

A Thesis in General Surgery
**“CLINICAL STUDY OF HYPOCALCEMIA FOLLOWING THYROID
SURGERY”**

Submitted in partial fulfilment of the requirements for the degree of
M.S General Surgery
(Branch I)



The TamilNadu
Dr. M.G.R Medical University,
Tirunelveli Medical College,
Chennai.
2015

DECLARATION BY THE CANDIDATE

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This dissertation is submitted to THE TAMILNADU DR.MGR MEDICAL UNIVERSITY CHENNAI in partial fulfilment of the requirements for the degree of M.S. General Surgery examinations to be held in April 2016

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ABSTRACT

CLINICAL STUDY OF HYPOCALCEMIA FOLLOWING THYROID SURGERY

BRIEF RESUME OF INTENDED WORK:

NEED FOR STUDY:

Post-thyroidectomy hypocalcemia is a serious early complication. Estimates indicate that transient hypocalcemia incidence of 9.2% and permanent hypocalcemia incidence of 0.5%¹.

Hypocalcemia may occur secondarily to surgical trauma, devascularization, unintentional removal of parathyroid glands, reoperation². Even after meticulously performed procedures, some temporary parathyroid dysfunction may occur². Surgery extension has been seen as a risk factor, as in total thyroidectomy there is potential blood supply involvement resulting from bilateral surgical manipulation.

However, other factors are related to the chosen surgical procedure and its impact on devascularization or accidental removal of the parathyroid glands. The recommended surgical strategy is meticulous dissection and preservation of the parathyroid glands and their blood supply. The best way to avoid accidental excision is properly identifying the parathyroid glands. Risk of complication is higher when fewer than three glands are identified during surgery².

Depending upon the extent of parathyroid damage, postoperative hypocalcemia may be transient, resolving within a few months, or permanent, requiring lifelong oral or intravenous calcium supplementation³.

This study aims to prospectively study and analyze the incidence and possible causes of hypocalcemia following thyroid surgery.

REVIEW OF LITERATURE:

Postoperative hypocalcemia is a common complication after thyroidectomy. permanent hypocalcemia is rare, The incidence of transient and permanent hypocalcemia was 9.2%, and 0.5%, respectively¹.

Yon seon kim et al concluded in their study that the number of preserved parathyroid glands is the most important factor for predicting permanent hypocalcemia and found that only one functional parathyroid gland was needed to avoid permanent hypocalcemia. Even if all the parathyroid glands cannot be completely accounted for, the surgeon should make an attempt at identifying and preserving parathyroid glands without damaging their blood supply¹.

Rogério aparecido deividis et al recommended that parathyroid glands are spared based on careful dissection of the gland's blood pedicle. Permanent hypoparathyroidism occurs exclusively when fewer than three parathyroid glands are identified during surgery. Other authors consider that the identification and sparing of at least two glands may result in higher rates of permanent hypoparathyroidism².

Randall L. Baldassarre et al concluded in their study that Postoperative hypocalcemia occurred in 5.5% ($n = 6, 605$) of all thyroidectomy patients before discharge. Patients undergoing total thyroidectomy had a postoperative hypocalcemia incidence of 9.0%, compared with 1.9% following unilateral thyroid lobectomy³.

OBJECTIVES OF THE STUDY:

1. To determine the incidence of hypocalcemia following thyroid surgery.
2. To study the prevalence of post thyroidectomy hypocalcemia in response to age
3. To study the various clinical presentations of post thyroidectomy hypocalcemia
4. Post thyroidectomy hypocalcemia related with various pathological conditions of thyroid
5. To correlate the serum calcium level with clinical diagnosis
6. To study the time of presentation of post thyroidectomy hypocalcemia
7. Post thyroidectomy related with surgical procedure

SOURCE OF DATA :

All patients undergoing thyroidectomy surgeries (Minimum of 50 cases) from august 2014 to july 2015 at tirunelveli medical college Hospital,tirunelveli.

METHODS OF COLLECTION OF DATA:

Data will be collected from the patients undergoing total thyroidectomies by meticulous history taking, careful clinical examination, appropriate radiological, haematological investigations including serum calcium and serum albumin, operative findings and follow-up of the cases will be done after surgery for post-operative hypocalcemia.

A. SAMPLE: Minimum of 50 cases

B. STUDY DESIGN: Prospective study

C. STATISTICAL METHOD : Data collected will be analyzed using descriptive statistical principles (like mean, proportions and percentages)

D. INCLUSION CRITERIA :

Patient aged more than 12 yrs including both gender with clinically and pathologically diagnosed thyroid swellings undergoing thyroidectomy surgery

E. EXCLUSION CRITERIA :

1. Patients undergoing hemithyroidectomy/lobectomy.
2. Primary parathyroid pathologies.
3. Age < 12 years.
4. previous irradiation to neck
5. patient already on calcium supplementation

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATION OR INTERVENTION TO BE CONDUCTED ON PATIENTS OR ANIMALS SPECIFY?

No investigations will be done on animals. Study will be done on patients after taking their informed consent.

Investigations:

Investigations only on patients with their consent.

1. Routine blood investigations like hemoglobin, bleeding time, clotting time
2. Blood sugar levels
3. Renal parameters : Blood urea, Serum creatinine
4. Serum electrolytes including total Calcium and ionised Calcium (pre-operative and post-operative)
5. Serum Albumin
6. Liver function tests
7. Thyroid function tests: T3, T4, TSH, free T3 & T4.
8. Neck radiograph
9. Chest radiograph
10. FNAC
11. post operative histo pathological analysis

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**CLINICAL STUDY OF HYPOCALCAEMIA FOLLOWING THYROID
SURGERY**

INTRODUCTION

Scientific researches of any kind should be properly planned before execution for accuracy so as to attract the future generations.

Dr. William Stewart Halsted said that "The extirpation of thyroid gland typifies perhaps better than any operation the supreme triumph of the surgeon's art."

Thyroid disorders and surgical management for thyroid disorders are more common in any surgeon's day to day life. In this modern medical era for every 3 hours one paper was presented about thyroid disorders.

Post operative complications after thyroid surgery are varied and reported more frequently with budding and learning surgeons.

Hypocalcaemia after bilateral surgical resection of thyroid is a potential early complication. From 9.2% to 25% of transient hypocalcaemia are reported in literature and the incidence of permanent hypocalcaemia ranges from 0.5 to 2%(1).

Even in experienced hands the incidence of early transient post thyroidectomy hypocalcaemia is quite significant, some studies show up to 59%.(2)

Careful meticulous dissection to identify and sparing at least 2 parathyroid glands under direct vision is mandatory to avoid postoperative reduced calcium levels and its complications, some studies says that postoperative hypocalcaemia is more frequent following bilateral resection of lobes than unilateral 9% and 1.9% respectively (3)

Early recognition and prompt initial treatment of post thyroidectomy hypocalcaemia is crucial for successful outcome in the postoperative period following thyroidectomies.(4).

There are many predictors are under study till now to establish an effective protocol to be followed in the postoperative period in the thyroidectomy surgeries to manage post thyroidectomy hypocalcaemia successfully.

But the availability of tests in small scale hospitals and the cost factor decides that serum calcium estimation post operatively is the most ideal tool for early diagnosis and management of post thyroidectomy hypocalcaemia.(5).

In this study we add few drops to the ocean as our contribution.

OBJECTIVES OF THE STUDY:

1. To determine the incidence of hypocalcaemia following total thyroidectomy - our institutional experience.
2. To study the prevalence of post thyroidectomy hypocalcaemia in response to age.
3. To study the various clinical presentations of post thyroidectomy hypocalcaemia.
4. Post thyroidectomy hypocalcaemia related to various pathological conditions of thyroid.
5. To correlate serum calcium level with clinical diagnosis.
6. To study the time of presentation of post thyroidectomy hypocalcaemia.

REVIEW OF LITERATURE

surgical anatomy and embryology of the thyroid gland

Surgeons should have in-depth knowledge of the surgical anatomy and embryology of the thyroid and parathyroid glands to apply it during thyroid surgeries to avoid potential complications like hypocalcaemia .

Embryology of the thyroid gland

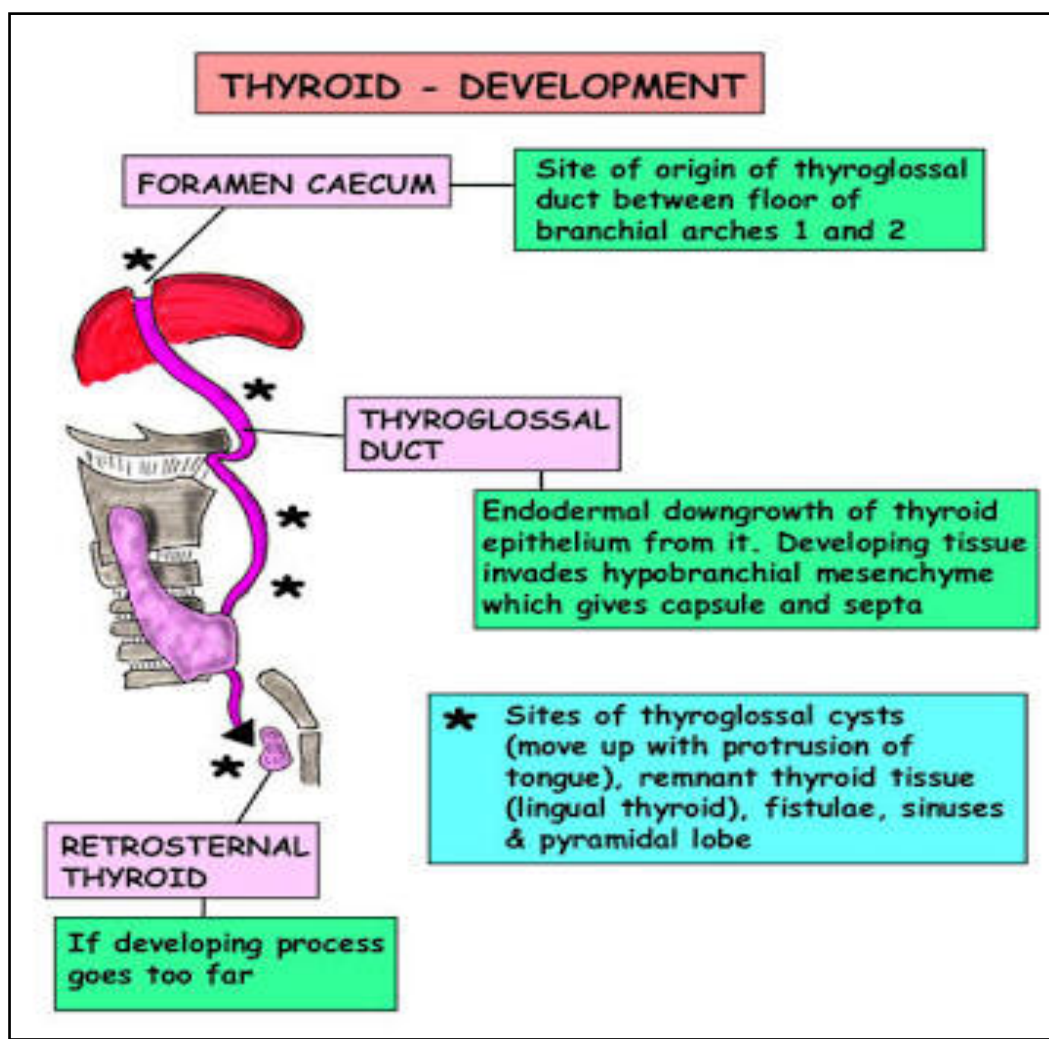


Figure 1 - Development of thyroid gland.

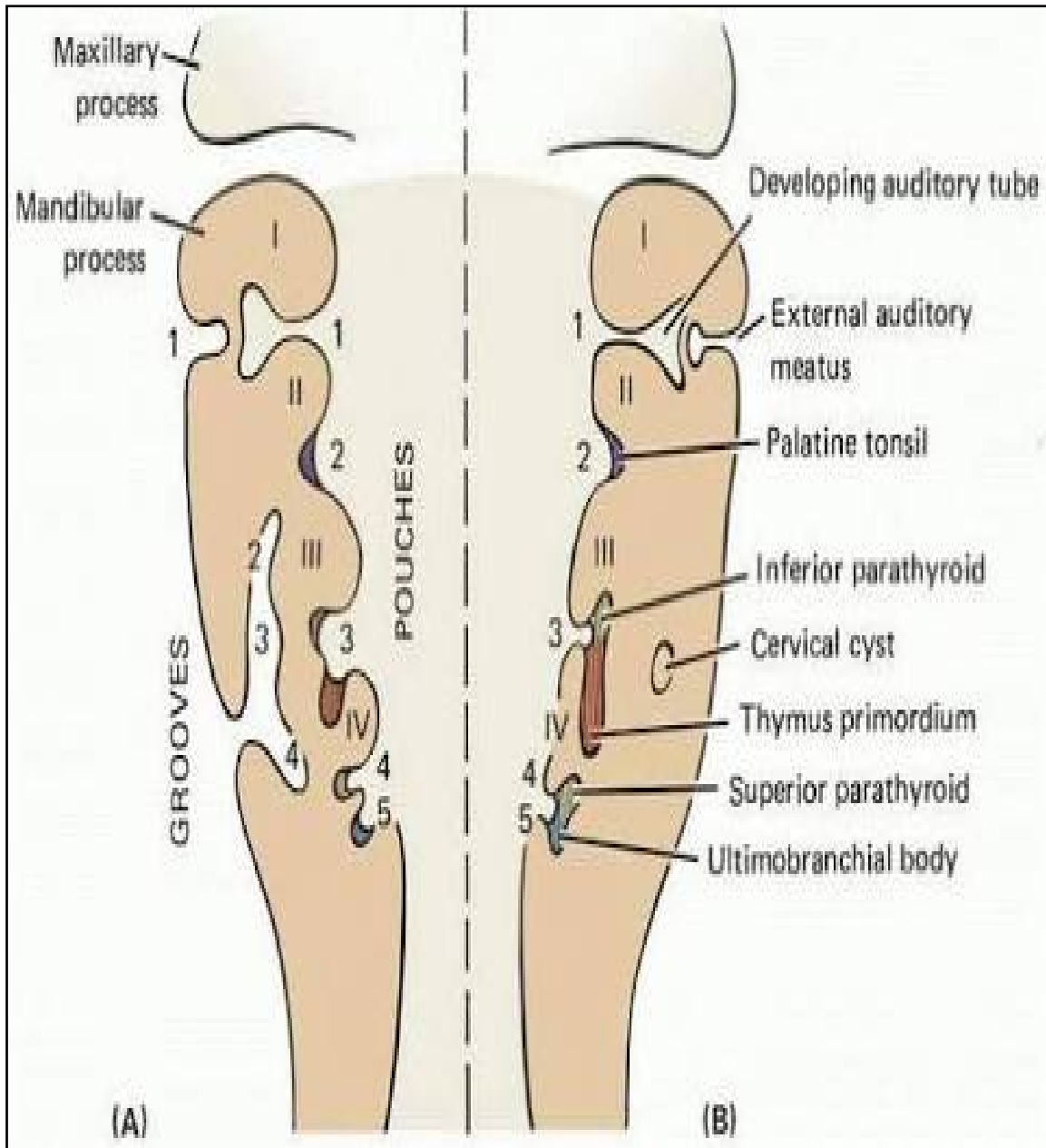


Figure 2 - coronal view of pharyngeal arch transformations.

At third week of intrauterine life thyroid is derived from endoderm of the 4th pharyngeal pouch.

It develops as a midline diverticulum from the foramen caecum and descends downwards in a complex pathway, crosses hyoid anteriorly encircling the lower border of hyoid and takes a curve after touching the posterior surface of hyoid then descend downwards.

By 6 weeks of intrauterine life the central column of cells got reabsorbed and becomes thyroglossal duct which bifurcates to form thyroid lobes.

The pyramidal lobe is a remnant of the thyroglossal duct which extends from foramen caecum to the isthmus seen in 55% of patients.

Parafollicular C cells derived from ultimobranchial bodies/ neural crest cells from 4th and 5th branchial pouch, they are more numerous in the upper thyroid lobes.

Parathyroid glands and thymus develop from 3rd and 4th pharyngeal pouches (6)

Thyroid gland

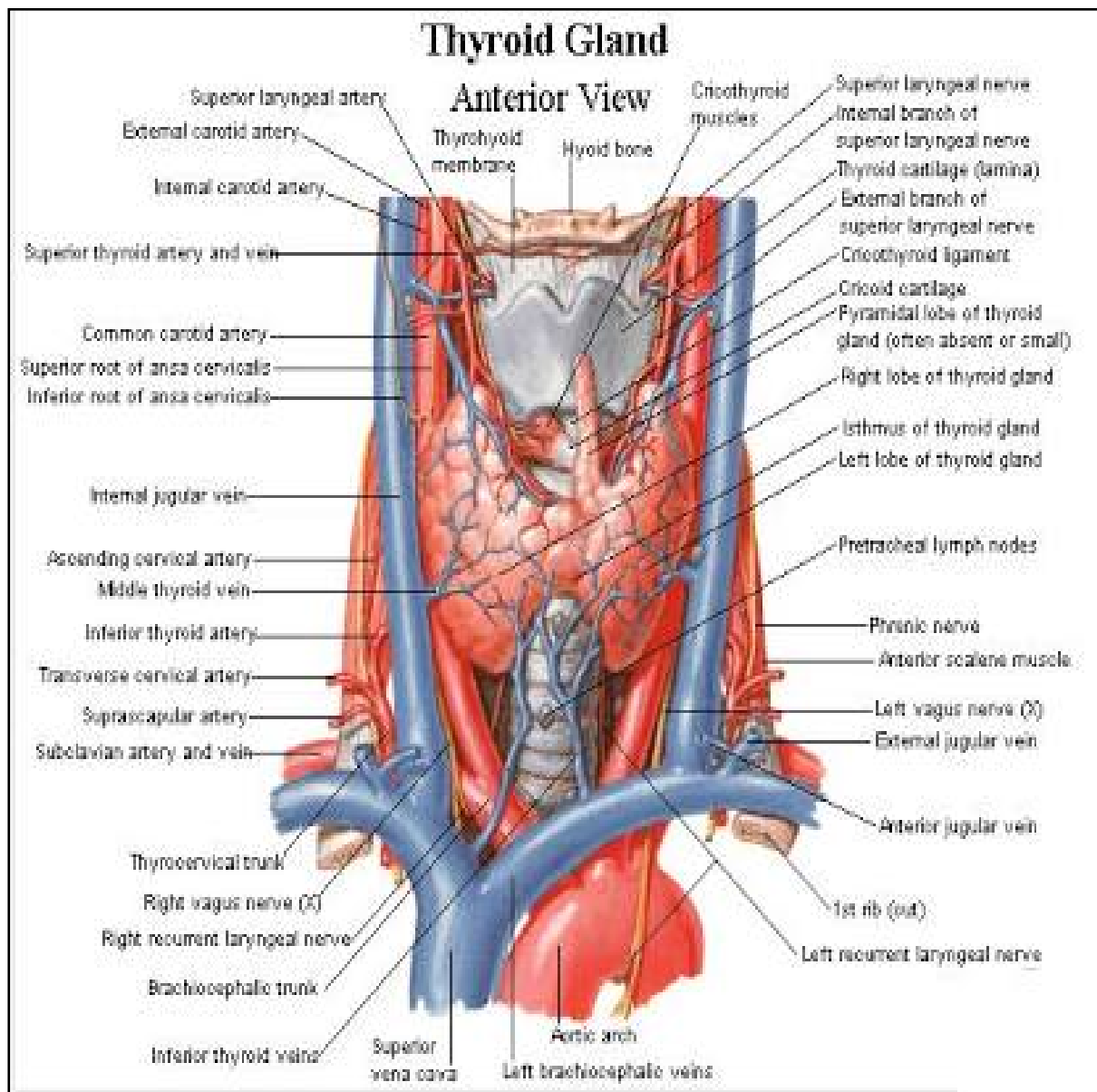


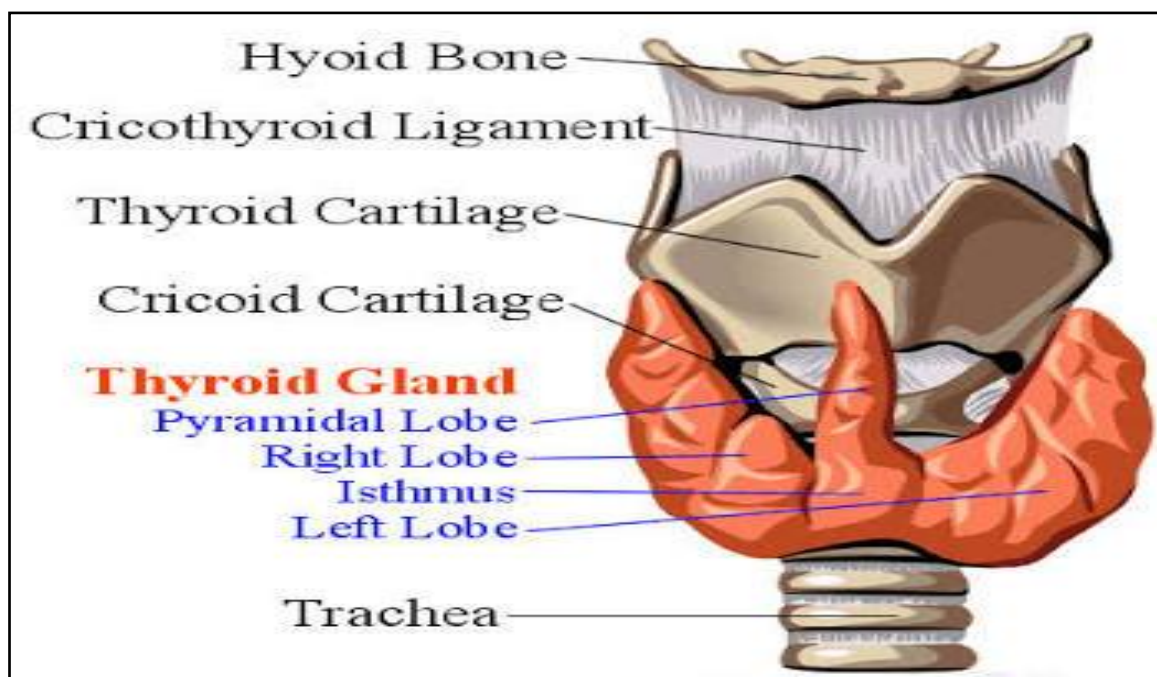
Figure 3 - Anterior view of thyroid gland.

Thyroid glands weighs about 10 to 20 gms in adults highly vascular endocrine gland of the human body next to adrenals, thyroid gland consists of 2 lobes and isthmus it is located in the anterior triangle of the neck deep to the investing layer of deep cervical fascia, lateral lobe was in relation to the

tracheoesophageal groove medially and carotid sheath laterally, and sternocleidomastoid , sternohyoid, sternothyroid , superior belly of omohyoid was in relation to the anterior and lateral surfaces, thyroid disorders such as malignancy , thyroiditis, goitre, previous surgery in the neck, previous irradiation in the neck can considerably alter the normal anatomy of the gland (7).

Thyroid Isthmus

Figure 3 - Thyroid isthmus.



Isthmus is a small band of thyroid tissue covering 2nd and 3rd tracheal rings in order to connect the 2 lobes of thyroid, variations like wide or long isthmus or absence of isthmus or pyramidal lobe can be seen (7).

Pyramidal lobe

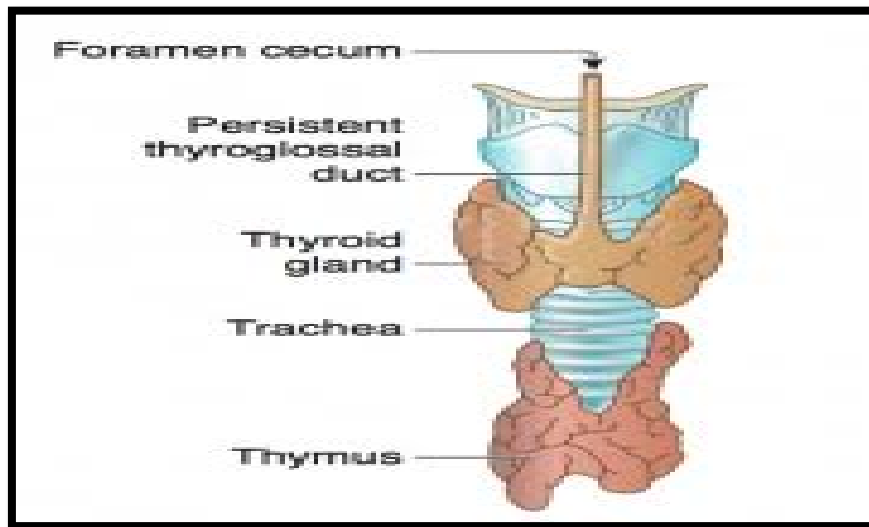


Figure 5 - Pyramidal lobe

It extends from superior border of isthmus and can reach up to the level of hyoid bone, sometimes its superior pole is connected to the fibrous tract which may end in foramen caecum which may contain thyroglossal cyst, variations seen in pyramidal lobe are long , short, stubby, bifid or absent, studies shows pyramidal lobe seen more commonly in men than women, Inorder to avoid recurrent thyroid neoplasms and recurrent thyroid toxicity surgeon should carefully look for pyramidal lobe intraoperatively (8).

Tubercle of Zuckerkandl

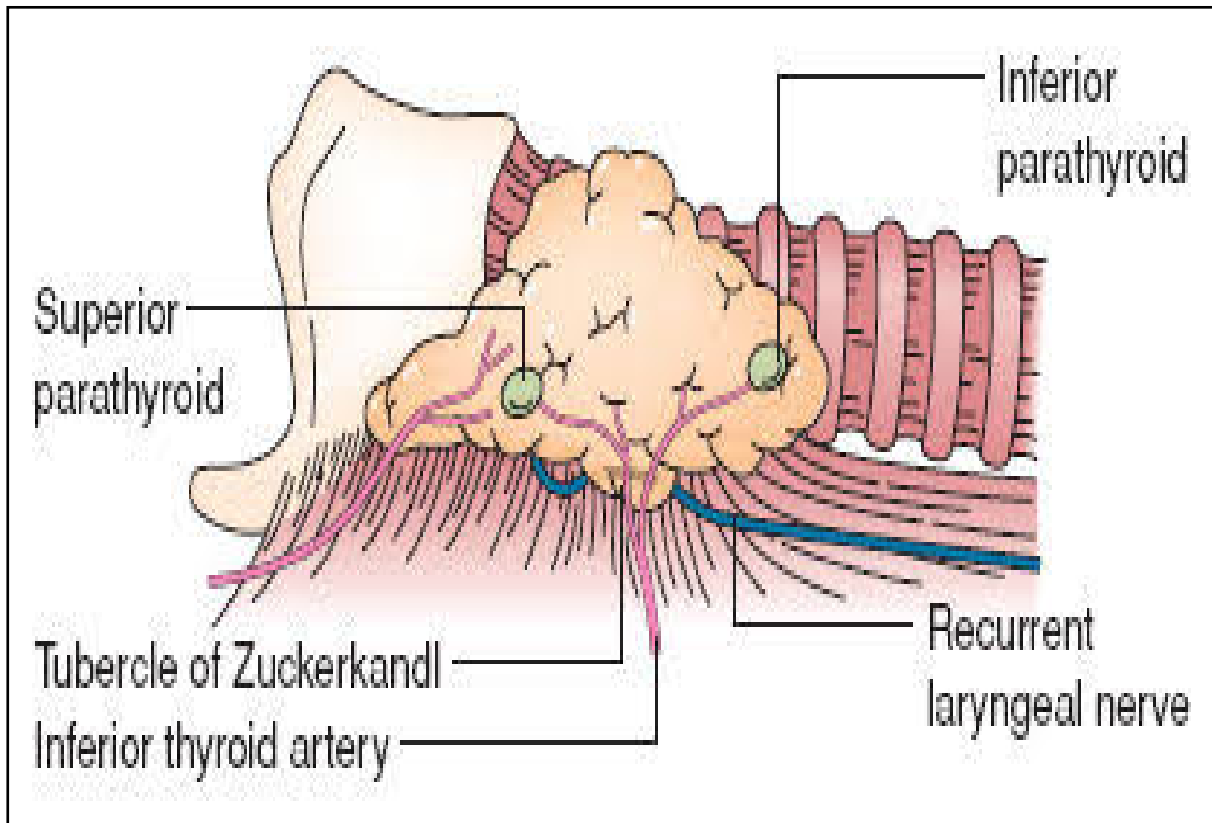


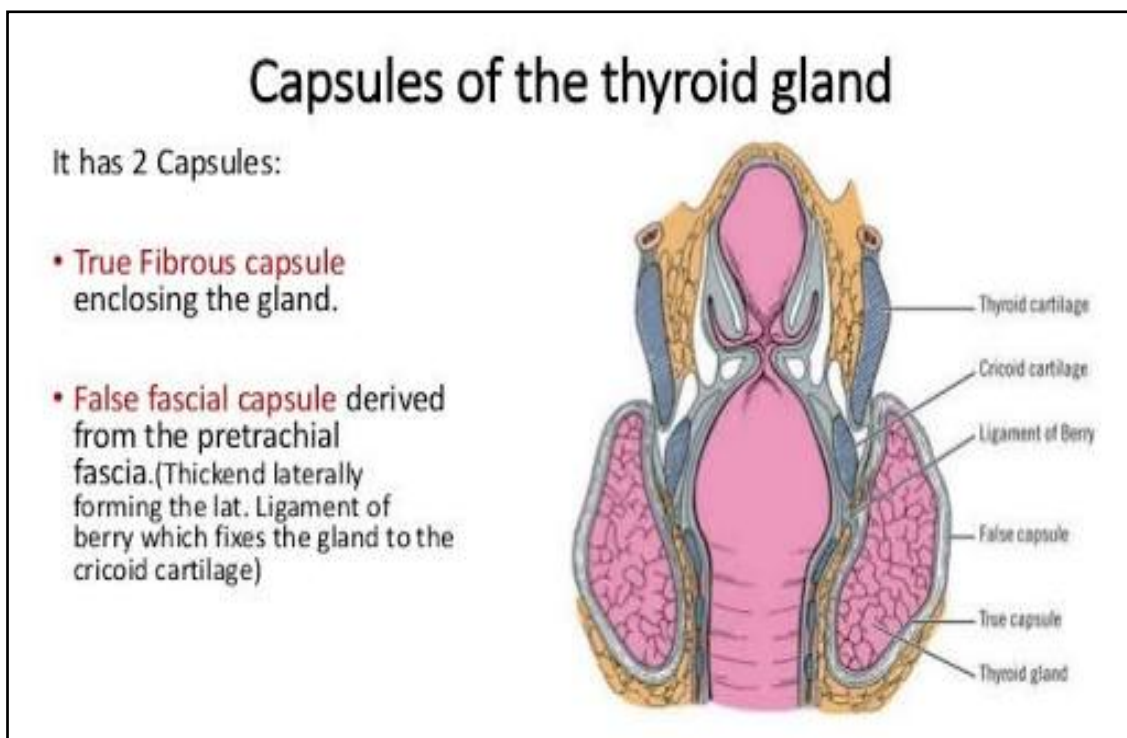
Figure 6 - Tubercle of Zukercandl

It is an extension of thyroid gland on the posterior aspect of both lateral thyroid lobes, it is important due to recurrent laryngeal nerve is in posterior relation to this tubercle, surgeon can use this landmark to identify this nerve, in some studies this tubercle is in deep relation to recurrent laryngeal nerve, this variation may mislead surgeon and resultant injury to the nerve is disastrous (9).

The capsule

True capsule of the thyroid gland is the condensation of stroma of the organ, outside the true capsule the gland is covered by false capsule derived from pretracheal fascia, false capsule is usually left in the field during thyroidectomy, the false capsule suspends the thyroid gland to the cricoid cartilage and trachea, condensation of false capsule in the posteromedial aspect forms the ligament of berry and it is in close relation to the recurrent laryngeal nerve. Surgeon should be careful in this region to avoid iatrogenic nerve injury (10).

Figure - 7 Capsules of the thyroid gland.



Blood supply

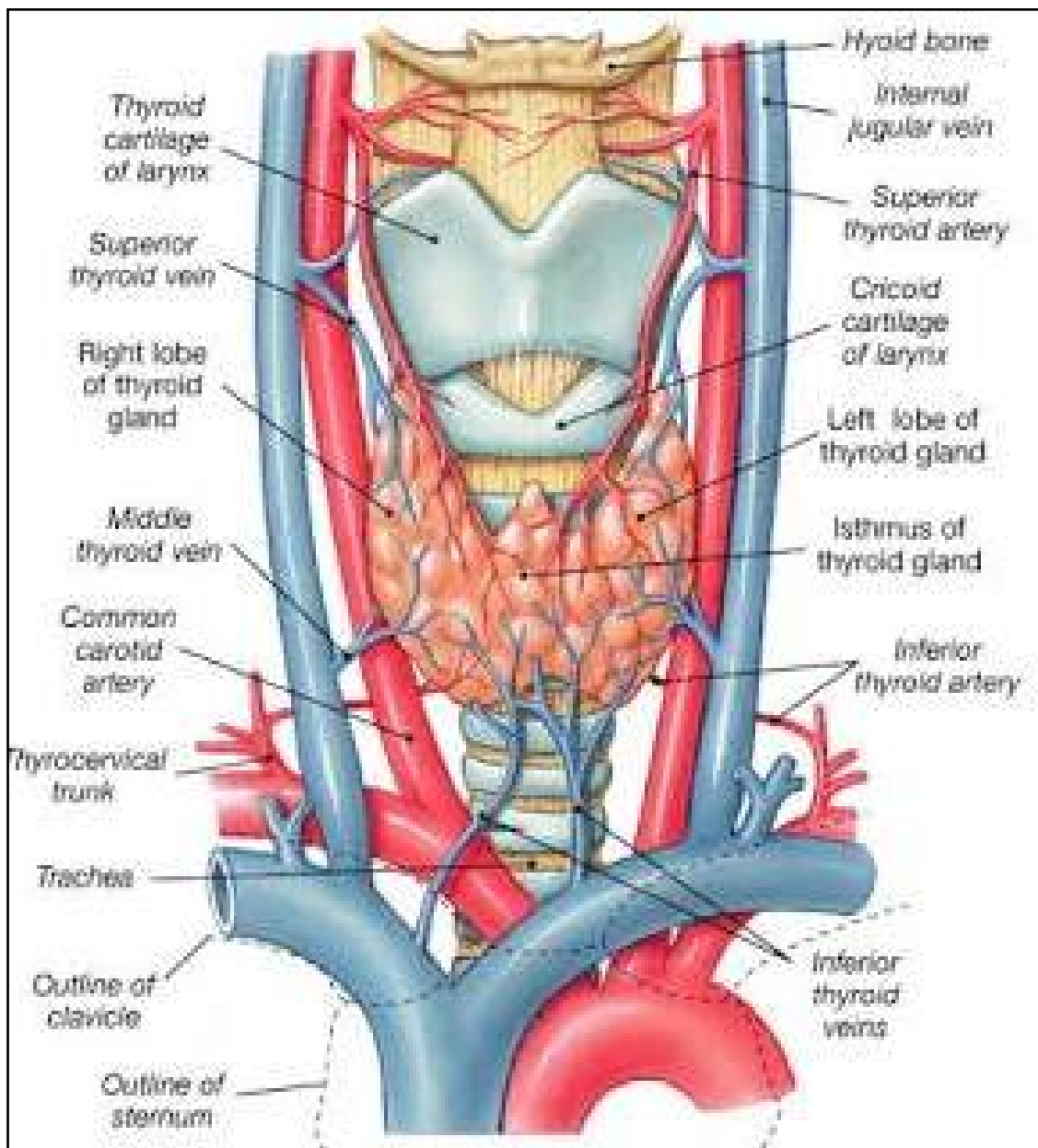


Figure 8 - Blood supply of thyroid gland.

Artery supplying to the superior pole of thyroid

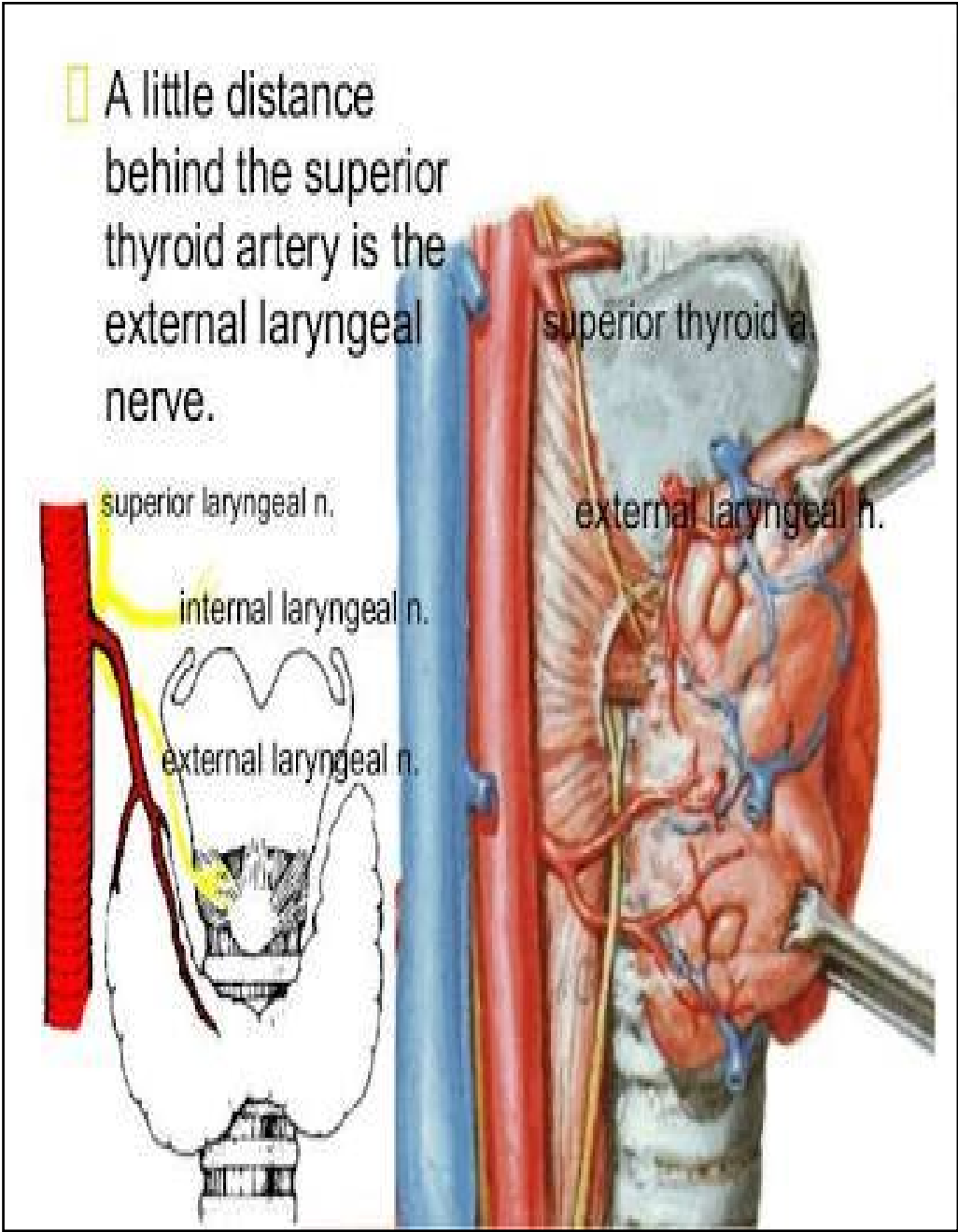


Figure 9 - Superior pole of thyroid.

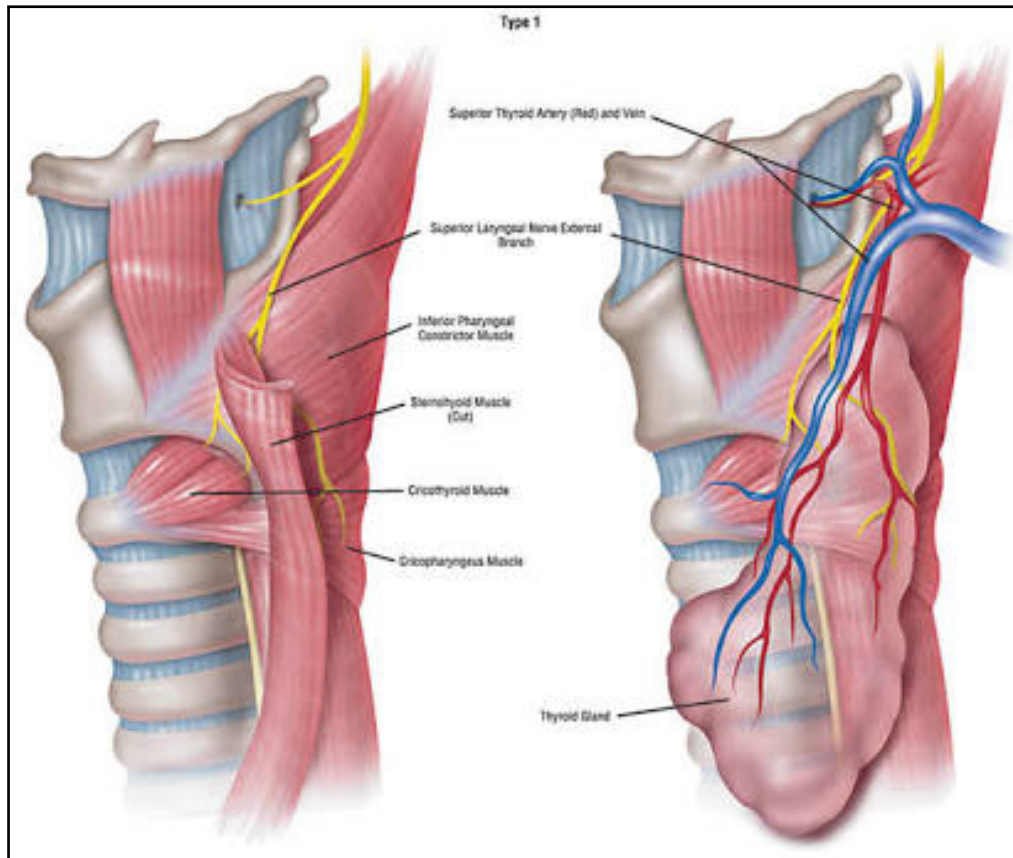


Figure 10 - Superior pole with vessels and nerve.

Arises from the external carotid artery. It is parallel to the course of external laryngeal nerve. In order to avoid external laryngeal nerve injury, superior pedicle to be ligated near the gland. The corresponding vein drains into the internal jugular or common facial vein. Terminal posterior branch of superior thyroid artery contribute some blood supply to the parathyroid glands. In a study 67% of superior parathyroid supplied by single vessel, 33% supplied by 2 or more vessels (11).

Artery supplying to the inferior pole of thyroid

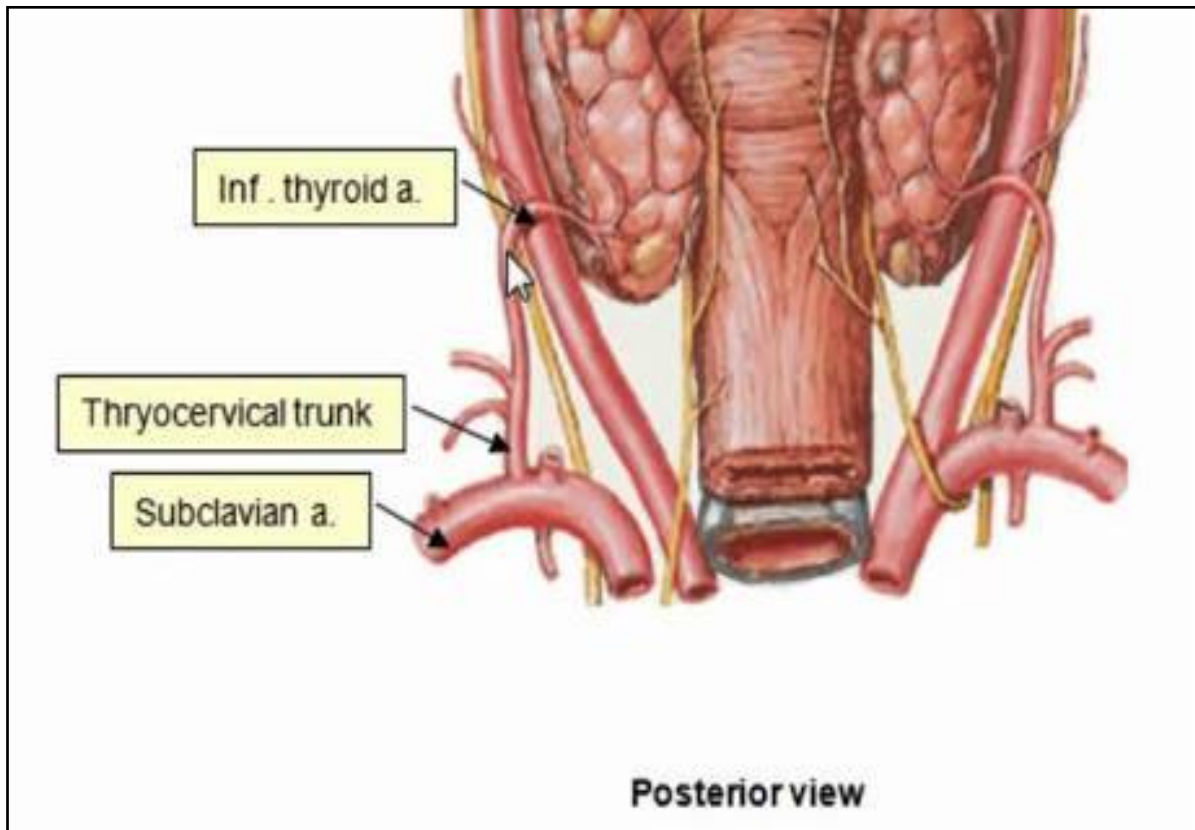


Figure 11 - Inferior pole of thyroid.

Derived from the thyro cervical trunk, but in 15% arises from the subclavian artery. Multiple terminal branches of this vessel is in relation to the recurrent laryngeal nerve, in order to avoid injury to the vessel we should ligate the inferior thyroid pedicle away from the gland, it is the major blood vessel to parathyroid glands. It supplies inferior and superior parathyroid glands. Ligation of the artery supplying inferior pole of thyroid bilaterally results in permanent hypoparathyroidism, hence studies suggested that identify and ligate these vessels seperately by 3 to 4 times near the capsule. (12)

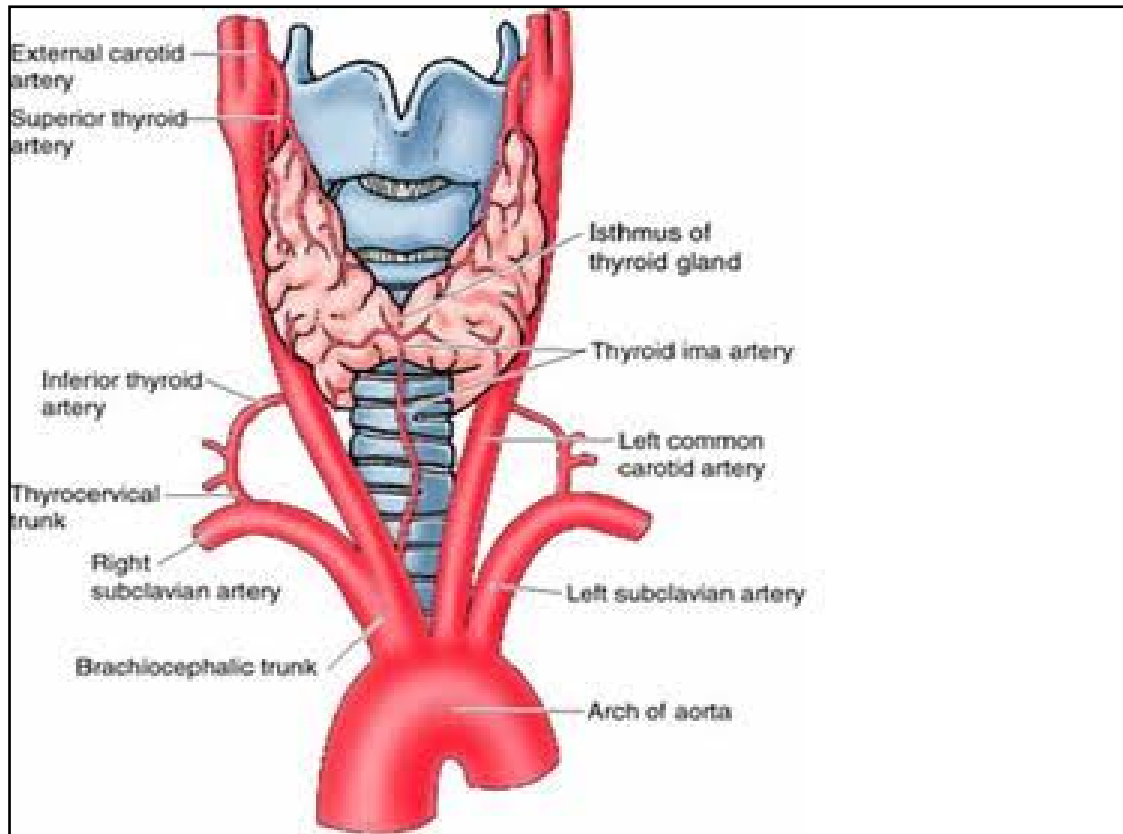


Figure 12 - Lower pole vessels.

Thyroid ima artery arises from the brachiocephalic trunk or aorta supplying lower part of isthmus.

Vein draining the inferior pole of thyroid is the largest, variable and asymmetric bilaterally and drains in to brachiocephalic vein on either side

Middle thyroid vein

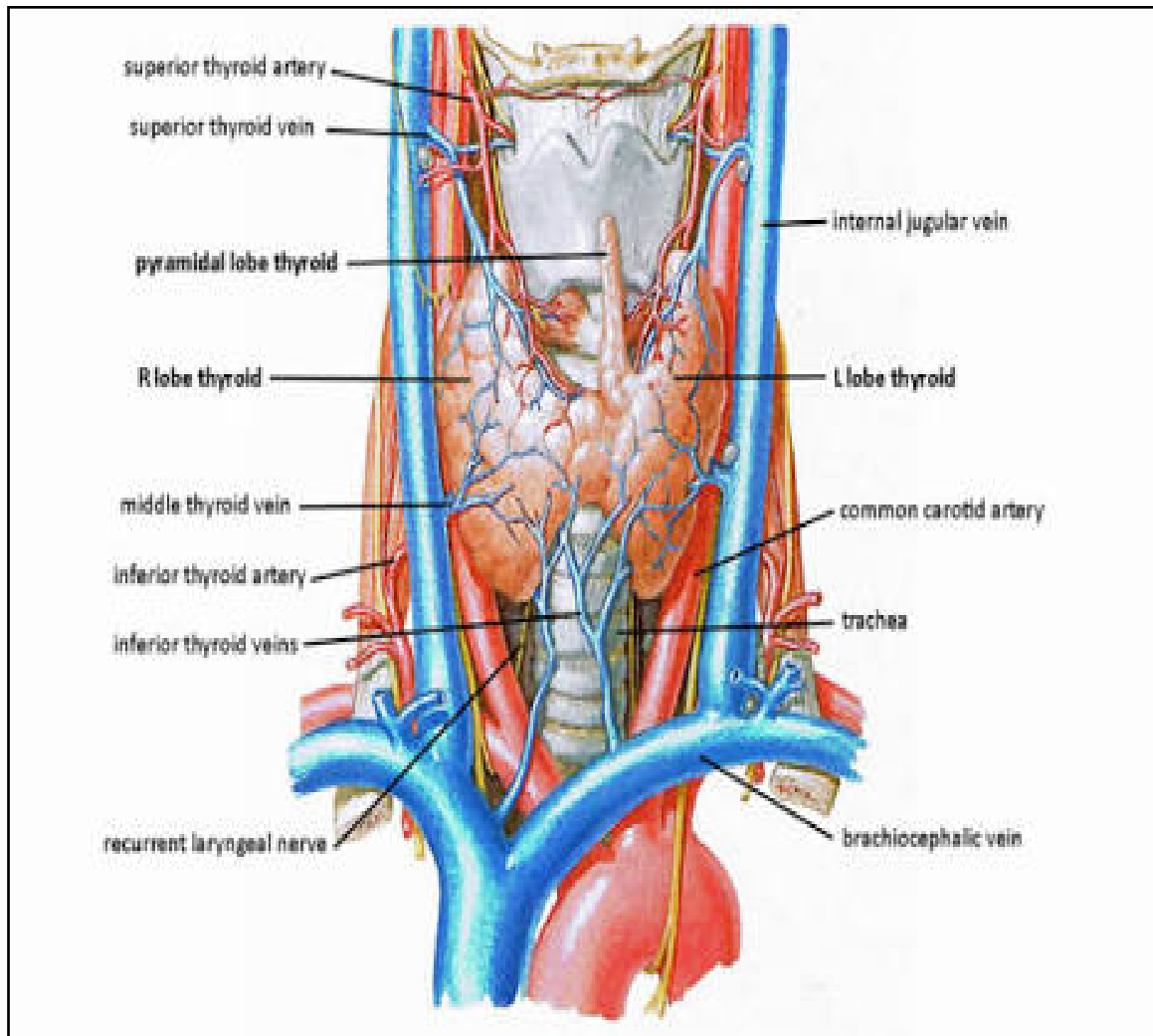


Figure 13 - Veins of thyroid.

Middle thyroid veins are short and stubby and drains in to internal jugular vein.

Kochers vein is a rare variation found between middle and inferior thyroid vein.

Variations of vessels supplying thyroid gland like double vessels, altered course or absence may result in complications like post thyroidectomy ischemic necrosis of parathyroids, torrential bleeding or hematoma(12).

Lymphatics

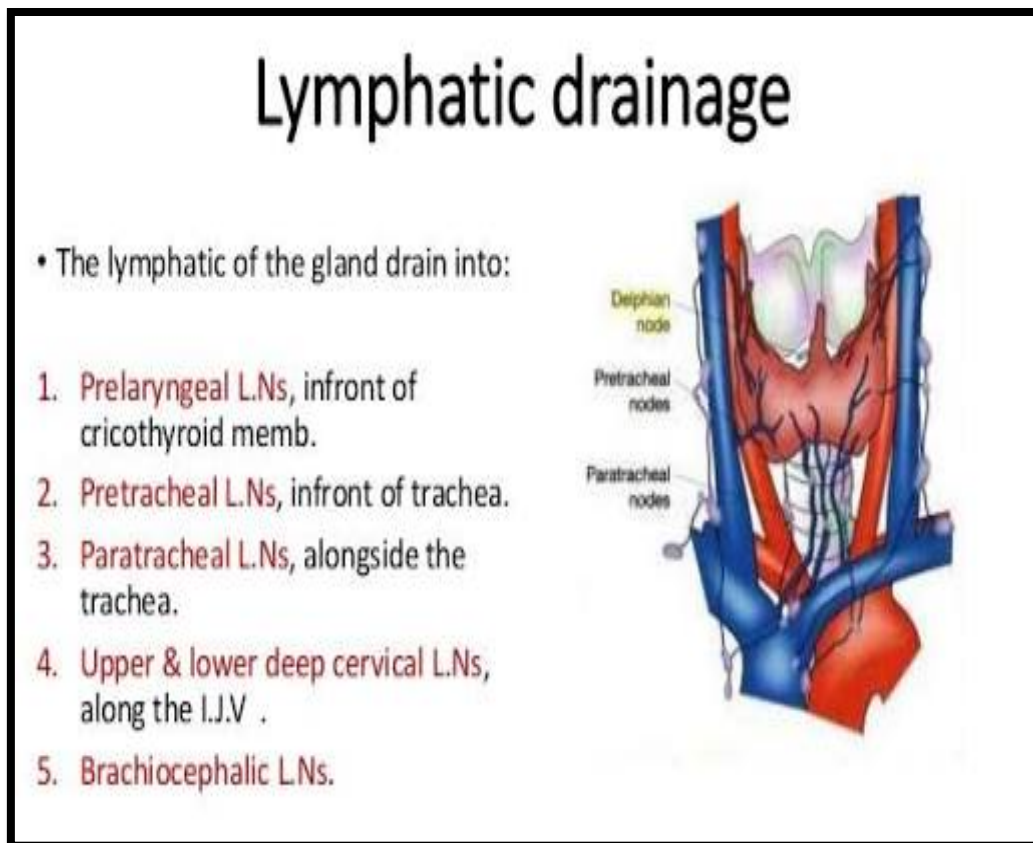


Figure 14 - Lymphatics of thyroid.

Lymphatic plexus within the capsule drains into pretracheal delphian nodes and prelaryngeal nodes, these nodes drains into lower deep cervical nodes (level 3 and 4) and mediastinal nodes, some lymphatics may drain into supraclavicular nodes(13).

Embriology and surgical anatomy of Parathyroid Glands

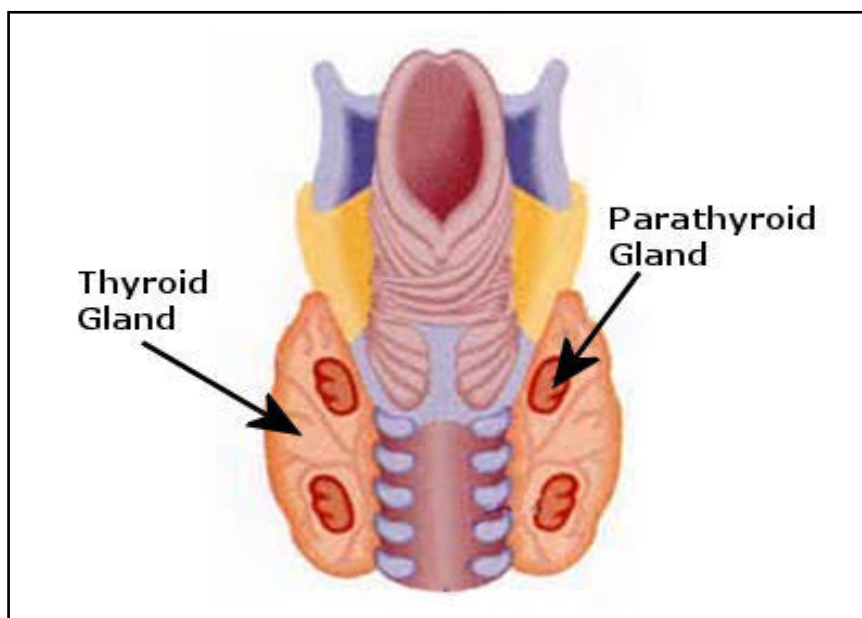
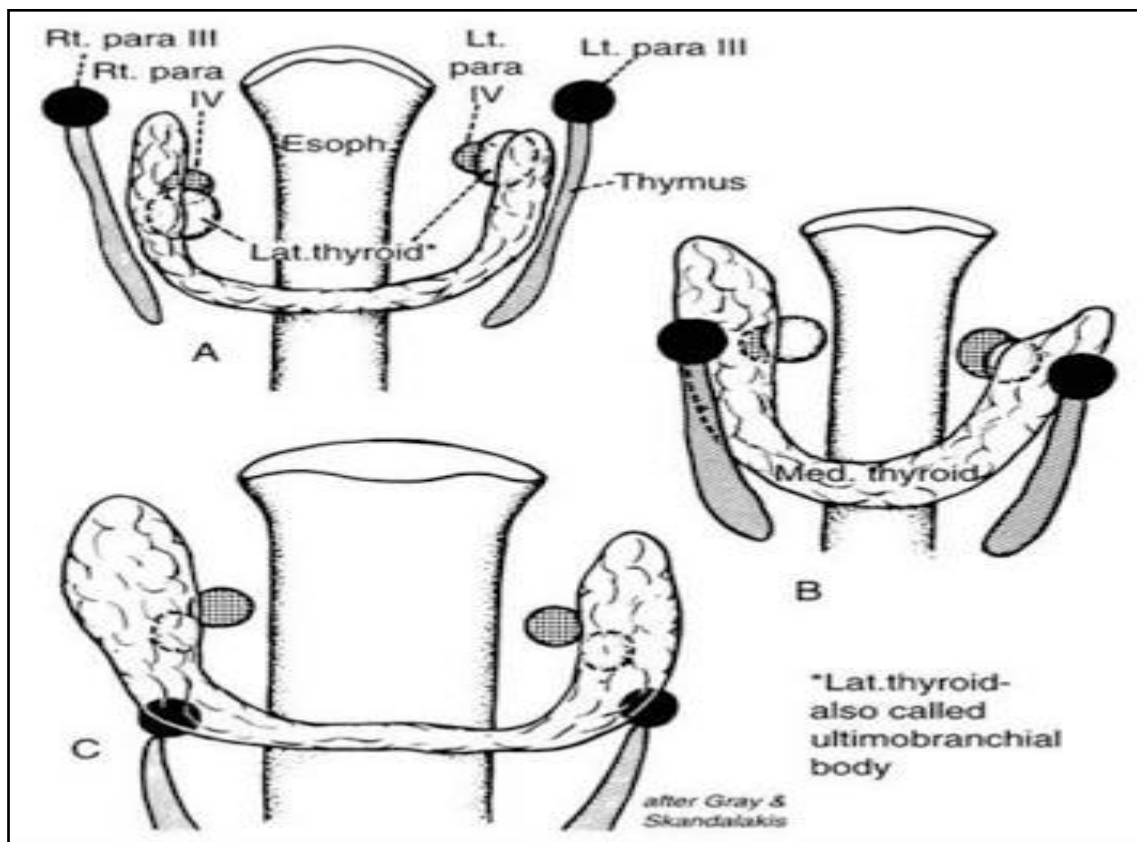


Figure 15 - Development of Parathyroid glands.

Develops during the 5th and 6th week of intrauterine life. They develop as epithelial thickening of the dorsal endoderm of 3rd and 4th bronchial pouches. The inferior parathyroid is derived from the 3rd pouch. On development it subsequently migrates along with the thymus to the inferior position and becomes the inferior parathyroid gland. In some variants it descends along with thymus into the mediastinum. So its position is variable, developmental anomalies like variation in the location, number can be seen.

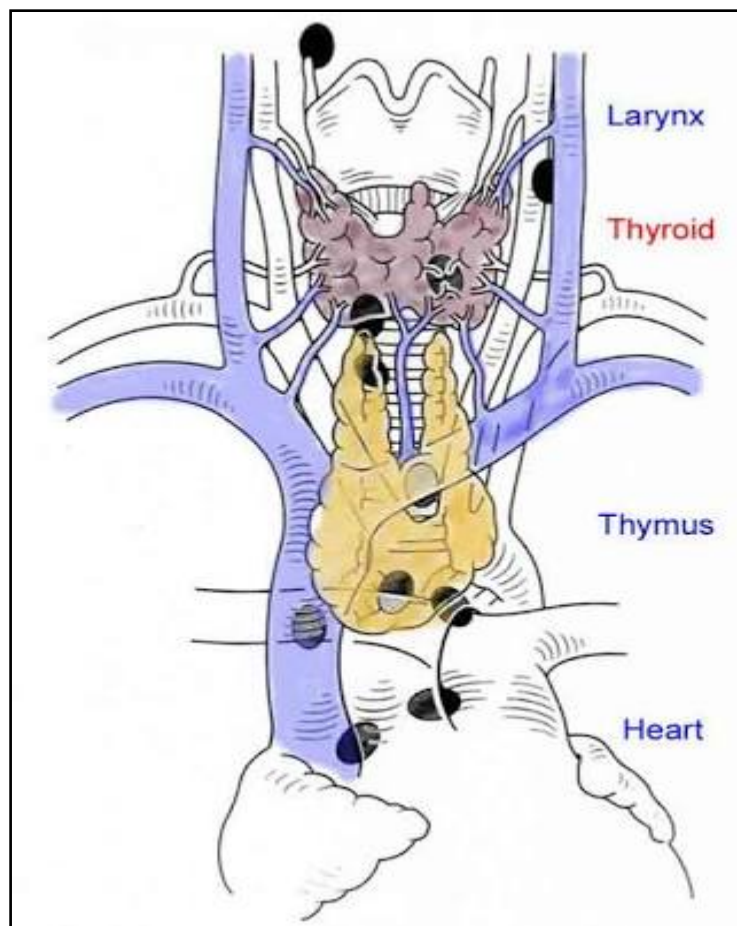
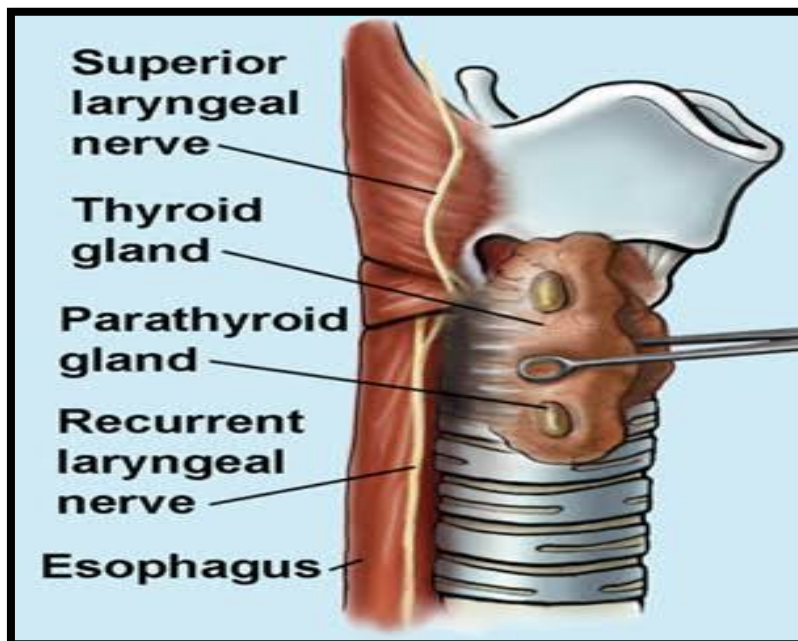


Figure 16 - Variations of position of parathyroid.

They are seen in the posterior surface of thyroid gland having a connective tissue capsule and having separate blood supply. It appears golden yellow to light brown in colour, sometimes parathyroid may be seen within the capsule of thyroid (14).



Figure 17 - Parathyroids and its blood supply.



Libutti et al in his study reported that 7% incidence of intrathyroidal parathyroid gland and advised careful ultrasonographic location of parathyroids before proceeding for thyroidectomy. The surgeon should search superior parathyroids 2.5 cm above the junction of inferior thyroid artery and lower pole of thyroid gland and 2.5 cm below this point look for inferior parathyroids.(15)

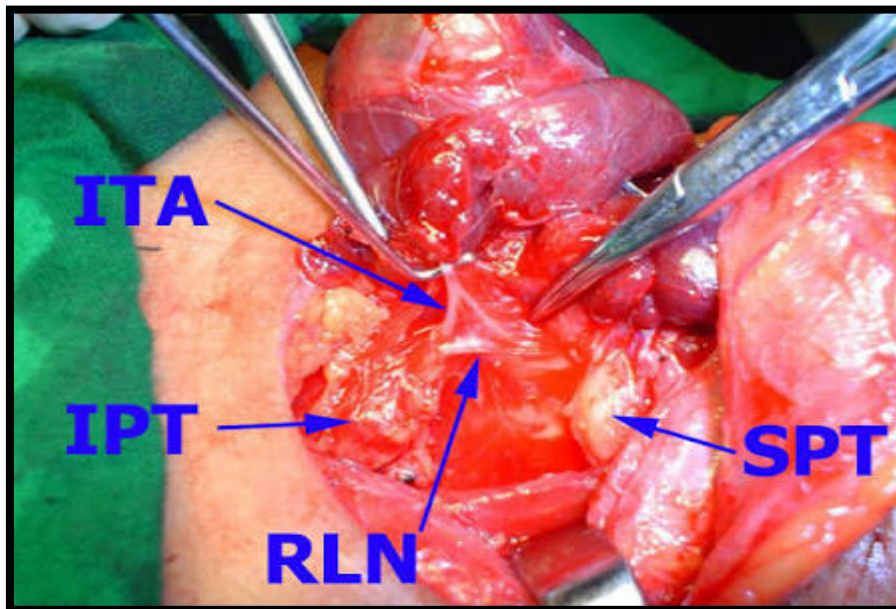
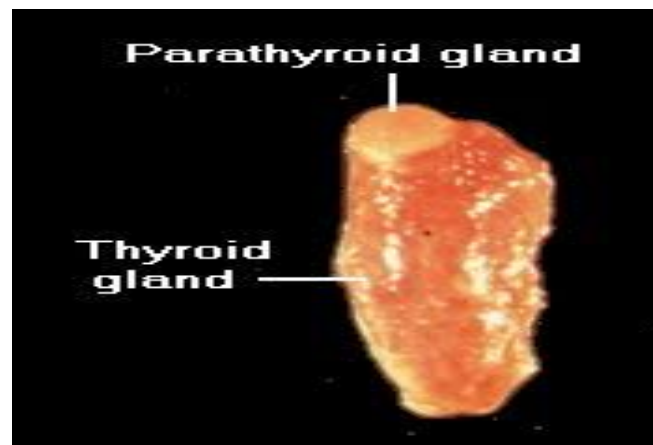


Figure 18 - Parathyroid on surgical field.

Variations like absent parathyroids have been reported and such cases can result in hypoparathyroidism after thyroidectomy with even injury to single gland of parathyroid (16).

For locating parathyroid glands in operating table we can use methylene blue.

On table measurement of parathormone levels can be used as predictor of hypocalcaemia after surgery.

Histology:

Principle cells or chief cells secretes parathormone, neoplastic glands may show water clear cells.

Calcium metabolism

Few words about calcium levels in various organs of body and how they are regulated.

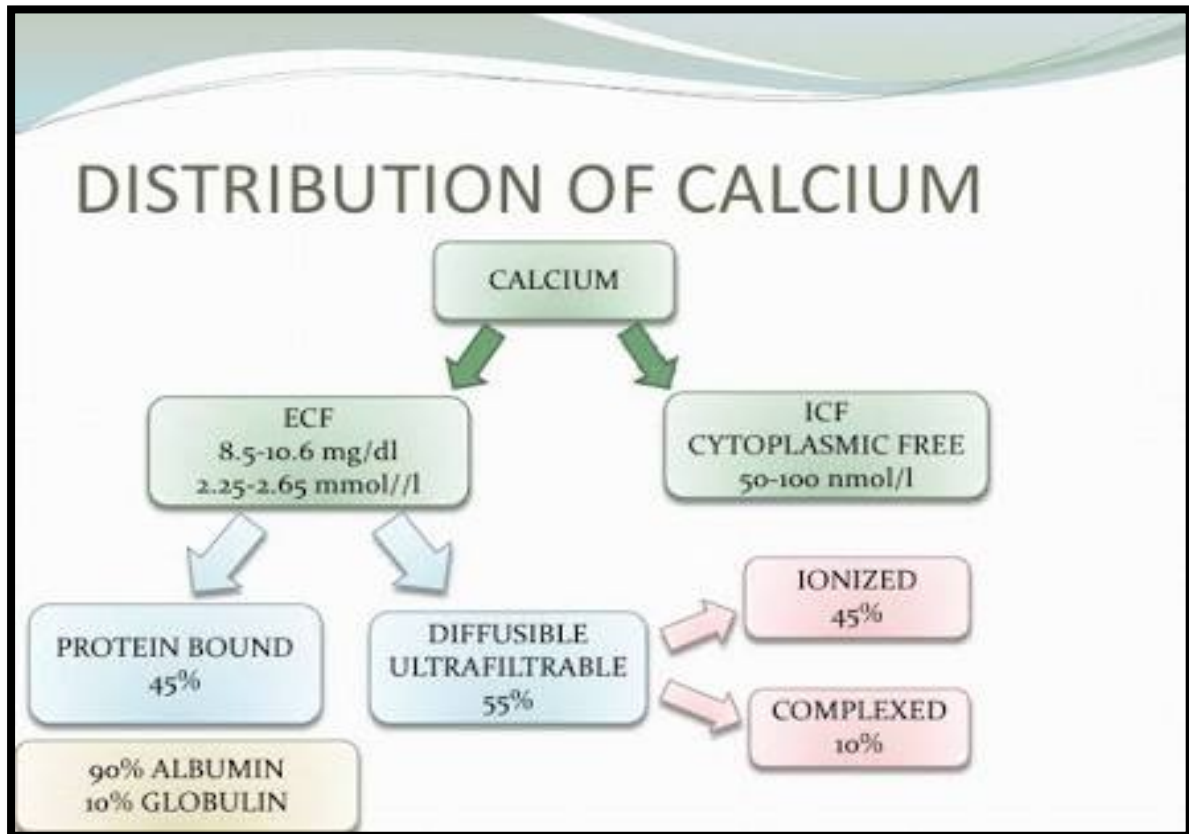


Figure 19 - Calcium distribution.

Blood plasma calcium levels are maintained in very narrow limits. Slight changes can result in hypo or hyper calcaemia.

An average adult human contains about 1 kilogram of calcium of which majority is in the form of skeletal calcium phosphate.

ECF contains 23mmol of calcium of which 9 to 11 mmol are in the plasma.

ICF contains very minimal or negligible calcium.

It is on regular feedback control involving two major hormones parathormone secreted by parathyroid glands and calcitonin secreted by parafollicular C cells of thyroid and Vitamin D. (17)

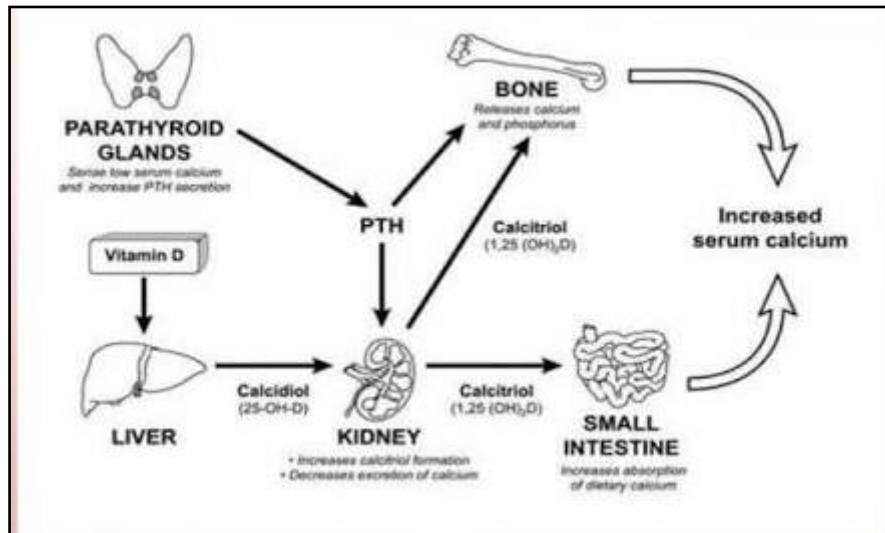


Figure 20 - Calcium metabolism.

Parathyroid hormone:

Parathormone is a peptide containing 84 aminoacids. It's secretion is regulated by serum calcium and magnesium. Parathormone secretion is not under the control of pituitary gland. Stimulating factors are hypercalcemia and hypomagnesemia.

Action of Parathormone:

- 1.It causes mobilisation of calcium out of the bone.
- 2.It causes increased absorption of calcium from the kidney.

3.It causes increased excretion of phosphate in the kidney.

4.It increases absorption of calcium from the GIT.

In overall Parathormone cause increase in serum calcium level.

Parathormone action is balanced by calcitonin.(17)

Few important functions of calcium:

1.For optimal functioning of clotting factors.

2.Neurotransmission regulation by preventing the leaking of sodium into the neural axons.

3.Major supporting material in skeletal system.

4. act as a effective 2nd messenger in muscle contraction.

5.2nd messenger in releasing insulin from pancreas.(17)

Normal range of calcium

Total calcium 2.2 to 2.6 mmol/lit (9 to 10.5mg/dl).

Ionised calcium 1.3 to 1.5 mmol/lit(4.5 to 5.6mg/dl).

Amount of total calcium altered with serum albumin levels.

Ionised calcium is not associated with serum albumin level. so estimation of ionised calcium is more precious than total calcium in hypocalcaemia.

But in normal serum albumin levels total calcium level will also reflect biological effects of calcium.(17)

For calculation of corrected calcium

corrected calcium(mg/dl)= measured total calcium in mg/dl+ 0.8(4.0-serum albumin in gm/dl)

Absorption of calcium

Calcium is absorbed in intestine and bound to calbindin. It is transferred into endoplasmic reticulum of intestinal epithelial cell. From there PMCA1 calcium pump transport it into the body. Active transport and major transport occurs in the duodenum. Passive occurs in the jejunum and ileum, Absorption of calcium is regulated by calcitriol in the blood(vit-D).(17)

Due to the parathyroid stimulation cholecalciferol converted into 1-25 dihydroxy cholecalciferol in kidney which regulates absorption of calcium in the gut. (17)

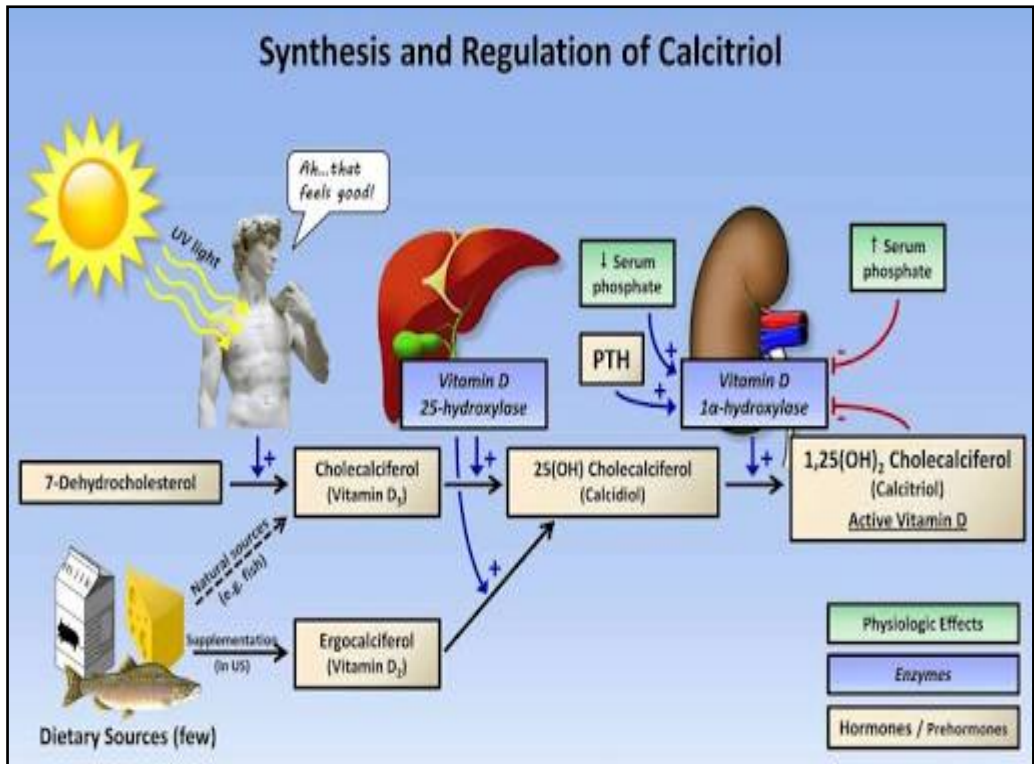


Figure - 21 Action of Vitamin D.

Hypocalcaemia

Acute hypocalcaemia may endanger the life , so close monitoring in the post operative period, early identification of signs and symptoms of hypocalcaemia and effective replacement management is crucial in the management of post thyroidectomy hypocalcaemia

Definition of hypocalcaemia

Serum calcium level lower than 8.2 mg/dl(2.05mmol/lit)

Ionised calcium level lower than 4.4mg/dl(1.1 mmol/lit)

Signs and symptoms of hypocalcaemia:

1. Neurological disturbances

-seizures

- dementia

-emotional problems like - anxiety/depression(17).

-Chovestek sign- Tapping at the angle of jaw over the course of facial nerve produces twitching of facial muscles which are supplied by it.




Figure 22 - Elicitation of Chovestek sign.

-Trousseau's sign- Induced carpopedal spasm by increasing the pressure in blood pressure cuff wrapped around the arm.

Hypocalcemia sx:

- Neuromuscular excitability
- Carpopedal spasm
- **Tetany**
- Chvostek's sign
- Trousseau's sign
- **Seizures, confusion**
- **EKG: prolonged QT,**

Trousseau's sign?



inflate BP cuff to >SBP for 3 min... elicits spasm

Figure 23 -Elicitation of Trousseau's sign.

- Parasthesia over extremities.
- Parasthesia in the perioral region.
- Myalgias and muscle spasms.
- Tetany-or carpopedal spasm- Thumb in palm deformity or obstetricians hand.



Figure 24 - Carpopedal spasm.

2. Cardiovascular disturbances

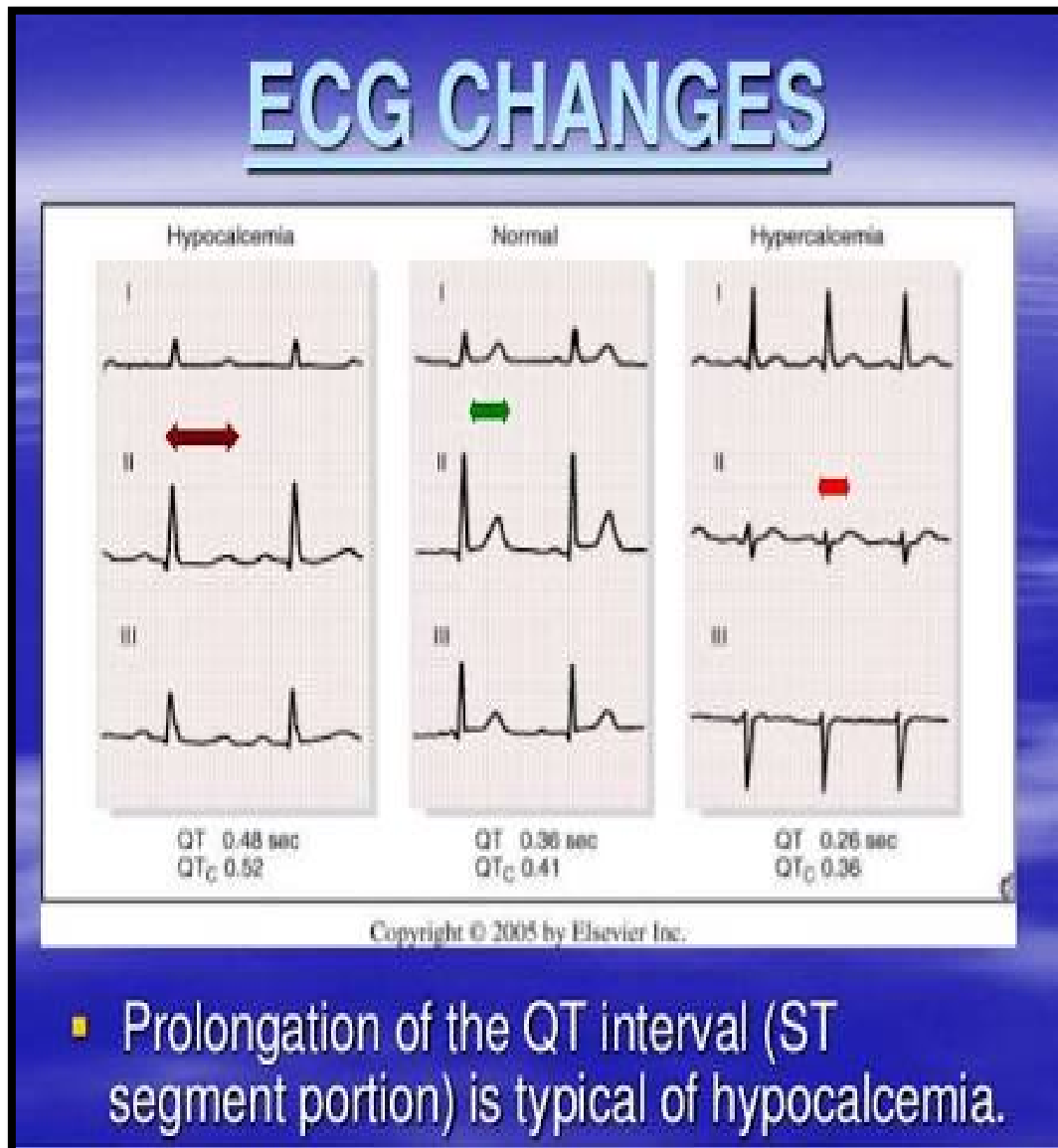


Figure 25 - ECG changes of hypocalcaemia.

-Prolonged QT interval.

-Hypotension.

-Cardiac failure.

3. Autonomic disturbances

-Biliary colic.

-Bronchospasm.

-Diaphoresis.

Classification of hypocalcemia(17)

Based on symptoms

1. Asymptomatic

2. Moderate hypocalcemia with numbness, tetany, chovestek sign , trousseau sign

3. Severe hypocalcemia with ecg.changes U waves , QT prolongation or bronchospasm(17).

Based on duration

1. Temporary hypocalcaemia - Less than 6 months duration

2. Permanant Hypocalcaemia- More than 6 months

Management of Hypocalcaemia

For asymptomatic hypocalcaemia per oral replacement of calcium starting with the low dose and titrate according to 24 hours serum calcium assessment.

For moderate hypocalcaemia, patient can be treated in general ward with initial high dose of oral calcium along with calcitriol supplementation 0.5micro gram daily.

For severe hypocalcaemia, patient treated in Intensive care unit with intravenous calcium gluconate 10ml diluted in 100ml normal saline over 15mins slow iv and frequent monitoring of serum calcium levels and continuous cardiac monitoring. Once normocalcaemia level reached then swith over to oral calcium supplementation with Vit D. (17 ,5,18)

Thyroidectomy

After putting the patient in semi fowler position with hyperextension of neck with a sandbag and head support with a ring.

Prepare the patients neck with betadine and spirit as per the institutional protocol.

Mark the incision line by 2-0 silk in the lower skin crease.

By lower collar skin crease incision or kochers incision skin, subcutaneous tissue and platysma is divided in the same line.

After establishing good control of bleeding superior and inferior flaps are raised.

Superior flap raised up to superior border of thyroid cartilage and inferior flap raised up to sternal notch for exposing the field adequately.

Small incisions and inadequate raising of flaps and inadequate exposure of field may result in difficult dissection or bleeding and disturbance to parathyroid blood supply.

Open the deep fascia in the midline vertically, retract the strap muscles laterally, In some cases with huge thyroid swelling may need division of strap muscles for better exposure.

To avoid injury to the ansa cervicalis always divide the strap muscles on its upper half.

After thorough examination of the pathology of the thyroid gland, and parathyroid glands position retract the lobe of the thyroid medially and above in order to taut the middle thyroid vein , careful dissection should be made to ligate this vein.

Identify and protect the parathyroids intraoperatively by its typical colour.

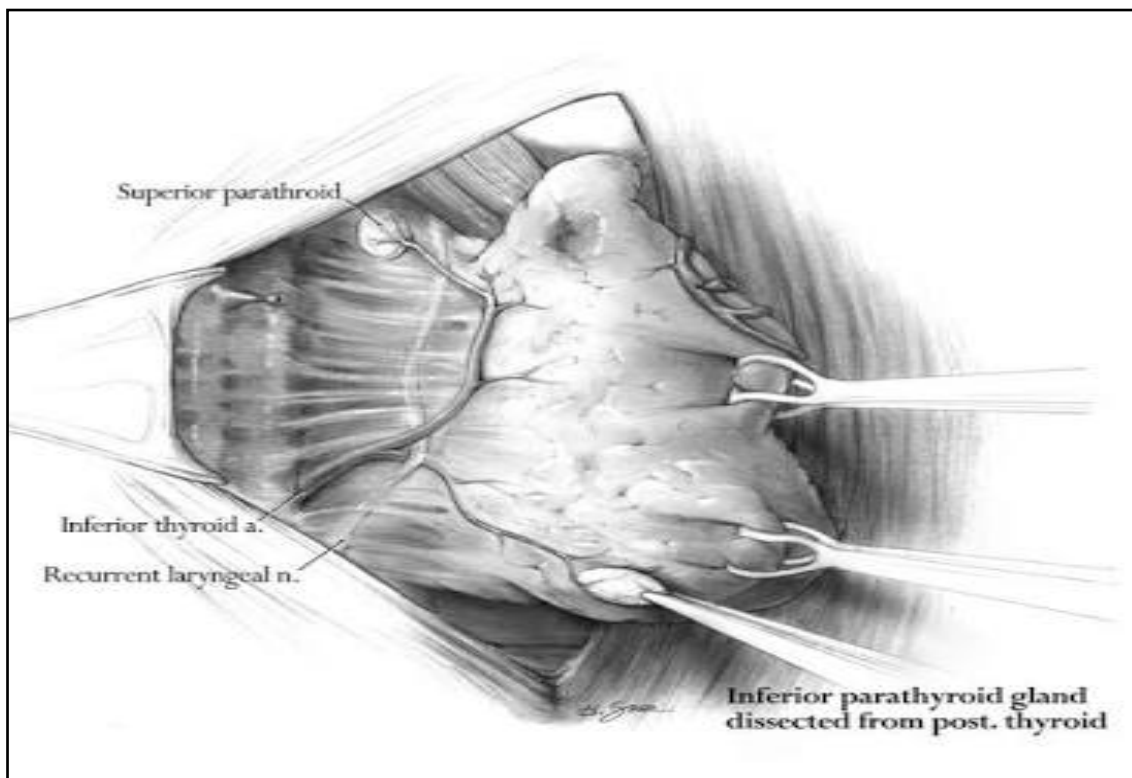


Figure 26 - Exposing Parathyroids during surgery.

Ligate the inferior thyroid artery branches after identifying the recurrent laryngeal nerve using 3 to 4 separate clamps close to the capsule leaving behind the vessels supplying parathyroids.

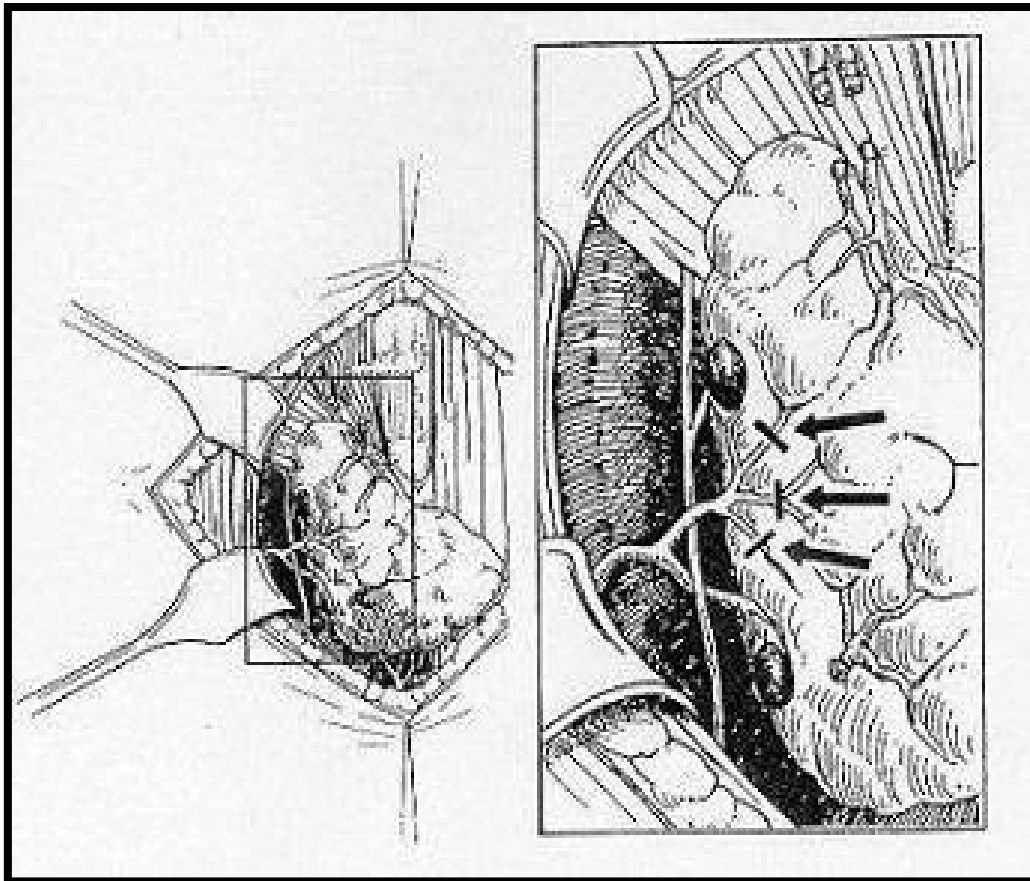


Figure 27 - Ligation of inferior thyroid artery.

Carefully ligate the vessels supplying the upper pole after careful dissection near the gland.

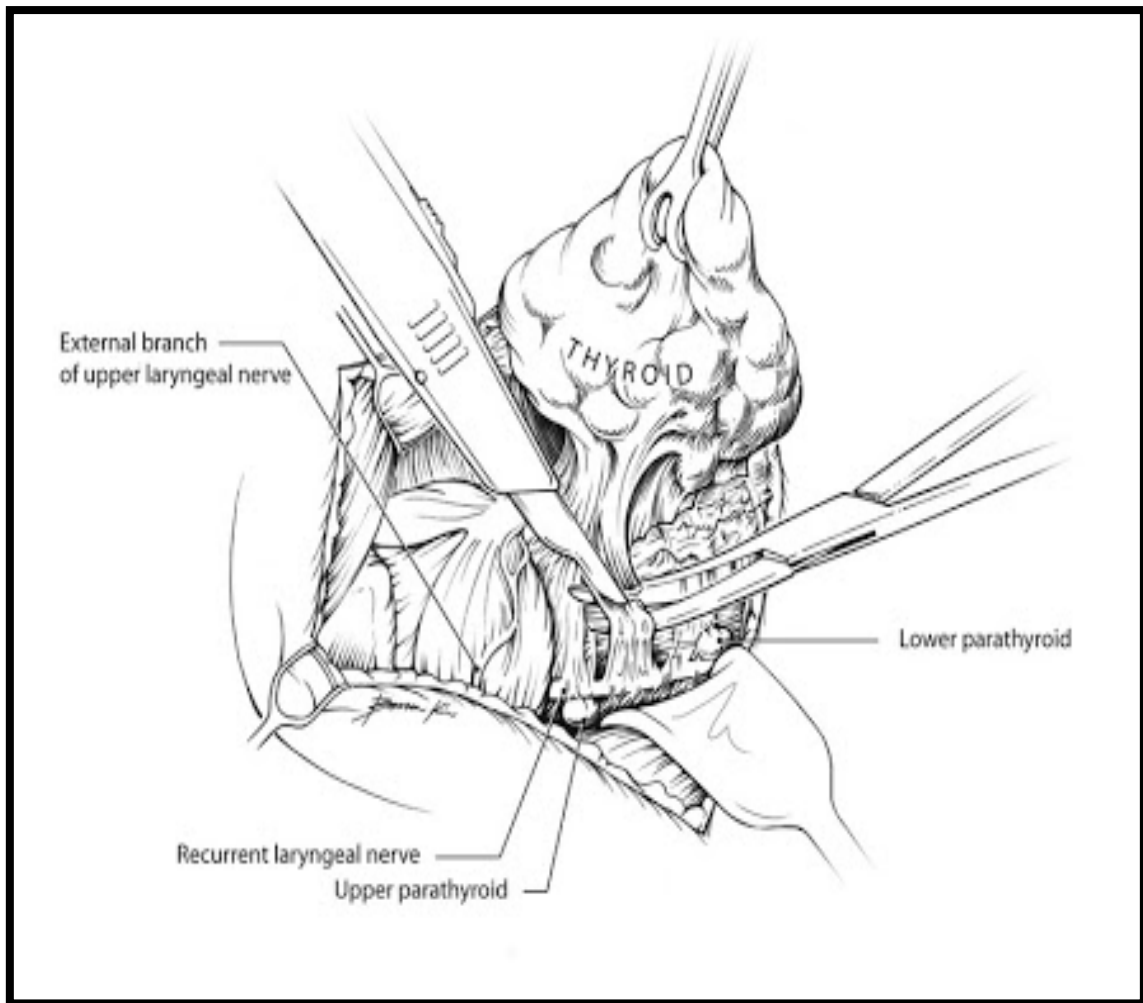


Figure 28 - Dissection in the field.

Blunt dissection made to separate the lobe from trachea, and underlying ligaments and vessels ligated and divided.

The same procedure to be repeated on the opposite side.

Carefully divide the attachments between the isthmus and trachea and don't forget to look for pyramidal lobe or aberrant thyroids to avoid resurgeries which may be a high risk for post operative hypocalcaemia,

After achieving complete haemostasis wound should be closed in layers leaving a glove drain in situ as per the institutional protocol.(19,20,21)

Complications of Total Thyroidectomy

1.wound hematoma.

Early life threatening complication.

resulting in airway obstruction.

may need immediate surgical intervention.

2.Hypocalcemia

May be temporary or permanent.

Need early diagnosis and prompt treatment.

3.Seroma collection.

4.Infection.

5.Hypertrophic scar or keloid.

6.Recurrent laryngeal nerve palsy.

7.Superior laryngeal nerve palsy.

8.Horners syndrome.

9.Chyle leak.

10. Loss of voice.
11. Tracheomalacia.
12. Hypothyroidism.
13. Airway obstruction(22).

Post thyroidectomy complications incidence are increased with

1. Extent of the disease(large size).
2. Extent of the surgery(long duration and difficult recovery from anaesthesia).
3. Reoperative surgeries done for recurrent diseases.
4. Extrathyroidal extension of diseases.
5. Surgeries combined with neck dissection.
6. Reexploration for post operative hematoma(19,20,21)

Some Predictors of Post Thyroidectomy Hypocalcemia

1. Regular preoperative and post operative serum calcium estimation.
2. Intraoperative and postoperative parathyroid hormone level estimation.

Parathormone as a predictor

Perioperative and peroperative estimation of parathyroid hormone level in blood is a well documented predictor of post thyroidectomy hypocalcaemia in literature (fewins J et al).

For that parathormone estimation was done intraoperatively and 1 hour and 24 hours after surgery.

A fall in parathormone level immediately after surgery that is 1 hour and continuing fall in 24 hours is strongly associated with hypocalcaemia (lam and ker et al).

Parathormone level 8 picogram/ml associated with hypocalcaemia and more than 9 picogram/ml does not produce hypocalcaemia.

But the availability of this test and the cost are the limiting factors in low scale hospital setups(24).

Calcium as predictor

Various studies regarding serial calcium estimation and analysis post operatively and the prediction value of post thyroidectomy hypocalcaemia shows varying results.

But the cost factor of the parathormone estimation may necessitate the use of calcium estimation even in small health care delivery systems.

In a study conducted by (Ancuta Leahu et al) shows patient with positive calcium trend such that, rise of postoperative calcium levels on serial estimation shows normocalcaemic pattern and excludes hypocalcaemia successfully in 96.2% of patients.

The same study shows the patients with negative calcium trend like that a serial fall in serum calcium level after thyroid surgeries may result in hypocalcaemia in 51.6% of patients.

From this pattern of results he concluded, positive calcium trend patients can be discharged earlier without the fear of hypocalcaemia and patients with negative calcium trends should be monitored some more days for hypocalcaemia or starting oral supplementation of calcium(5).

Prevention of post thyroidectomy hypocalcemia

In order to prevent Post Thyroidectomy Hypocalcaemia, the surgeon must have adequate knowledge about surgical anatomy and embryology of thyroid and parathyroid glands.

The surgeon and anaesthetist team should have a good rapport in order to give pleasant and smooth anaesthesia during surgery and during recovery.

Cuff of endotracheal tube must be smaller in size in order to avoid laryngeal edema.

The surgeon must ensure good exposure of the operating field with good light source.

Perfect haemostasis to be maintained for identification of parathyroids in the operating field with naked eyes.

Meticulous dissection to be done throughout the procedure.

Prompt recognition of parathyroids by its size, colour and location or some other protocols according to the institution like methylene blue dye detection in the field.

Carefully identify and protect the blood supply to the parathyroids.

To preserve the blood supply of parathyroids the surgeon should ligate inferior thyroid artery at its terminal branch level.

Avoid parathyroid hematoma.

Avoid excessive suction in the field.

In case of accidental injury to parathyroid glands or its blood supply resulting in colour change, do immediate parathyroid auto transplantation in the same side sternocleidomastoid.

In case of accidental parathyroid hematoma noted by its bulge and congested appearance, don't hesitate to open the capsule of parathyroid by small incision and note the perfusion of the gland by its colour change.

If the perfusion of the gland is doubtful don't hesitate to do parathyroid auto transplantation.

Close postoperative follow up and early diagnosis and management also play a crucial role in postthyroidectomy hypocalcaemia (1,2,3,5,23,24)

Parathyroid Auto Transplantation

Accidental removal of parathyroid glands during thyroid surgery may result in temporary or permanent hypocalcemia.

In order to prevent this potential life threatening complication, some studies suggested that immediate auto transplantation of parathyroid glands on the operating table in the sternocleidomastoid muscle is recommended (Testini M et al).

It is performed on table whenever a surgeon identifies a devascularised parathyroid gland.

Parathyroid auto transplantation was described by F.H. Lahey in 1926.

Delayed auto transplantation surgeries can be done after cryo preservation of parathyroid gland in the post operative period.

It can be preserved up to two years.

But the success rate of immediate auto transplantation is higher than delayed transplantation 85 to 99% in immediate to 71% in delayed respectively.

Parathyroid auto transplantation is highly recommended in completion thyroidectomies, huge nodular goitre, radical head and neck surgeries, total thyroidectomy with radical neck dissection (Testini M et al).

Parathyroid auto transplantation reduces the risk of permanent hypocalcaemia (23,24).

So inadvertently removed parathyroid glands during complicated neck surgeries should be auto transplanted in the ipsilateral sternocleidomastoid.

The operating surgeon must carefully examine the resected thyroid on table to identify any accidentally removed parathyroid gland as a routine procedure for parathyroid auto transplantation.

Specimen examination on table may show congested or ischemic parathyroids is treated with incision of the capsule of the parathyroid to prevent necrosis.

If the colour is satisfying after this procedure leave it as such or transplant it to the same side sternocleidomastoid(23,24).

Some surgeons prefer routine parathyroid auto transplantation in all total thyroidectomy patients to avoid life long replacement of calcium(23).

Results

In this study we followed 51 patients who were undergone total thyroidectomies on various indications.

These patients are selected from, patients undergoing total thyroidectomies in 3rd surgical unit , tirunelveli medical college from the period of august 2014 to july 2015, after meticulous history taking and fulfilling the inclusion and exclusion criterias mentioned in this study proposal.

After thorough history taking we excluded patients undergoing surgeries other than total thyroidectomies like hemithyroidectomy near total and sub total thyroidectomies, in the age group of above 12 years.

we excluded patients with preoperative altered calcium levels in order to avoid previous altered parathyroid functions and excluded patients with previous history of radiation and also excluded patients already on calcium supplementation

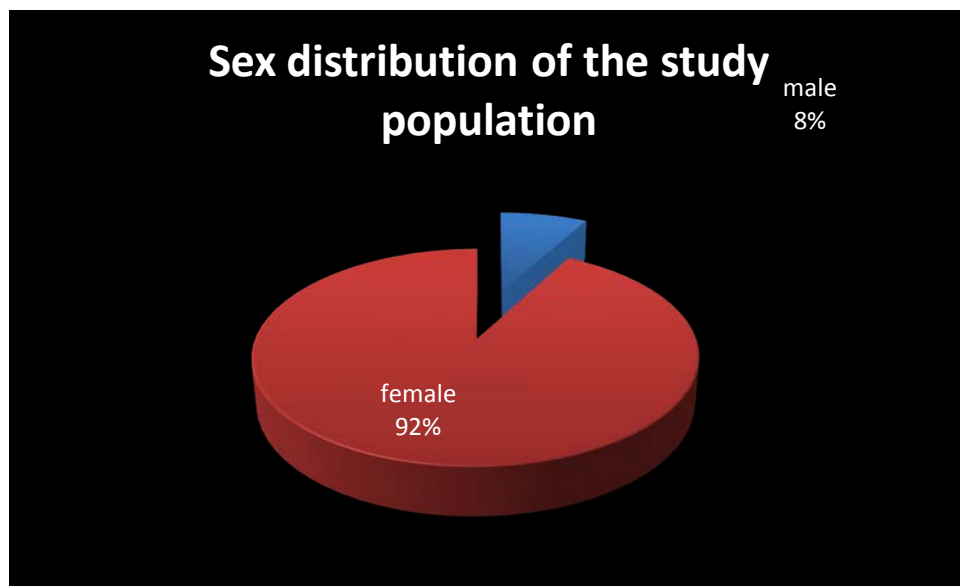
we followed all patients met our study criteria with serial estimation of serum calcium levels post operatively by day1, day 2 and day 4 and also records history about various presentations of postoperative hypocalcaemia like perioral numbness, carpopedal spasm, trousseau sign, chovestek's sign, ECG changes of hypocalcaemia and other neurological symptoms.

Description of study population:

sex of the study population

Sex of study population	No of patients
male	04
female	47
total	51

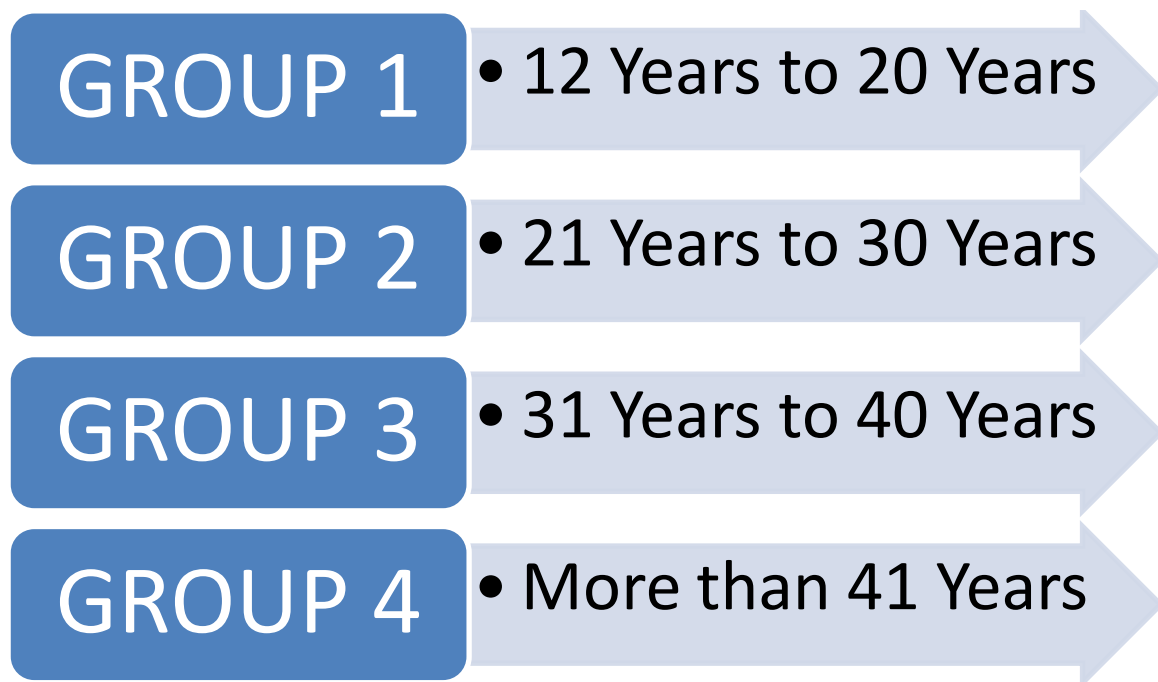
TABLE 1 SEX DISTRIBUTION OF THE STUDY POPULATION



In this study we followed 47 female patients and 4 male patients underwent total thyroidectomy.

Age distribution of study population

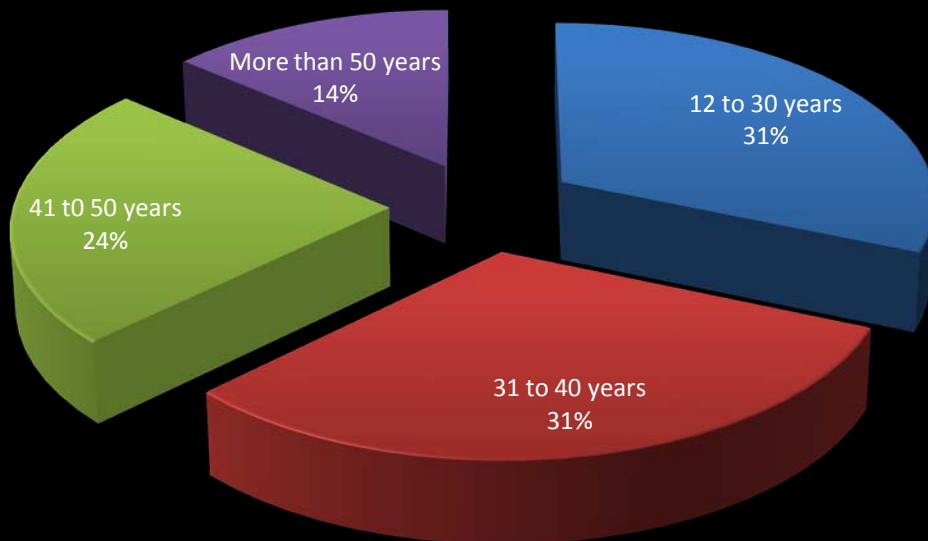
we categorise the study population according to the distribution of age in to Four groups



Age distribution of study population	No of patients
12 to 30 years	16
31 to 40 years	16
41 to 50 years	12
More than 50 years	07
total	51

TABLE 2 AGE DISTRIBUTION OF THE STUDY POPULATION

Age Distribution of the study population

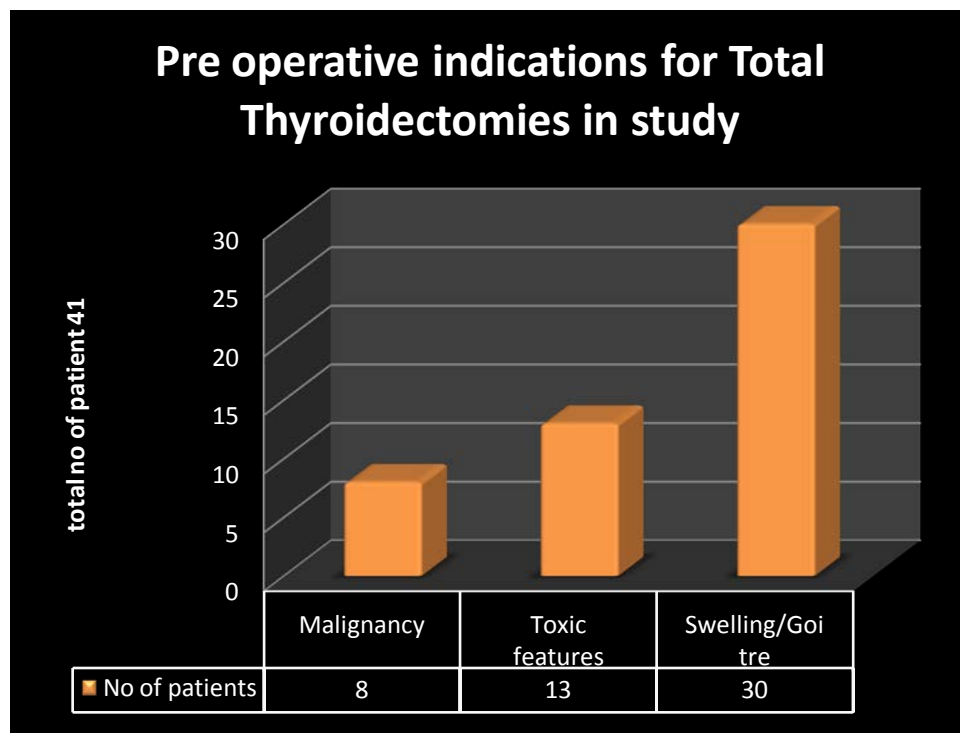


16 patients fall in the group1, and 16 patients fall in the group2, and 12 patients fall in the group3, and 7 patients fall in the group 4.

Preoperative indications for Total Thyroidectomy

Pre operative indications for Total Thyroidectomy	No of patients
Malignancy	08
Toxic features	13
Swelling/Goitre	30
Total	51

TABLE 3 PRE OPERATIVE INDICATIONS FOR TOTAL THYROIDECTOMY IN STUDY POPULATION



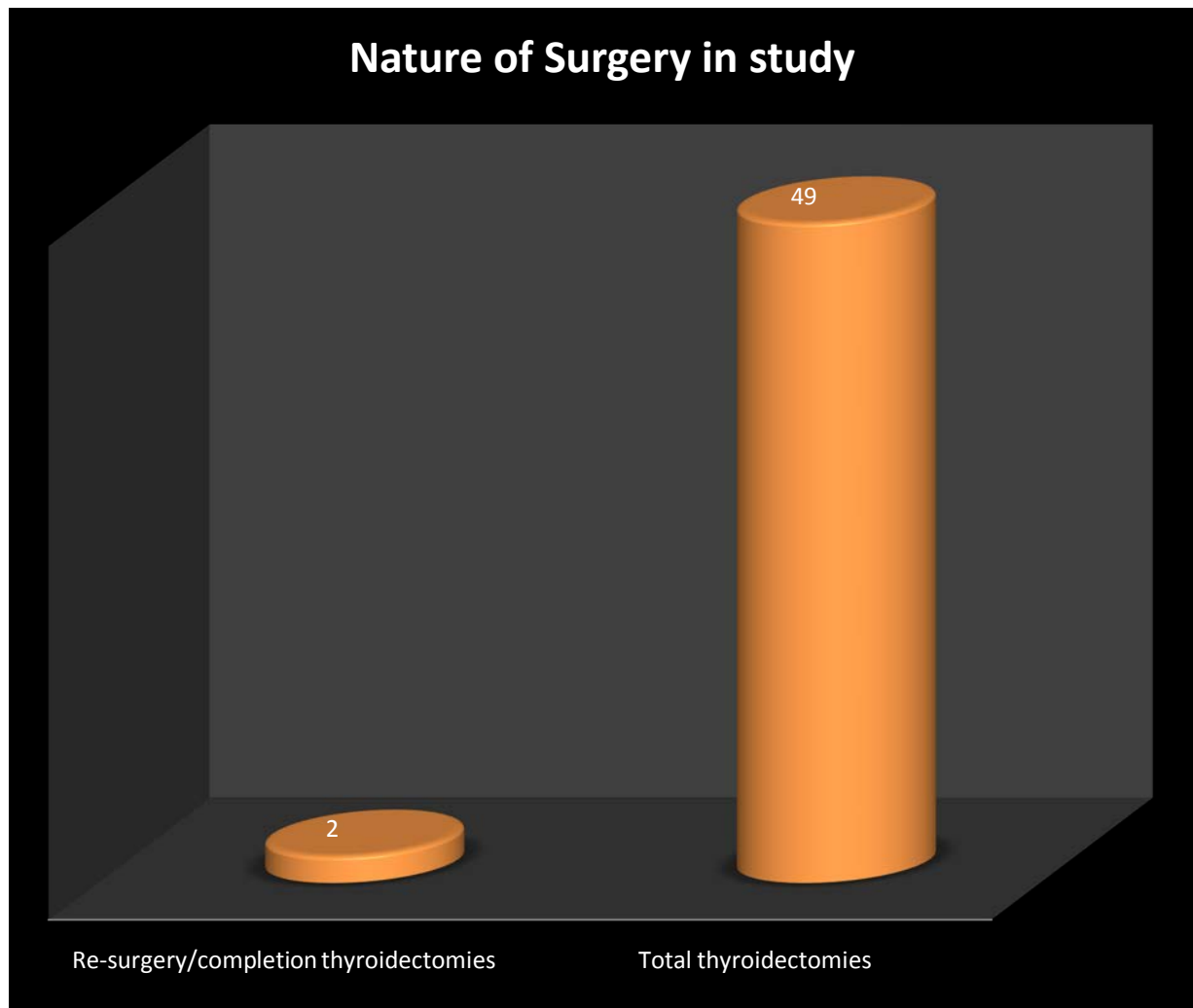
According to preoperative indications of thyroidectomy of these 51 patients, 8 patients are posted for thyroidectomy for suspecting malignancy, 13 patients are posted for thyroidectomy for toxic features after controlling

toxicity, 30 patients are posted for thyroidectomy for complaints like swelling or goitre or pressure effects.

Nature of surgery

Nature of surgery	No of patients
Re-surgery/completion thyroidectomies	02
Total thyroidectomies	49
Total	51

TABLE 4 NATURE OF SURGERY IN STUDY POPULATION



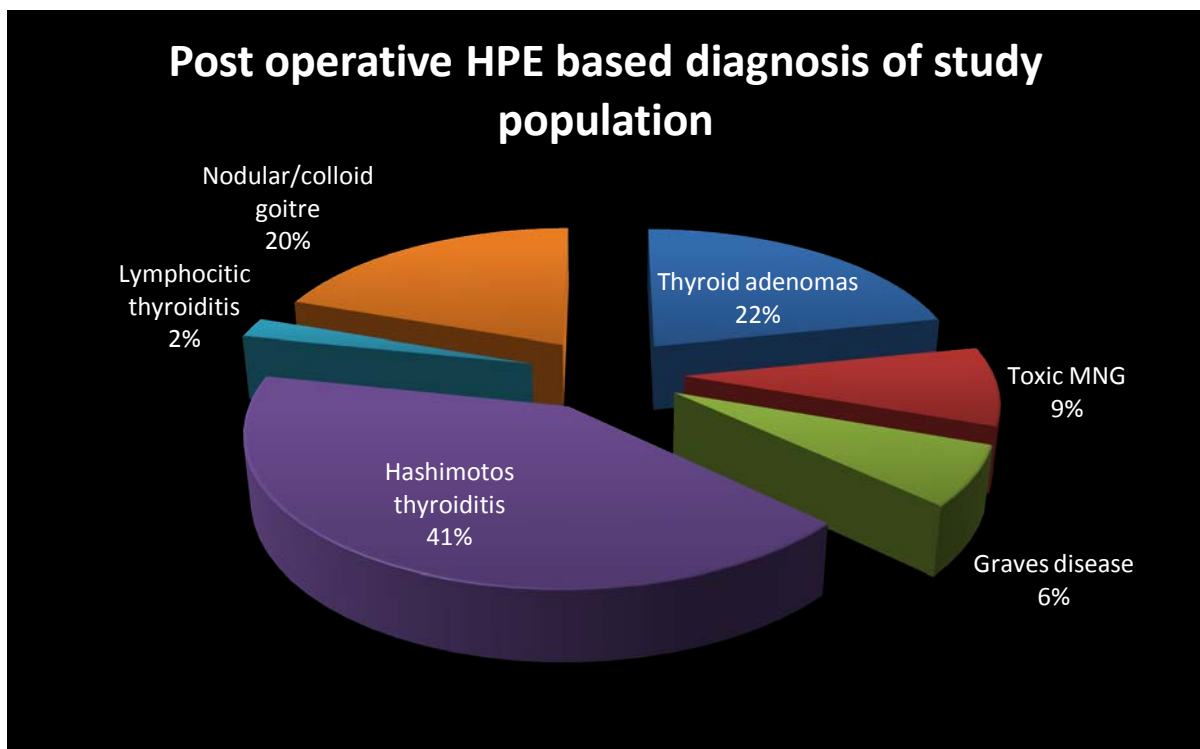
Of these 51 total thyroidectomies 2 patients are posted for completion thyroidectomy(resurgery) followed after previous hemithyroidectomy or subtotal thyroidectomy with preoperative benign FNAC report and posoperative histopathological finding shows papillary malignancy for one patient, and recurrent toxicity for another patient.

Postoperative final diagnosis based on HPE report

DIAGNOSIS	NO OF CASES studied
Thyroid malignancy	05
Thyroid adenomas	10
Toxic MNG	04
Graves disease	03
Hashimotos thyroiditis	19
Lymphocitic thyroiditis	01
Nodular/colloid goitre	09
Total no of cases	51

TABLE 5 POST OPERATIVE HPE BASED DIAGNOSIS OF STUDY

POPULATION



Of the 51 total thyroidectomised patients, postoperative follow up shows the following HPE reports.

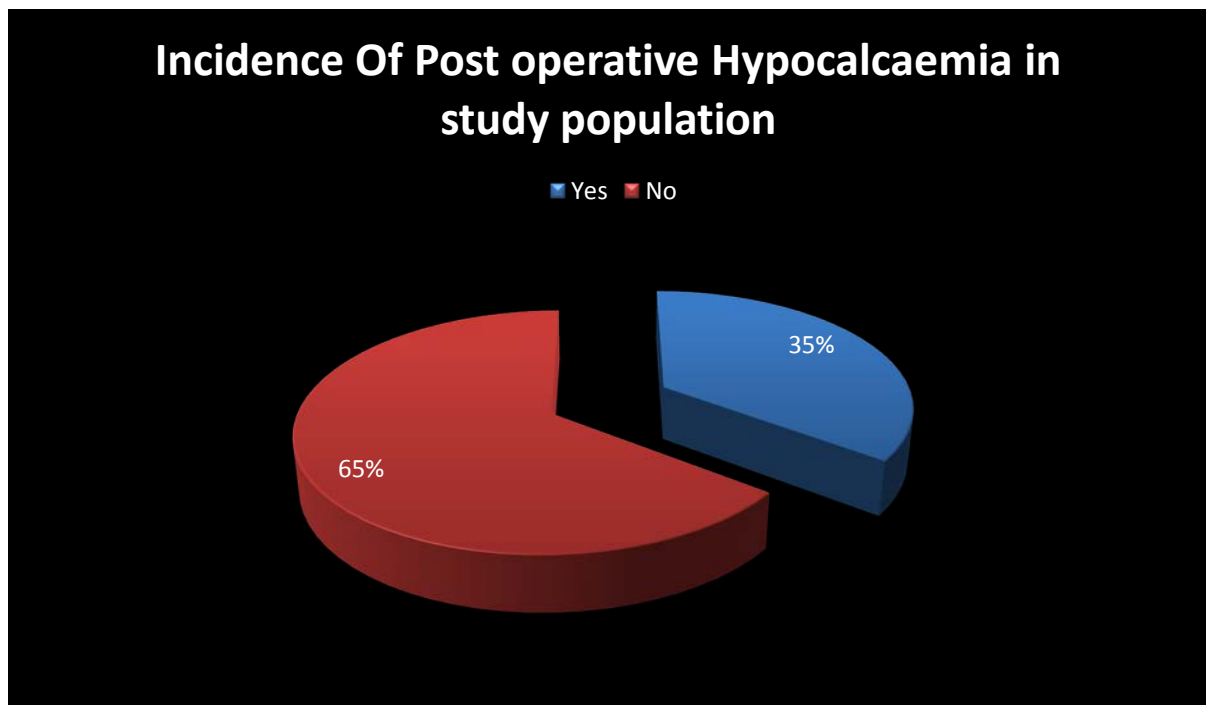
5 patients underwent total thyroidectomy shows Papillary thyroid carcinoma in their specimen, 10 patients showing thyroid adenoma, 4 patients HPE report reveals toxic multinodular goitre and 3 patients specimen shows graves disease. Hashimotos thyroiditis reported in post thyroidectomy specimens of 19 patients and lymphocytic thyroiditis. in 1 patient and 9 patients with nodular or colloid goitre.

Post Thyroidectomy Hypocalcemia in the study population

In our study period we documented 18 patients out of 51 patients of study population had experienced signs and symptoms of hypocalcemia in their post operative period.

Post operative hypocalcaemia in study	No of patients	Percentage
Yes	18	35%
No	33	65%

TABLE 6 INCIDENCE OF POST THYROIDECTOMY HYPOCALCAEMIA IN STUDY POPULATION

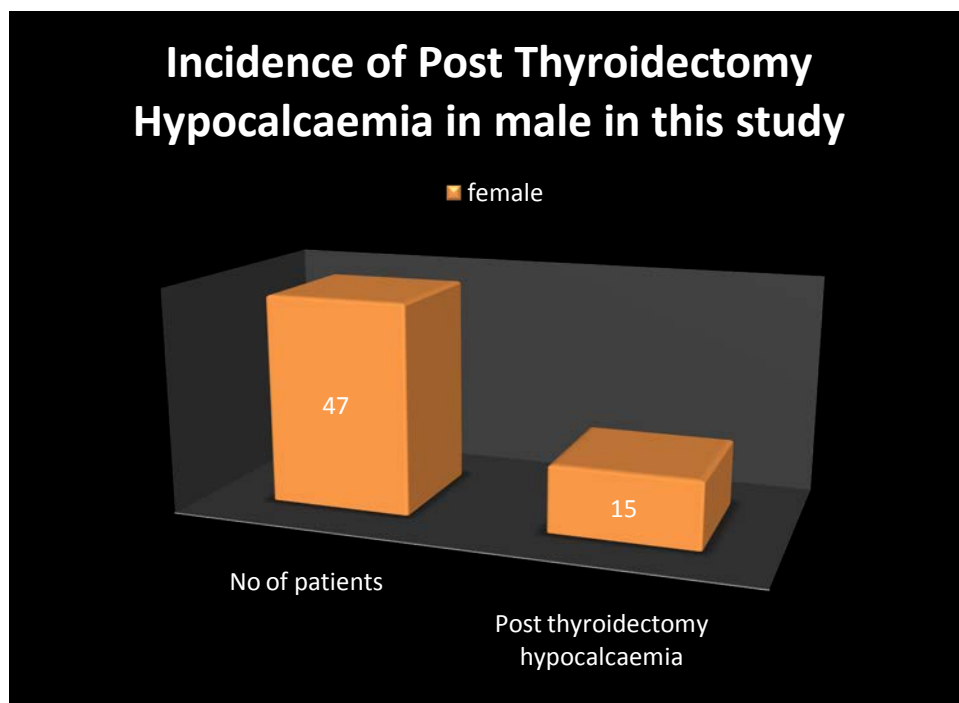


It denotes approximately 35% of study population experienced hypocalcemia in their post operative period.

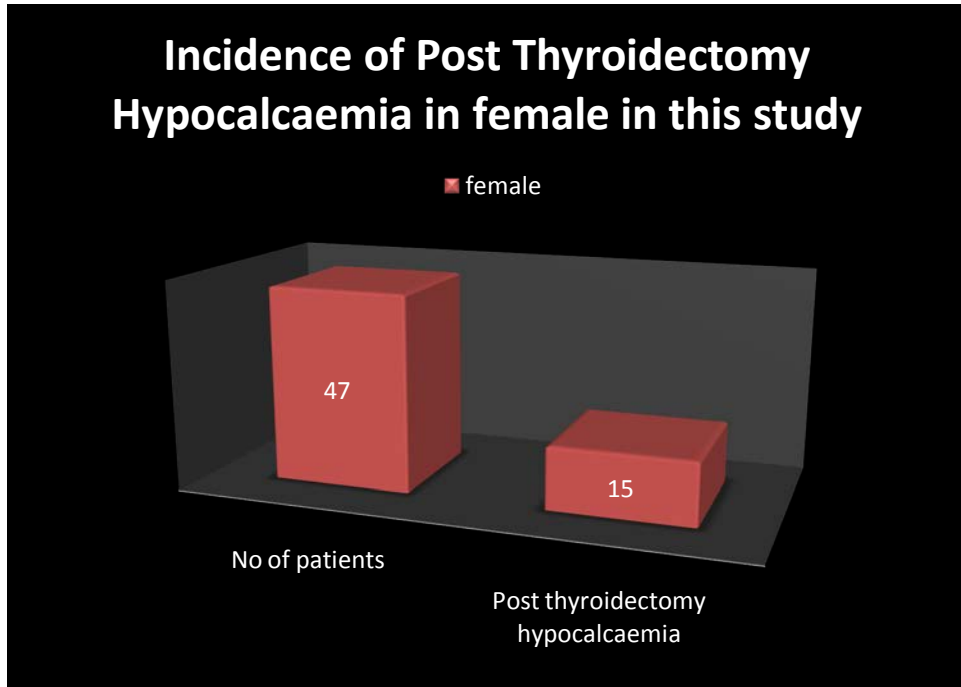
Sex of study population	No of patients	Post thyroidectomy hypocalcaemia
male	04	03
female	47	15

TABLE 7 INCIDENCE OF POST THYROIDECTOMY HYPOCALCAEMIA IN RELATION TO SEX IN STUDY POPULATION

Of these 3 males out of 4 male patients experienced hypocalcaemia in their post operative period, this approximates 75%.



Out of 47 female patients 15 patients shows signs and symptoms of hypocalcemia, this approximates 32%.

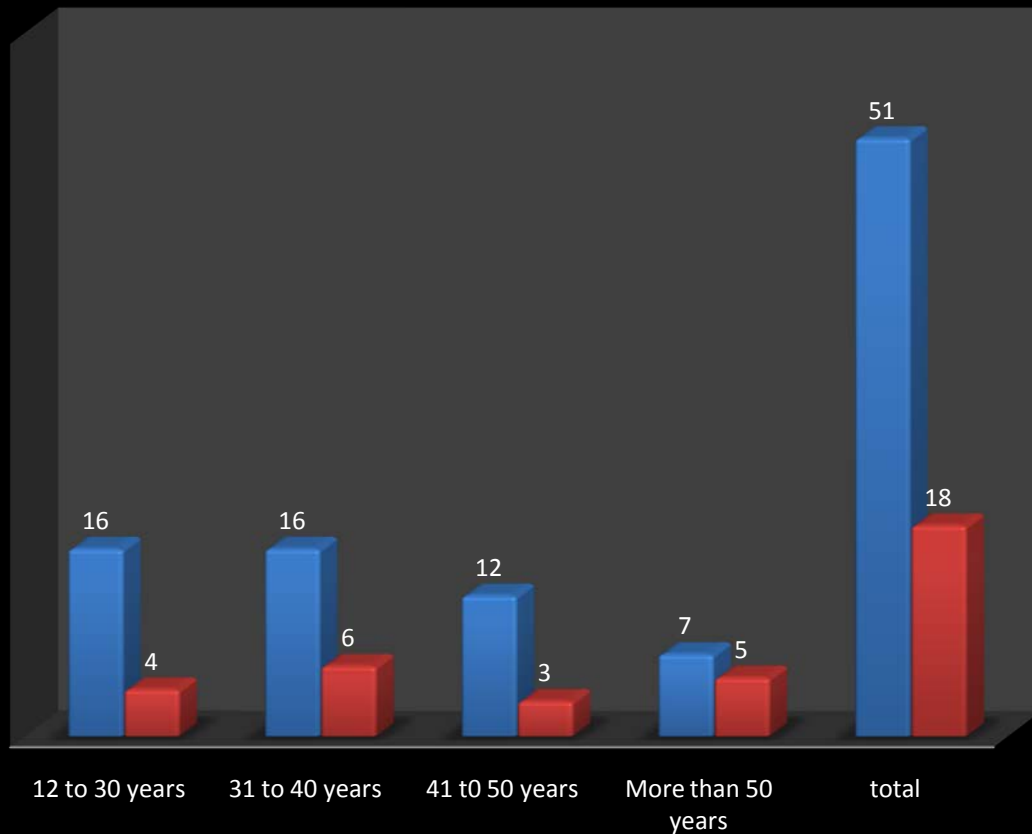


Age distribution of study population	No of patients	Post thyroidectomy hypocalcaemia
12 to 30 years	16	4
31 to 40 years	16	6
41 to 50 years	12	3
More than 50 years	07	5
total	51	18

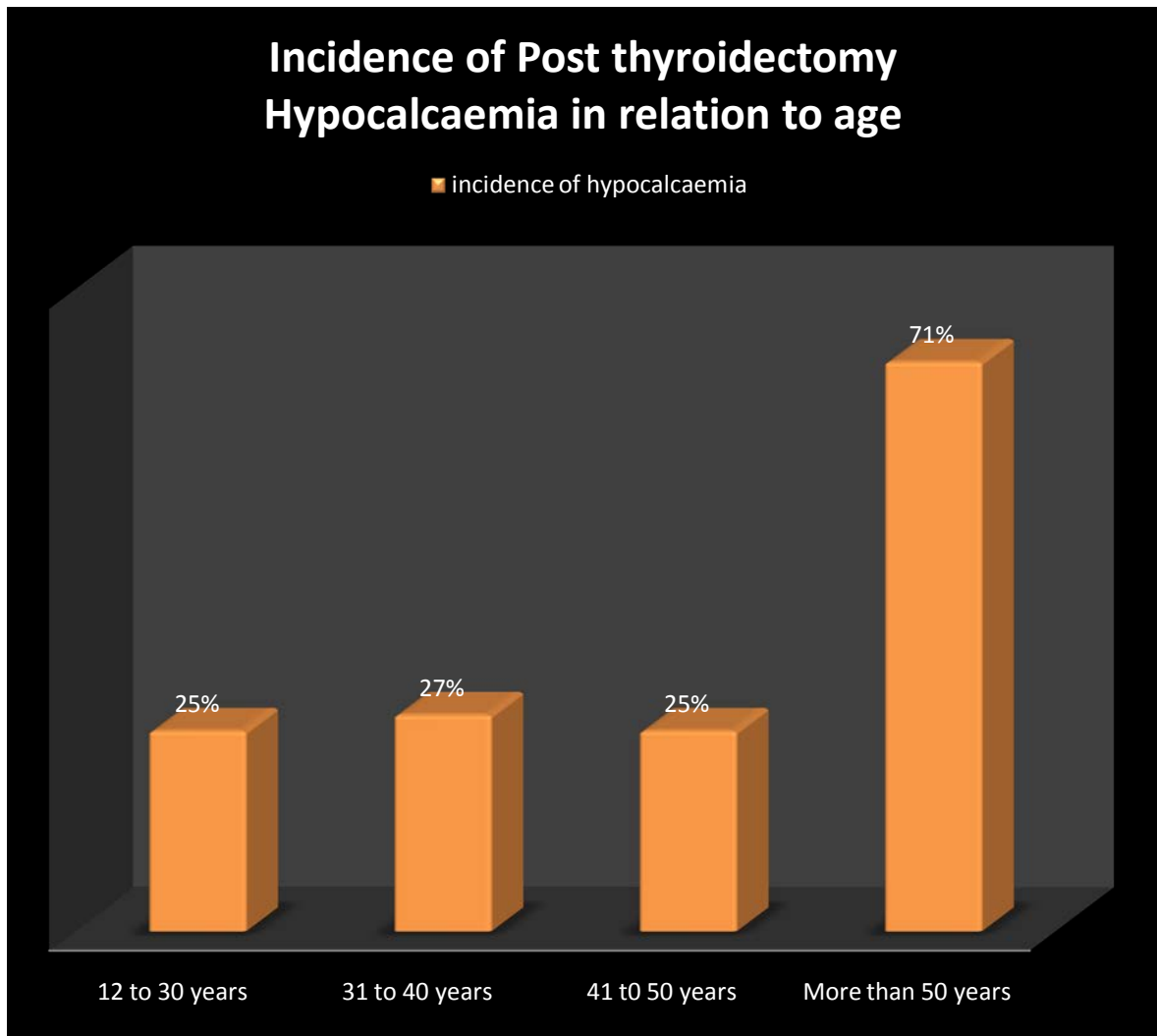
**TABLE 8 INCIDENCE OF POST THYROIDECTOMY HYPOCALCAEMIA
IN RELATION TO AGE IN STUDY POPULATION**

Incidence of Post Thyroidectomy Hypocalcaemia in relation to age

■ No of patients ■ Post thyroidectomy hypocalcaemia



According to age distribution 4 patients in the age group of 12 to 30 years and 6 patients in the age group of 31 to 40 years, and 3 patients in the age group of 41 to 50 years and 5 patients in the age group of more than 50 years are affected by post operative hypocalcaemia.



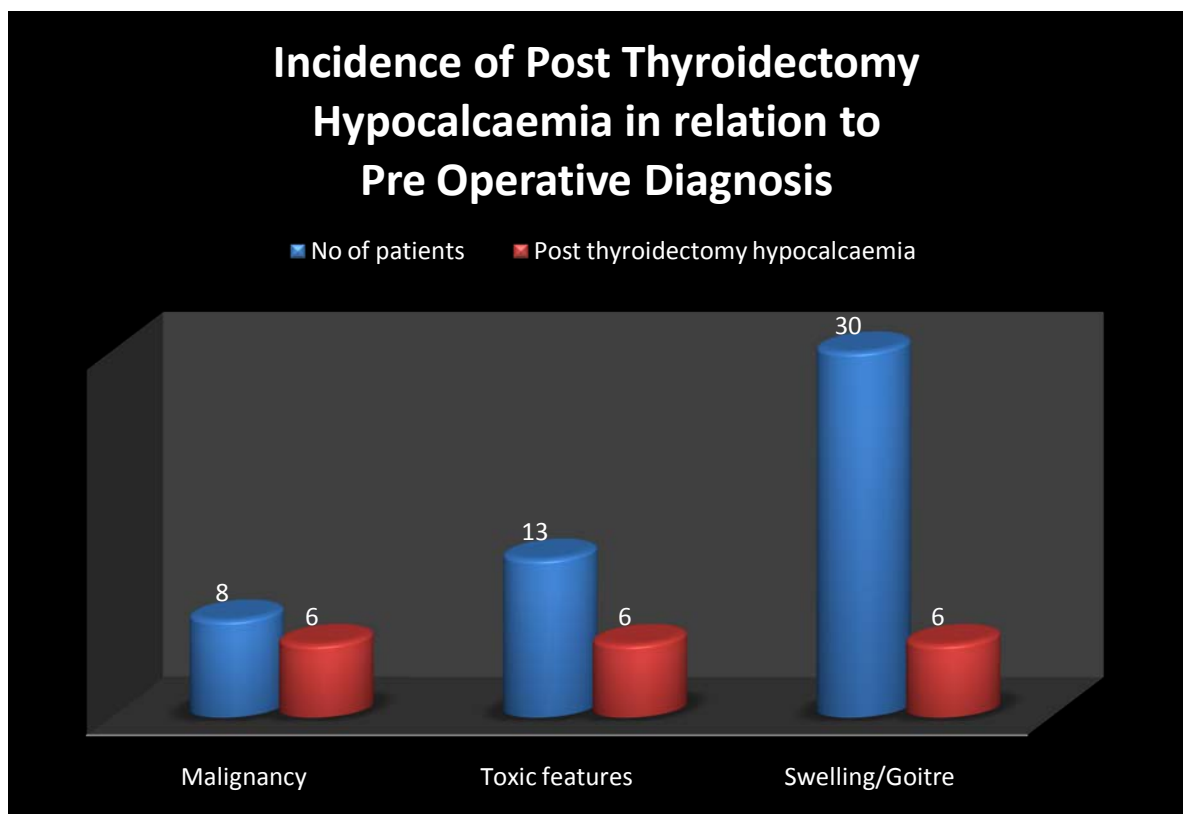
25 % of 12 to 30 years patients experienced post operative hypocalcaemia, 27% of 31 to 40 years experienced hypocalcaemia, and 25 % of 41 to 50 years experienced hypocalcaemia and 71% of more than 50 years experienced post operative hypocalcaemia.

Patients underwent total thyroidectomy with pre operative diagnosis of malignancy experienced 75 % of postoperative hypocalcaemia and approximately 46% of patients with toxic features experienced postoperative

hypocalcaemia , only 20% of patients with swelling or goitre are reported with postoperative hypocalcaemia.

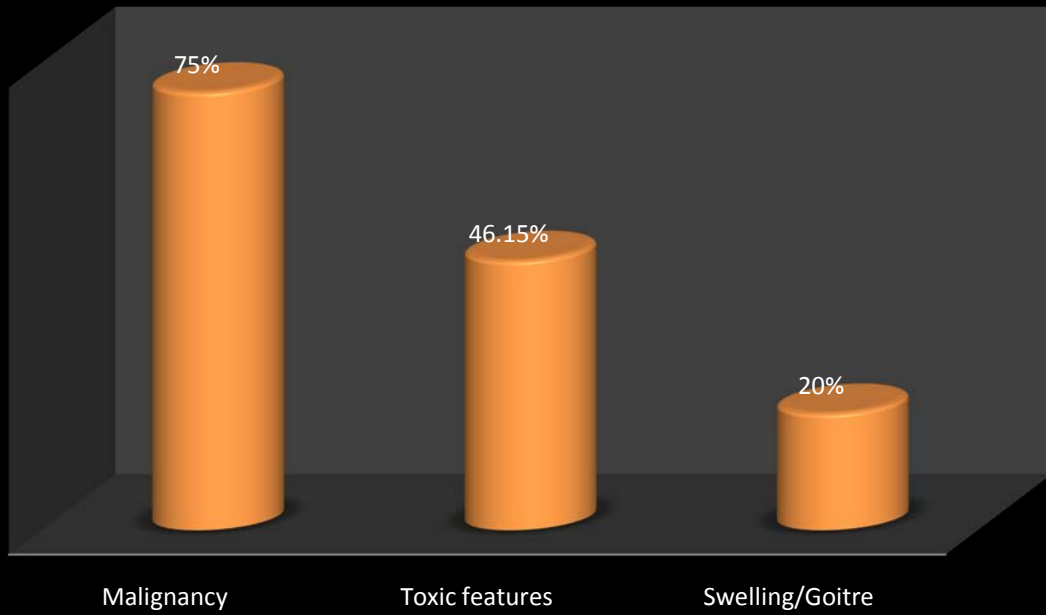
Pre operative indications for thyroidectomy	No of patients	Post thyroidectomy hypocalcaemia	percentage
Malignancy	08	6	75%
Toxic features	13	6	46.15%
Swelling/Goitre	30	6	20%

TABLE 9 INCIDENCE OF POST THYROIDECTOMY HYPOCALCAEMIA IN RELATION TO PRE OP INDICATIONS IN STUDY POPULATION



Post thyroidectomy HYPOCALCAEMIA

■ Post thyroidectomy HYPOCALCAEMIA

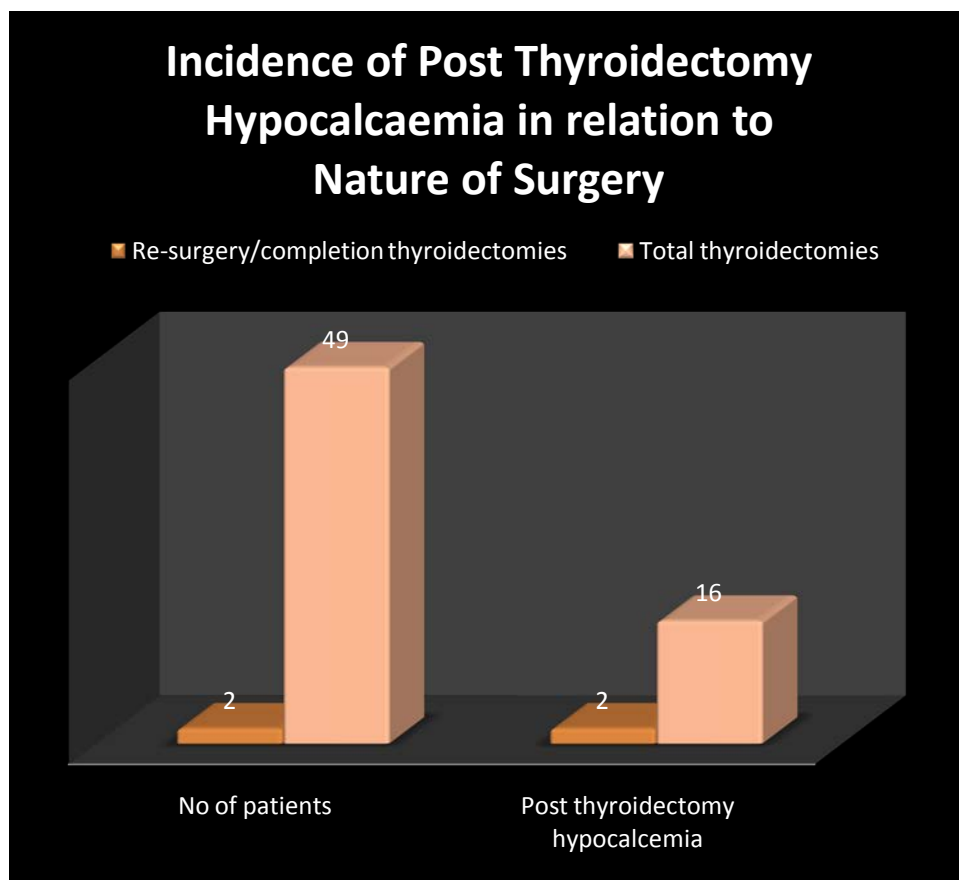


Patients who underwent resurgeries like completion thyroidectomy shows 100% incidence of post thyroidectomy hypocalcaemia.

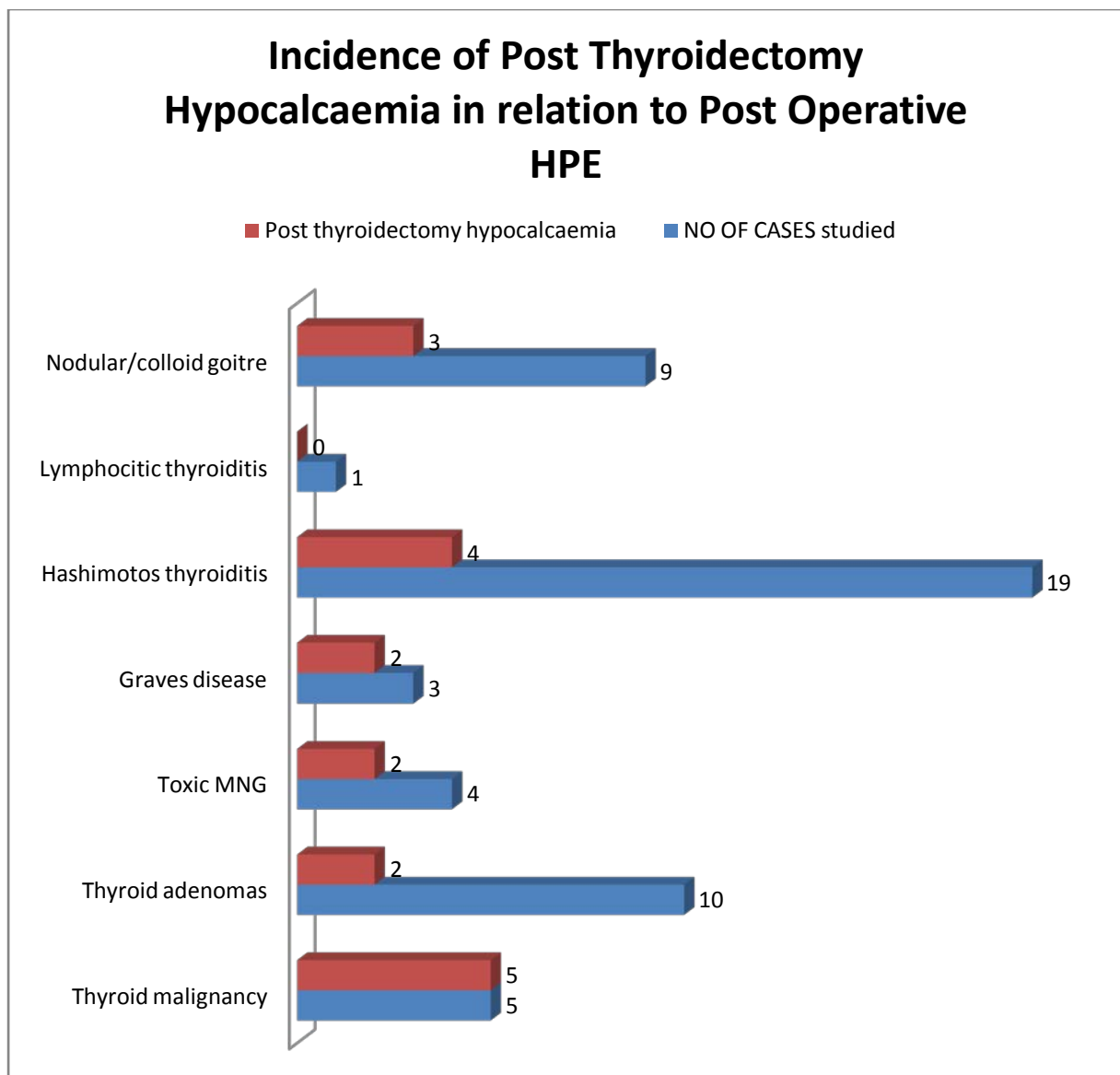
Nature of surgery	No of patients	Post thyroidectomy hypocalcemia	percentage
Re-surgery/completion thyroidectomies	02	02	100%
Total thyroidectomies	49	16	32.65%

TABLE 10 INCIDENCE OF POST THYROIDECTOMY

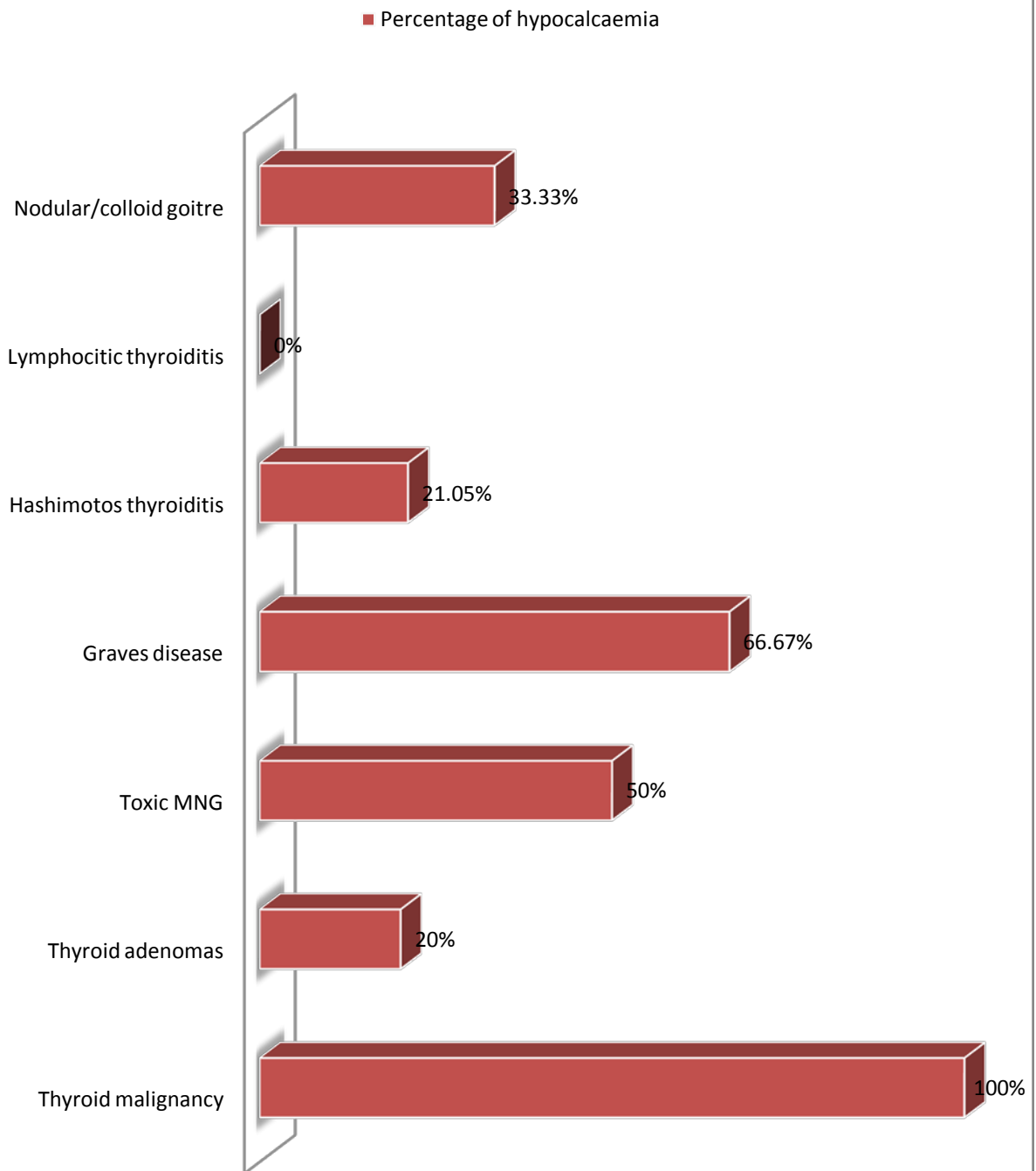
HYPOCALCAEMIA IN RELATION TO NATURE OF SURGERY



According to final postoperative HPE based diagnosis, the incidence of post thyroidectomy hypocalcaemia experience in our study was 5 out of 5 thyroid malignant patients experienced post thyroidectomy hypocalcaemia and 20 % of thyroid adenomas, and 50% of toxic multinodular goitre patients and 67% of graves disease patients and 21% of hashimotos thyroiditis patients and 33% of nodular or colloid goitre patients experienced post operative hypocalcaemia.



Incidence of Post Thyroidectomy Hypocalcaemia in relation to Post Op HPE



DIAGNOSIS	NO OF CASES studied	Post thyroidectomy hypocalcaemia	Percentage of hypocalcaemia
Thyroid malignancy	05	05	100%
Thyroid adenomas	10	02	20%
Toxic MNG	04	02	50%
Graves disease	03	02	66.67%
Hashimotos thyroiditis	19	04	21.05%
Lymphocitic thyroiditis	01	00	0%
Nodular/colloid goitre	09	03	33.33%

TABLE 11 INCIDENCE OF POST THYROIDECTOMY

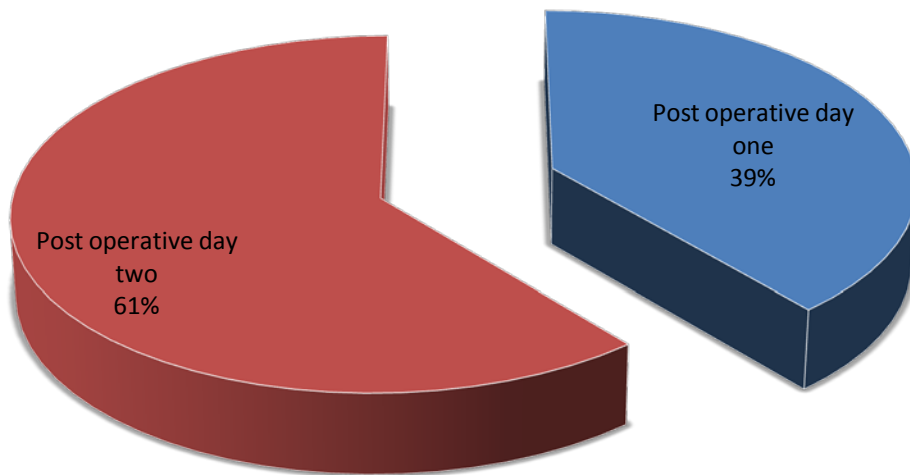
HYPOCALCAEMIA IN RELATION TO POST OPERATIVE HPE

In our study 18 patients out of 51 patients experienced postoperative hypocalcaemia, majority of them manifested the symptoms on postoperative day2 such that 61%, remaining patients presented on postoperative day1

Day of presentation of hypocalcemia	No of patients	Percentage
Post operative day one	7	38.89%
Post operative day two	11	61.11%

**TABLE 12 TIME OF PRESENTATION OF POST THYROIDECTOMY
HYPOCALCAEMIA IN STUDY POPULATION**

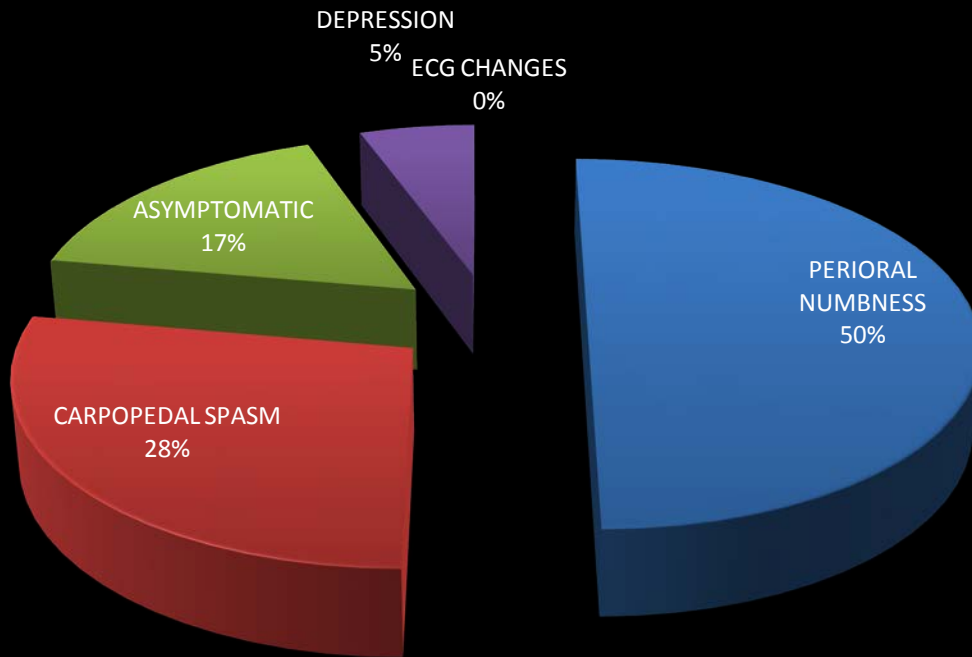
Time of Manifestation of Post operative hypocalcaemia in study



PRESENTING SYMPTOM OF POST THYROIDECTOMY HYPOCALCAEMIA	NO OF PATIENTS
PERIORAL NUMBNESS	9
CARPOPEDAL SPASM	5
ASYMPTOMATIC	3
DEPRESSION	1
ECG CHANGES	0

**TABLE 13 PRESENTING FEATURE OF POST THYROIDECTOMY
HYPOCALCAEMIA IN STUDY POPULATION**

Presenting feature of Post Thyroidectomy Hypocalcaemia in this study



Most common presenting feature in our study was perioral numbness.

About 50% patient's first complaint during hypocalcaemia is perioral numbness.

Discussion

Thyroid diseases are more common in females, as in many literature. Our study population also reflects the same .male 8% and female contributes 92% of thyroid disorders(22).

In our study, results show that thyroid diseases that may need thyroid surgeries are frequent in the middle age group between 30 to 40years.

But the post thyroidectomy hypocalcaemia incidence is more common in the advancing age group i.e more than 50 years. A study conducted by Erbil Y et al named the impact of age , vit D level and incidental parathyroidectomy on postoperative hypocalcemia after total or near total thyroidectomy reveals that in advancing ages the level of vitD fall postoperatively increases tremendously . so the incidence 25 times greater for the patients of more than 50 years of age(26).

Benign diseases shows less incidence of post thyroidectomy hypocalcaemia than the malignant diseases, this attribute to the extensive surgical dissection performed in malignant disorders in order to obtain tumour clearance. In a study conducted by sokouti M et al, regarding the incidence of transient and permanent hypocalcemia after total thyroidectomy for thyroid cancer reveals higher incidence of hypocalcemia after total thyroidectomy in

malignant diseases of thyroid. The incidence increases more with surgeries combined with radical neck dissection(23).

The incidence of post thyroidectomy hypocalcaemia is more in the toxic thyroid diseases than non toxic diseases, this also attributes to the extensive surgical dissection in the toxic disorders in order to avoid recurrence of the disease

The same reason can explain the 100% incidence of post thyroidectomy hypocalcaemia in the resurgeries in our study, and in resurgeries some literatures postulates that extensive fibrosis can be a reason for vascular compromise that results in hypo parathyroidism.

Indications for total thyroidectomy in our study population shows majority of them are resected for thyroid mass or goitre (23).

In our study period we concentrated mainly on immediate postoperative hypocalcaemia and due to the poor compliance of patients permanent hypocalcaemia was not analysed.

Our study shows the incidence of postoperative hypocalcaemia was approximately 35%, In literature it was reported from 27% to 80%(23).

During the study period we did parathyroid autotransplantation for 4 patients who are found to be with accidental injury to the parathyroid glands

found on table and post thyroidectomy hypocalcaemia didn't manifest in that patients.

In a study conducted by Low and lam et al, where their team follow routine parathyroid auto transplantation incidence of hypocalcemia was less, patients presenting with hypocalcaemia are whom parathyroid auto transplantation was not done(25)

zendenius et al reported in his study that he did 100 case series with total thyroidectomy and parathyroid auto transplantation and concluded there was no permanent hypocalcaemia in his study group(26).

For prevention of post thyroidectomy hypocalcaemia many authors followed identification of parathyroid intraoperatively by various methods.some of them are Esselstyn CB used parathyroid blush on table, Silverberg used methylene blue staining of parathyroids, Ramao used iv methylene blue for identification of parathyroids, Sofola et al used polarised spectral imaging, Pederson et al used portable gamma camera with sestamibi radio tracer, Yao et al touching print preparations , still the studies are going on(23,24)

Conclusion & Summary

From our study we concluded that post thyroidectomy transient hypocalcaemia is a frequent complication which can be prevented with preoperative preparation of patients with extreme caution and peroperative meticulous dissection, prompt identification of parathyroids and postoperative frequent monitoring of serum calcium and early treatment can prevent significant morbidity.

Parathyroid autotransplantation should be considered in accidental injury to parathyroids during the procedure.

Resurgeries of thyroid should be done with extreme caution.

For treating patients more than 50 years surgeon should careful in preventing hypocalcaemia.

While doing surgeries for malignant and toxic lesions for thyroid, the surgeon should consider total thyroidectomy as not only a thyroid removing surgery but also a surgery done to preserve parathyroids.

For small scale hospitals serial monitoring of serum calcium levels preoperatively and postoperatively combined with careful monitoring of signs and symptoms of hypocalcemia is a efficient and cost effective tool to detect post thyroidectomy hypocalcemia.

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ANNEXURES

Proforma

Name

Age

Sex

Ip/op number

Complaints

Preoperative FNAC

TFT

PREOPERATIVE SERUM CALCIUM

RBS

Blood urea

Serum Creatinine

LFT

USG NECK

CXR PA VIEW

X RAY NECK AP LATERAL

INDICATION FOR SURGERY

SURGERY DONE

SURGICAL NOTES

PTAT Y/N

POST OPERATIVE SERUM CALCIUM

POD-1-

POD-2-

POD-4-

PERIORAL NUMBNESS

CARPOPEDAL SPASM

MOOD CHANGES

ECG CHANGES

TREATED WITH

S.NO	PATIENT NAME	AGE	SEX	IP NO	PRE OP INDICATION	PROCEDURE DONE	DATE OF SURGERY	POST OP HPE	PRE OP SERUM CALCIUM IN mg/dl	SERUM CALCIUM IN 1ST POD	SERUM CALCIUM IN 2ND POD	SERUM CALCIUM IN POD 4	PRENTING SYMPTOM	TEATMENT
1	SEETHALKASH MI	65	FEMALE	40823	RECURRENT PAPILLARY CARCINOMA	COMPLETION THYROIDECTOMY	02-08-2014	PAPILLARY CARCINOMA	8.5	7.5	7.8	8.5	PERI ORAL NUMBNESS	ORAL
2	CHANDRA	70	FEMALE	48816	MNG	TOTAL THYROIDECTOMY	02-08-2014	NODULAR GOITRE WITH CYSTIC DEGENERATION	9	8.5	8.5	8.5		
3	MUTHULAKS HMI	37	FEMALE	40696	MNG	TOTAL THYROIDECTOMY	02-08-2014	GRAVES DISEASE	8.7	7	7.5	8.4	CARPOPEDAL SPASM	IV
4	RAMATHAL	57	FEMALE	42001	PAPPILARY CARCINOMA	TOTAL THYROIDECTOMY	05-08-2014	PAPILLARY CARCINOMA	9	8.5	8	9	ASYMPTOMATIC	ORAL
5	MARISELVI	28	FEMALE	43421	PAPPILARY CARCINOMA	TOTAL THYROIDECTOMY	09-08-2014	FOLLICULAR ADENOMA	9	9	8.5	8.5		
6	VALLI	30	FEMALE	43521	MNG	TOTAL THYROIDECTOMY	12-08-2014	ADENOMATOUS HYPERPLASIA	8.8	8.5	9	9		
7	MARIAMMAL	27	FEMALE	44795	PAPPILARY CARCINOMA	TOTAL THYROIDECTOMY	15-08-2014	PAPILLARY CARCINOMA	8.8	8.5	7.5	8.5	PERI ORAL NUMBNESS	ORAL
8	LAKSHMI	37	FEMALE	47264	DIFFUSE GOITRE	TOTAL THYROIDECTOMY	02-09-2014	HASHIMOTOS THROIDITIS	9.5	9	9	9		
9	BASIRA BEGAM	28	FEMALE	47679	MNG	TOTAL THYROIDECTOMY	02-09-2014	HASHIMOTOS THROIDITIS	9.5	9.5	9	9		
10	MURUGAMM	42	FEMALE	48856	TOXIC MNG	TOTAL	09-09-	HASHIMOTOS	8.5	9	7.8	8.8	PERI ORAL	ORAL

	AL					THYROIDECTOMY	2014	THROIDITIS					NUMBNESS	
11	CHITRA	42	FEMALE	50353	MNG	TOTAL THYROIDECTOMY	13-09-2014	ADENOMATOUS HYPERPLASIA	9	9	8.5	9		
12	GURUVAMMAL	50	FEMALE	47593	PAPPILARY CARCINOMA	TOTAL THYROIDECTOMY	20-09-2014	PAPILLARY CARCINOMA	9	8.5	8	9	ASYMPTOMATIC	ORAL
13	FATHIMA	40	FEMALE	50394	PAPPILARY CARCINOMA	TOTAL THYROIDECTOMY	23-09-2014	ADENOMATOUS HYPERPLASIA	8.5	8.5	8.5	9		
14	SELVI	35	FEMALE	55614	MNG	TOTAL THYROIDECTOMY	11-10-2014	HASHIMOTOS THROIDITIS	9.5	9	8.5	9		
15	LATHA	30	FEMALE	54384	TOXIC MNG	TOTAL THYROIDECTOMY	25-10-2014	MICROFOLLICULAR ADENOMA	10	9	9	9		
16	MUPIDATHI	35	FEMALE	54407	RECURRENT TOXIC MNG	COMPLETION THYROIDECTOMY	28-10-2014	HASHIMOTOS THROIDITIS	9	7.5	7.8	8.5	CARPOPEDAL SPASM	IV
17	SARASWATHI	44	FEMALE	59674	TOXIC GOITRE	TOTAL THYROIDECTOMY	08-11-2014	LYMPHOCYTIC THYROIDITIS	10	9.5	9	8.5		
18	SAMUTHIRAM	39	FEMALE	61010	MNG	TOTAL THYROIDECTOMY	11-11-2014	HASHIMOTOS THROIDITIS	9	9	9	8.5		
19	MAHALAKSHMI	28	FEMALE	64013	MNG	TOTAL THYROIDECTOMY	02-12-2014	HASHIMOTOS THROIDITIS	9	8.5	9	8.8		
20	SABURAAL BEEVI	50	FEMALE	67094	MNG	TOTAL THYROIDECTOMY	13-12-2014	HASHIMOTOS THROIDITIS	8.5	8.5	8.8	8.8		
21	RAMA SUBRAMANIAM	55	MALE	62131	PAPPILARY CARCINOMA	TOTAL THYROIDECTOMY	16-12-2014	PAPILLARY CARCINOMA	8.5	7.5	8	8.5	PERI ORAL NUMBNESS	ORAL

22	RAJAKUMARI	30	FEMALE	72943	DIFFUSE GOITRE	TOTAL THYROIDECTOMY	03-01-2015	HASHIMOTOS THROIDITIS	8.8	8.5	9	9		
23	MALLIKA	24	FEMALE	72396	DIFFUSE GOITRE	TOTAL THYROIDECTOMY	06-01-2015	HASHIMOTOS THROIDITIS	9.2	9	9	9		
24	MARIAMMAL	30	FEMALE	4120	MNG	TOTAL THYROIDECTOMY	27-01-2015	COLLOID GOITRE	9	9	8.8	9		
25	MUTHULAKSHMI	49	FEMALE	10229	MNG	TOTAL THYROIDECTOMY	28-02-2015	COLLOID GOITRE	9	8.5	7.8	8.8	PERI ORAL NUMBNESS	ORAL
26	PETCHIAMMAL	48	FEMALE	11817	MNG	TOTAL THYROIDECTOMY	07-03-2015	COLLOID GOITRE	9.5	9.5	9	9		
27	SHANMUGATHAI	41	FEMALE	11793	MNG	TOTAL THYROIDECTOMY	07-03-2015	MICROFOLLICULAR ADENOMA	9.6	9	9	9		
28	MAHARASI	26	FEMALE	13320	PRIMARY THYROTOXICOSIS	TOTAL THYROIDECTOMY	10-03-2015	COLLOID GOITRE	9.8	8.8	8	9	ASYMPTOMATIC	ORAL
29	JEYANTHI	30	FEMALE	1210	DIFFUSE GOITRE	TOTAL THYROIDECTOMY	17-03-2015	HASHIMOTOS THROIDITIS	8.8	8.5	8.8	9		
30	SHANMUGATHAI	55	FEMALE	1311	DIFFUSE GOITRE	TOTAL THYROIDECTOMY	17/03/2015\	COLLOID GOITRE	8.5	8.5	8.5	8.5		
31	ULAGAMMAL	37	FEMALE	14877	MNG	TOTAL THYROIDECTOMY	21-03-2015	COLLOID GOITRE	8.2	8.5	8.5	8.5		
32	AVUDAYAMMAL	60	FEMALE	14849	MNG	TOTAL THYROIDECTOMY	21-03-2015	HASHIMOTOS THROIDITIS	8.4	8.5	8.5	9		
33	ATHISAYAMANI	40	FEMALE	16304	MNG	TOTAL THYROIDECTOMY	28-03-2015	HASHIMOTOS THROIDITIS	9	9	8.8	9		

						MY								
34	THEIVANAI	65	FEMALE	21871	MNG	TOTAL THYROIDECTOMY	12-05-2015	COLLOID GOITRE	8.5	7	7.8	8.5	CARPOPEDAL SPASM	IV
35	MARIAMMAL	35	FEMALE	26645	TOXIC GOITRE	TOTAL THYROIDECTOMY	26-05-2015	TOXIC MNG	9	7	7.5	8	CARPOPEDAL SPASM	IV
36	SUGUNA	31	FEMALE	26644	SOLITARY THYROID NODULE LEFT	TOTAL THYROIDECTOMY	16-05-2015	FOLLICULAR ADENOMA	9.5	8.5	7.2	8.5	PERI ORAL NUMBNESS	ORAL
37	MARAMANI	35	FEMALE	26646	TOXIC MNG	TOTAL THYROIDECTOMY	23-05-2015	TOXIC MNG	10	10	9	9		
38	KOKILA	26	FEMALE	28140	DIFFUSE GOITRE	TOTAL THYROIDECTOMY	16-05-2015	HASHIMOTOS THROIDITIS	10.5	10	9.5	9		
39	RAMALAKSHMI	40	FEMALE	26703	TOXIC MNG	TOTAL THYROIDECTOMY	30-05-2015	HASHIMOTOS THROIDITIS	9	9	9	8.5		
40	LAKSHMI	46	FEMALE	31331	MNG	TOTAL THYROIDECTOMY	02-06-2015	HASHIMOTOS THROIDITIS	9.5	9	7.5	8.5	CARPOPEDAL SPASM	IV
41	GRACE SALOMIA	34	FEMALE	34149	MNG	TOTAL THYROIDECTOMY	09-06-2015	HASHIMOTOS THROIDITIS	8.5	8.5	8.8	8.5		
42	KALA	48	FEMALE	36083	TOXIC MNG	TOTAL THYROIDECTOMY	23-06-2015	TOXIC MNG	8.8	8.5	8.5	8.5		
43	ARUL MOZHI	39	FEMALE	36098	MNG	TOTAL THYROIDECTOMY	27-06-2015	HASHIMOTOS THROIDITIS	9	8.5	9	9		
44	MUTHU SELVI	30	FEMALE	37651	MNG	TOTAL THYROIDECTOMY	30-06-2015	HASHIMOTOS THROIDITIS	9.5	9	8	9.5	PERI ORAL NUMBNESS	ORAL
45	ANBAZHAGI	30	FEMALE	37581	MNG	TOTAL	30-06-	MICROFOLLICU	10	10	9.5	9.5		

						THYROIDECTOMY	2015	LAR ADENOMA						
46	BASKAR	29	MALE	34511	PRIMARY THYROTOXICOSIS	TOTAL THYROIDECTOMY	30-06-2015	FOLLICULAR ADENOMA	10.5	8.5	7.8	8.5	PERI ORAL NUMBNESS	ORAL
47	MARIASELVAM	39	MALE	36078	TOXIC MNG	TOTAL THYROIDECTOMY	14-07-2015	TOXIC MNG	9	7.5	8	8.5	DEPRESSION	IV
48	RAJENDRA PRASAD	22	MALE	33991	PRIMARY THYROTOXICOSIS	TOTAL THYROIDECTOMY	14-07-2015	ADENOMATOUS HYPERPLASIA	9	9	9	8.5		
49	MARIAMMAL	37	FEMALE	40486	PRIMARY THYROTOXICOSIS	TOTAL THYROIDECTOMY	14-07-2015	GRAVES DISEASE	9.5	9	9	9		
50	THANGAM	36	FEMALE	42030	MNG	TOTAL THYROIDECTOMY	21-07-2015	COLLOID GOITRE	8.5	8.5	9	9.2		
51	PARVATHY	50	FEMALE	43620	MNG	TOTAL THYROIDECTOMY	25-07-2015	COLLOID GOITRE	8.8	8.5	7.8	8.8	PERI ORAL NUMBNESS	ORAL

நோயாளிகளுக்கு அறிவிப்பு மற்றும் ஒப்புதல் படிவம்
மருத்துவ ஆய்வில் பங்கேற்பதற்கு

ஆய்வு செய்யப்படும் தலைப்பு :
பங்கு பெறுபவரின் பெயர் :
பங்கு பெறுபவரின் வயது :

		பங்கு பெறுவர் இதனை ✓ குறிக்கவும்
1	நான் மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் நான் படித்து புரிந்து கொண்டேன். என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டுள்ளது என அறிந்து கொண்டேன்	<input type="checkbox"/>
2	நான் இவ்வாய்வில் தன்னிச்சையாக தான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும், எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.	<input type="checkbox"/>
3	இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்து மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.	<input type="checkbox"/>
4	இந்த ஆய்வில் மூலம் கிடைக்கும் தகவலையோ, முடிவையோ பயன்படுத்திக் கொள்ள மறுக்க மாட்டேன்.	<input type="checkbox"/>
5	இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக் கொள்கிறேன். எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன், ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ, அல்லது எதிர்பாராத, வழக்கத்திற்கு மாறான நோய்குறி தென்பட்டாலோ உடனே இதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன்.	<input type="checkbox"/>

பங்கேற்பவரின் கையொப்பம் / இடம்..... தேதி.....

கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்.....

ஆய்வாளரின் கையொப்பம் / இடம் தேதி.....

ஆய்வாளரின் பெயர்.....

மையம்

கல்வியறிவு இல்லாதவற்கு (கைரேகை வைத்தவர்களுக்கு) இது அவசியம் தேவை

சாட்சியின் கையொப்பம் / இடம் தேதி

பெயர் மற்றும் விலாசம்