOITRE	HEMITHYROIDECTOMY	12.3.2004			
9	MOHADEEN FATIMA	22	F	221843	NODULAR GOITRE	SUB TOTAL THYROIDECTOMY	19.3.2004			
10	CHINNATHAI	35	F	223091	ADENOMA THYROID	HEMITHYROIDECTOMY	29.3.2004			
11	MANDHIRA VADIVU	40	F	228560	FOLLICULAR CA THYROID	TOTAL THYROIDECTOMY	22.5.2004			
12	GANDHI	35	F	229334	MNG	NEAR TOTAL THYROIDECOMY	26.5.2004			
13	INDIRA	21	F	231231	NODULAR GOITRE	HEMITHYROIDECTOMY	5.6.2004			
14	SYED ALI FATHIMA	24	F	231270	ADENOMA THYROID	HEMITHYROIDECTOMY	5.6.2004			
15	SUDHA	18	F	231273	MNG	SUB TOTAL THYROIDECTOMY	5.6.2004		✓	
16	SABAYA JEYAPRAKASH	34	F	229374	NODULAR GOITRE	HEMITHYRODICTOMY	12.6.2004			
17	KAMALAM	52	F	232889	MNG	SUB TOTAL THYROIDECTOMY	23.6.2004			
18	PITCHAMMAL	51	F	234496	CARCINONA THYROID	TOTAL THYROIDECTOMY	10.7.2004			
19	RAMKUMAR	23	M	236934	SOLITARY NODULAR GOITRE	HEMITHYROIDECTOMY	28.7.2004			
20	PARVATHY		F	232106	SOLITARY NODULAR	HEMITHYROIDECTOMY	29.3.2004			

21	MEENA	24	F	222947	TOXIC MNG	SUB TOTAL THYROIDECTOMY	3.4.2004			
22	ANNAPUSHPAM	45	F	224527	SOLITARY NODULAR THYROID	HEMITHYROIDECTOMY	21.4.2004			
23	MALLIGA	34	F	223732	SOLITARY NODULAR THYROID	HEMITHYROIDECTOMY	7.4.2004			
24	RAMU	31	F	231198	FOLLICULAR CA THYROID	TOTAL THYROIDECTOMY	9.6.2004			
25	TAMILARASI	32	F	232016	ADENOMA THYROID	HEMITHYROIDECTOMY	9.6.2004			
26	PARVATHY	45	F	236157	TOXIC MNG	TOTAL THYROIDECTOMY	4.8.2004	✓		
27	RANJITHAM	35	F	238719	SOLITARY NODULAR THYROID	HEMITHYROIDECTOMY	7.8.2004			
28	SIRONMANI	20	F	240165	SOLITARY NODULAR THYROID	HEMITHYROIDECTOMY	7.8.2005			
29	PARVATHY	35	F	222647	SOLITARY NODULAR THYROID	HEMITHYROIDECTOMY	27.3.2004			
30	PETCHIAMMAL	22	F	223467	SOLITARY NODULE THYROID	HEMITHYROIDECTOMY	3.4.2004			

SL. NO	NAME OF THE PATIENT	AGE	SEX	I.P. NUMBER	DIAGNOSIS	SURGERY DONE	DATE OF SURGERY	HAEMORRHAGE IMMEDIATE	RESPIRATORY OBSTRUCTION	RLN PALSY	SLN PALSY	HYPO CALCEMIA	THYROID SRORM	EDEMA OF THE FLAP	SEROMAS & HEMATOMAS	WOUND INFECTION	ESOPHAGEAL INJURY
31	SHANTHI	25	F	228263	NONTOXIC MULTI NODULAR GOTRE	SUB TOTAL THYROIDECTOMY	15.5.2004										
32	KALAISELVI	25	F	228277	FOLLICULAR NEOPLASM	HEMITHYROIDECTOMY	29.5.2004										
33	RAJALAKSHMI	40	F	239145	MNG	SUB TOTAL THYROIDECTOMY	14.8.2004										
34	ESSAKKIAMMAL	35	F	222278	MNG	SUB TOTAL THYROIDECTOMY	26.3.2004										
35	RASAMMAL	32	F	220825	MNG	SUB TOTAL THYROIDECTOMY	12.3.2004										
36	RAJASEELI	37	F	220812	PAPILLARY CA THYROID	TOTAL THYROIDECTOMY	16.3.2004	✓	✓	✓							
37	PAPATHY	50	F	223279	CARCINOMA THYROID	TOTAL THYROIDECTOMY	26.3.2004										
38	PARATHAI	27	F	223227	SOLITARY NODULE THYROID	HEMITHYROIDECTOMY	29.3.2004										
39	SELVARAJ	49	M	221478	THYROTOXICOSIS	SUB TOTAL THYROIDECTOMY	2.4.2004										
40	VASANTHA	27	F	225852	SOLITARY NODULAR GOITRE LEFT	HEMITHYROIDECTOMY	20.4.2004										
41	SHEELA	23	F	226662	ADENOMA THYROID RIGHT	HEMITHYROIDECTOMY	27.4.2004										
42	LAILA BANU	31	F	225517	TOXIC GOITRE	SUB TOTAL THYROIDECTOMY	10.5.2004	✓									
43	VIJAYA	39	F	229527	MNG	SUB TOTAL THYROIDECTOMY	28.05.2004										
44	LAKSHMI	40	F	228288	TOXIC MNG	SUB TOTAL THYROIDECTOMY	1.6.2004					✓					
45	RAMALAKSHMI	16	F	230681	ADENOMA THYROID	SUB TOTAL THYROIDECTOMY	4.6.2004										
46	CHAKKADEVI	21	F	231422	MNG	SUB TOTAL THYROIDECTOMY	7.6.2004					✓					
47	MANJULA	25	F	231734	SOLITARY NODULE OF THYROID RIGHT SIDE	RIGHT HEMITHYROIDECTOMY	8.6.2004										
48	SANKARAMMAL	30	F	230492	MNG	SUB TOTAL THYROIDECTOMY	14.6.2004										
49	MUNIAMMAL	21	F	232153	MNG	SUB TOTAL THYROIDECTOMY	21.6.2004									✓	
50	SHOBANA	22	F	239167	MNG	SUB TOTAL THYROIDECTOMY	10.8.2004										
51	RAJALAKSHMI	40	F	239145	NODULAR GOITRE	SUB TOTAL THYROIDECTOMY	14.8.2004										
52	PUSHPAM	45	F	239535	SOLITARY NODULE THYROID LEFT	LEFT HEMITHYROIDECTOMY	16.8.2004										
53	SIVAN	46	M	240734	TOXIC GOITRE	SUB TOTAL THYROIDECTOMY	31.8.2004										
54	MARIYAMMAL	44	F	244107	NON TOXIC MNG	SUB TOTAL THYROIDECTOMY	25.9.2004										
55	AZHAGU SEENI	27	M	243729	SOLITARY MODULE THYROID	HEMITHYROIDECTOMY	27.9.2004										
56	MEENA	42	F	244551	SOLITARY NODULE THYROID	HEMITHYROIDECTOMY	1.10.2004										
57	GOMATHY	28	F	238410	TOXIC GOITRE	SUB TOTAL THYROIDECTOMY	5.10.2004										
58	KALIAMMAL	35	F	248154	MNG	TOTAL THYROIDECTOMY	9.11.2004	✓				✓					

SL. NO	NAME OF THE PATIENT	AGE	SEX	I.P. NUMBER	DIAGNOSIS	SURGERY DONE	DATE OF SURGERY	HAEMORRHAGE IMMEDIATE	RESPIRATORY OBSTRUCTION	RLN PALSY	SLN PALSY	HYPO CALCEMIA	THYROID SRORM	EDEMA OF THE FLAP	SEROMAS & HEMATOMAS	WOUND INFECTION	ESOPHAGEAL INJURY
61	SUGANTHI	31	F	249162	SOLITARY NODULE OF THYROID RIGHT SIDE	HEMITHYROIDECTOMY	27.11.2004										
62	PAPA	40	F	251984	ADENOMA THYROID	SUB TOTAL THYROIDECTOMY	26.11.2004										
63	CHELLAM	48	F	247995	SECONDARY HYPER THYRODISM	SUB TOTAL THYROIDECTOMY	29.11.2004									✓	
64	SHEEBA	19	F	255529	MNG	SUB TOTAL THYROIDECTOMY	27.12.2004										
65	VELLAIAMMAL	42	F	253290	SOLITARY NODULE THYROID	HEMITHYROIDECTOMY	4.1.2005										
66	LAKSHMI	32	F	254229	MNG SECONDARY THYROTOXICOIS	SUB TOTAL THYROIDECTOMY	18.1.2005							✓			
67	LAKSHMI	45	F	3355	MNG	SUB TOTAL THYROIDECTOMY	18.2.2005										
68	VALLI	41	F	3338	COLLOID GOITRE LOBE	COMPLETION THYROIDECTOMY	25.2.2005					✓					
69	SUBBULAKSHMI	40	M	10397	TOXIC MNG	SUB TOTAL THYROIDECTOMY	18.4.2005										
70	MARISAMY	18	F	12109	ADENOMA THYROID LEFT LOBE	LEFT HEMITHYROIDECTOMY	25.4.2005										
71	RUKMANI	61	F	13837	CARCINOMA THYROID	TOTAL THYROIDECTOMY	13.5.2005					✓					
72	VADIVU	36	F	15479	TOXIC GOITRE	SUB TOTAL THYROIDECTOMY	16.5.2005										
73	RAJAMMAL	59	F	16446	MNG	SUB TOTAL THYROIDECTOMY	27.5.2005										
74	SIVAGAMI	31	M	15493	MNG	SUB TOTAL THYROIDECTOMY	3.6.2005										
75	VIISHVANATHAN	47	F	16407	MNG	SUB TOTAL THYROIDECTOMY	6.6.2005								✓	✓	
76	MANIAMMAL	38	F	20289	MNG	SUB TOTAL THYROIDECTOMY	10.6.2005										✓
77	PAPPA	34	F	23043	MNG	SUB TOTAL THYROIDECTOMY	17.6.2005										
78	ANTONY SAVARIAMMAL	37	F	23009	SOLITARY NODULE THYROID	HEMITHYROIDECTOMY	20.6.2005									✓	
79	MADATHI	35	F	24932	MNG	SUB TOTAL THYROIDECTOMY	4.7.2005										
80	PONMANI	29	F	30801	MNG	SUB TOTAL THYROIDECTOMY	19.8.2005										
81	PERUMALAMMAL	57	F	32493	MNG	SUB TOTAL THYROIDECTOMY	29.8.2005										
82	SUBBAMMAL	43	F	36771	TOXIC MNG	SUB TOTAL THYROIDECTOMY	7.10.2005										
83	MARISELVI	28	F	44609	CARCINOMA THYROID	TOTAL THYROIDECTOMY	9.12.2005				✓	✓					
84	SUSAI AMMAL	48	F	22292	FOLLICULAR NEOPLASAM OF THYROID	TOTAL THYROIDECTOMY	17.6.2005										
85	SELVI	25	F	21340	TOXIC NODULAR GOITRE	SUB TOTAL THYROIDECTOMY	5.7.2005			✓							
86	REVATHI	33	F	27632	ADENOMA THYROID	RIGHT HEMITHYROIDECTOMY	29.7.2005										
87	CHELLAMMAL	42	M	32550	RECURRENT GOITRE	COMPLETION THYROIDECTOMY	2.9.2005					✓					
88	PRABHAKARAN	22	F	29823	MNG	SUB TOTAL THYROIDECTOMY	3.8.2005										
89	CHITRA	25	F	29810	MNG	SUB TOTAL THYROIDECTOMY	6.8.2005										

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