"A CLINICAL STUDY OF HYPOCALCEMIA FOLLOWING TOTAL THYROIDECTOMY IN TERTIARY CARE CENTRE"

A DISSERTATION SUBMITTED TO THE TAMILNADU

DR MGR MEDICAL UNIVERSITY

CHENNAI

In partial fulfillment of the requirement for the degree of

M.S. (GENERAL SURGERY)

BRANCH – I

Register No: 221711362

DEPARTMENT OF GENERAL SURGERY

TIRUNELVELI MEDICAL COLLEGE

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DR. S.M. KANNAN M. S, M.Ch (Uro)
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PROTOCOL TITLE: CLINICAL STUDY OF HYPOCALCEMIA FOLLOWING TOTAL THYROIDECTOMY IN THE TERTIARY CARE CENTER.
PRINCIPAL INVESTIGATOR: PG STUDENT
DESIGNATION OF PRINCIPAL INVESTIGATOR: DR.PARTHIPAN.G. MBBS.,
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Dear Dr.PARTHIPAN.G., MBBS, The Tirunelveli Medical College Institutional Ethics Committee (TIREC) reviewed and discussed your application during The IEC meeting held on 01.09.2017.

THE FOLLOWING DOCUMENTS WERE REVIEWED AND APPROVED

1.	TIREC Application Form	☐
2.	Study Protocol	☐
3.	Department Research Committee Approval	☐
4.	Patient Information Document and Consent Form in English and Vernacular Language	☐
5.	Investigator's Brochure	☐
6.	Proposed Methods for Patient Accrual Proposed	☐
7.	Curriculum Vitae of The Principal Investigator	☐
8.	Insurance /Compensation Policy	☐
9.	Investigator's Agreement with Sponsor	☐
10.	Investigator's Undertaking	☐
11.	DCGI/DGFT approval	☐
12.	Clinical Trial Agreement (CTA)	☐
13.	Memorandum of Understanding (MOU)/Material Transfer Agreement (MTA)	☐
14.	Clinical Trials Registry-India (CTRI) Registration	☐

THE PROTOCOL IS APPROVED IN ITS PRESENTED FORM ON THE FOLLOWING CONDITIONS

1. The approval is valid for a period of 2 year/s or duration of project whichever is later
2. The date of commencement of study should be informed
3. A written request should be submitted 3weeks before for renewal / extension of the validity
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6. At the time of PI's retirement/leaving the institute, the study responsibility should be transferred to a person cleared by HOD
7. The PI should report to TIREC within 7 days of the occurrence of the SAE. If the SAE is Death, the Bioethics Cell should receive the SAE reporting form within 24 hours of the occurrence.
8. In the events of any protocol amendments, TIREC must be informed and the amendments should be highlighted in clear terms as follows:
   a. The exact alteration/amendment should be specified and indicated where the amendment occurred in the original project. (Page no. Clause no. etc.)
   b. The PI must comment how proposed amendment will affect the ongoing trial. Alteration in the budgetary status, staff requirement should be clearly indicated and the revised budget form should be submitted.
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   e. Approval for amendment changes must be obtained prior to implementation of changes.
   f. The amendment is unlikely to be approved by the IEC unless all the above information is provided.
   g. Any deviation/violation/waiver in the protocol must be informed..

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Instances where selected sources appear:

5

CONTENTS

ABBREVIATIONS

MNG	-	MULTINODULAR GOITRE
RLN	-	RECURRENT LARYNGEAL NERVE
SLN	-	SUPERIOR LARYNGEAL NERVE
TFT	-	THYROID FUNCTION TEST
TSH	-	THYROID STIMULATING HORMONE
TRH	-	THYROID RELEASING HORMONE
PTH	-	PARATHORMONE
FNAC	-	FINE NEEDLE ASPIRATION CYTOLOGY
HPE	-	HISTOPATHOLOGICAL EXAMINATION
POST OP	-	POST OPERATIVE
IV	-	INTRA VENOUS
Ca	-	CALCIUM
POD	-	POST OPERATIVE DAY
CT	-	COMPUTERISED TOMOGRAPHY.
MRI	-	MAGNETIC RESONANCE TOMOGRAPHY.
T	-	TEMPORARY
P	-	PERMANENT

INTRODUCTION

Total Thyroidectomy is one of the most common endocrine surgeries . It is the treatment of choice for the patients with malignant thyroid tumors as well as patients with multinodular goiters who experience compression symptoms. The most common complication of total thyroidectomy is post-operative hypocalcemia due to hypoparathyroidism . This complication is relatively common with an incidence of 20% to 30%, perhaps due to the sensitivity of parathyroid glands and their supplying arteries to trauma during surgery. However, most cases of post-operative hypocalcemia are transient, and the rate of permanent hypocalcemia persisting 12 months after the surgery is less than 2% . postoperative hypocalcemia is associated with morbidity and healthcare costs, but is rarely fatal . Therefore, it is important to identify and avoid high-risk surgical techniques and management practices that are associated with higher incidence of hypocalcemia.

Surgical procedures on the thyroid gland are generally safe and well tolerated. Nonetheless the occasional complications that following surgery may be life threatening or permanently disabling. The complication arises from anatomical variations of many vital structures associated with thyroid gland in the neck.

Complication occurs infrequently due to the proximity of vital structures like recurrent laryngeal nerve and parathyroid glands. Despite high volume of surgery on the thyroid, no surgeon is likely to encounter a large experience with a particular complication.

A thorough knowledge of complications their prevention and the ability to recognise early and accordingly manage them has become more important because of the increased frequency of surgery on thyroid gland.

The exemplary work of Theodor Kocher during the last century in developing a safe technique for thyroidectomy resulted in a 'noble prize' and this allowed continuing progress in surgery by his successors.

The importance of safe operating technique can hardly be ever emphasised for it is far better to prevent a complication than to treat it.

This study is a view of the morbidity attributed to surgical procedures on thyroid gland

"**The extirpation of thyroid gland for goitre typifies,**

Perhaps better than any operation the supreme

Triumph of surgeons art"

- HALSTEAD, 1920

AIM OF THE STUDY

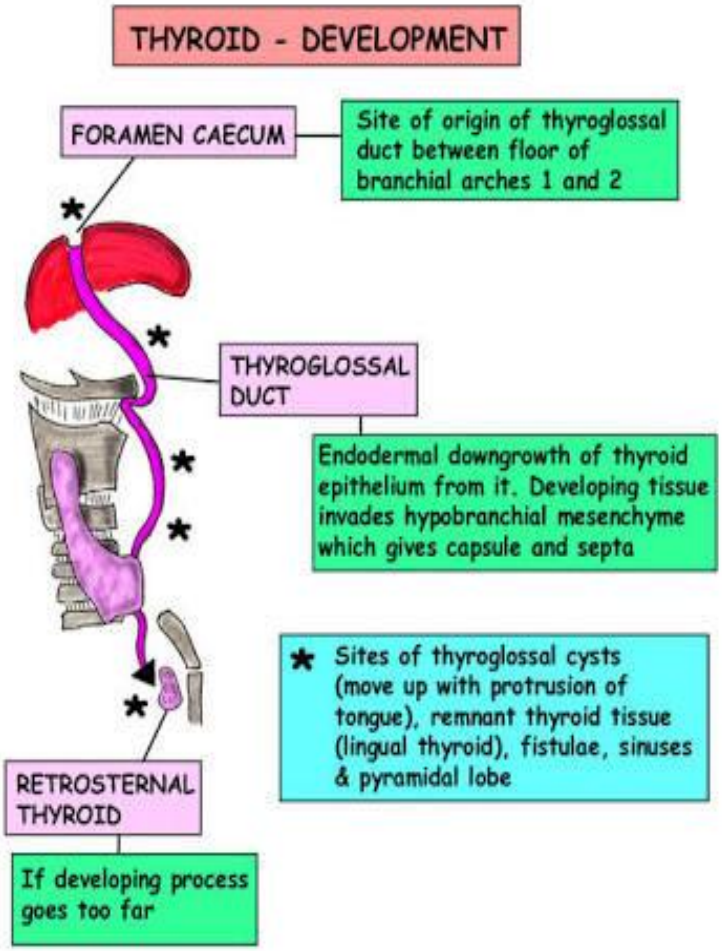
To estimate the incidence of hypocalcemia following total thyroidectomy and to correlate hypocalcemic features with ionized calcium level.

REVIEW OF LITERATURE

THYROID DEVELOPMENT:

- Development of thyroid gland as a median downgrowth of column of cells from floor of the pharynx between first and second pharyngeal pouches, subsequently marked by the foramen of caecum of the tongue and gradually a median diverticulum is formed.
- It grows downwards in the midline, bifurcation of its tip and cellular proliferation of this bifid end gives rise to the isthmus and lateral lobes of the thyroid gland.
- The connection of the median diverticulum with the pharynx is termed as thyroglossal duct.
- Expect the distal part of the duct which usually differentiates to form the pyramidal lobe of the thyroid, the rest of the duct disappears.

Figure 1 – DEVELOPMENT OF THYROID



- Sometimes a portion of the thyroglossal duct may persist and give rise to the formation of cyst in midline, which is called thyroglossal cyst.
- As the thyroid primordium descends, it acquires mesodermal contributions

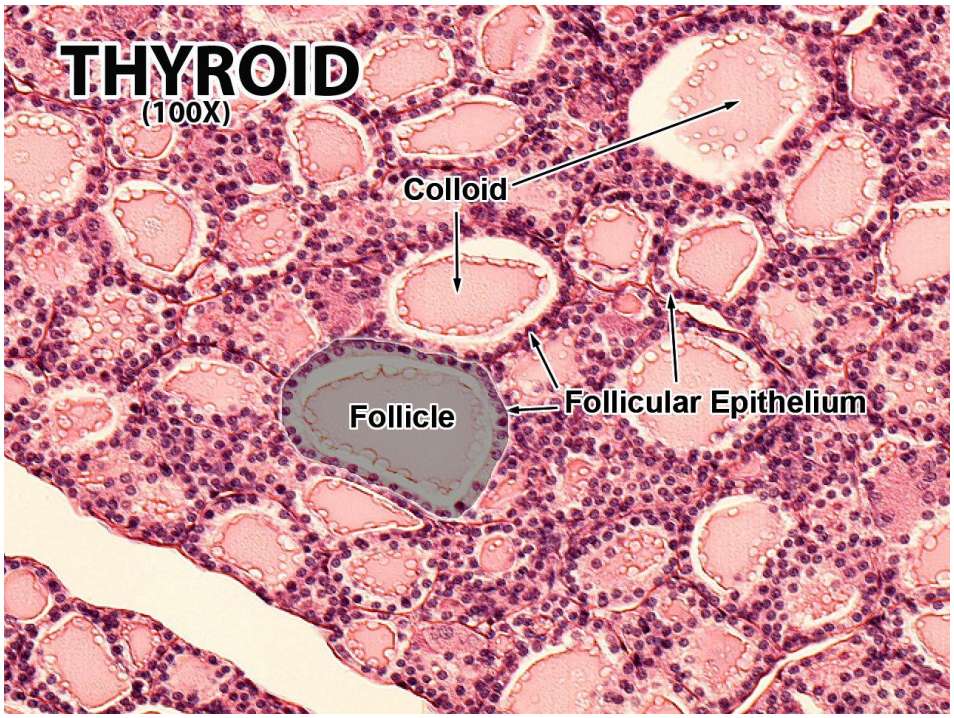
  such as the parafollicular C cells which secrete calcitonin.
- Parafollicular C cells derived from ultimo bronchial body which arises from the fourth pharyngeal pouch.

- Thyroid follicles are initially apparent by eighth weeks and colloid formation by 10th weeks of intrauterine life

HISTOLOGY:

Thyroid gland is divided into lobules that contain 20-40 follicles microscopically. The follicles are spherical in shape and 30 micro meter in diameter. Each follicle lined by cuboidal epithelium and contains central core of colloid secreted from the epithelial cells under the influence of thyroid stimulating hormone.

FIGURE-2 HISTOLOGY OF THYROID GLAND



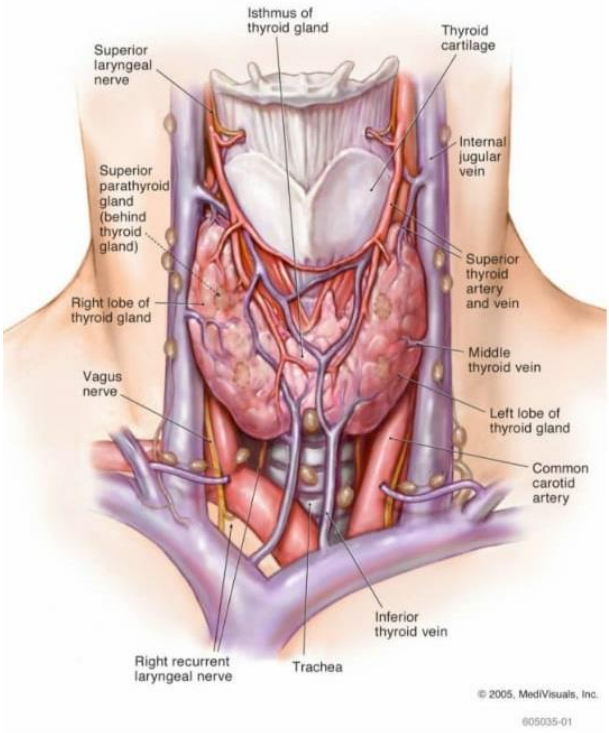
Parafollicular cells which are secretory C cells that contain and secrete the hormone calcitonin. These cells are found as individual or

clumped in small groups in the interfollicular stroma and located in upper thyroid lobes.

SURGICAL ANATOMY:

- Thyroid gland is a highly vascular organ situated in front of the neck, opposite the 5,6,7 cervical and 1st thoracic vertebrae.
- The weight of the gland is 15-25 grams, and invested by pretracheal layer of deep cervical fascia.

FIGURE-3 ANTERIOR VIEW OF THYROID GLAND



- It consists of right and left lobes joined together by an isthmus.

- Pyramidal lobe extends as fibrous strand or muscular strands from the junction of the isthmus and left lateral lobe.it is seen in 30% of individuals.
- It extends superiorly upto thyroid cartilage, laterally lie adjacent to carotid sheaths and sternocleidomastoid muscles and inferiorly upto 6^{th} tracheal ring.
- Anteriorly it is covered by strap muscles (sternohyoid, sternothyroid and superior belly of omohyoid)
- Medially it is related to trachea, oesophagus, thyroid cartilage, cricoid cartilage, cricothyroid and inferior constrictor muscles.
- Posterolaterally related to carotid sheath, ansa cervicalis and cervical sympathetic chain.
- Posterior border is related to parathyroid glands and tubercle of zuckerkandl.

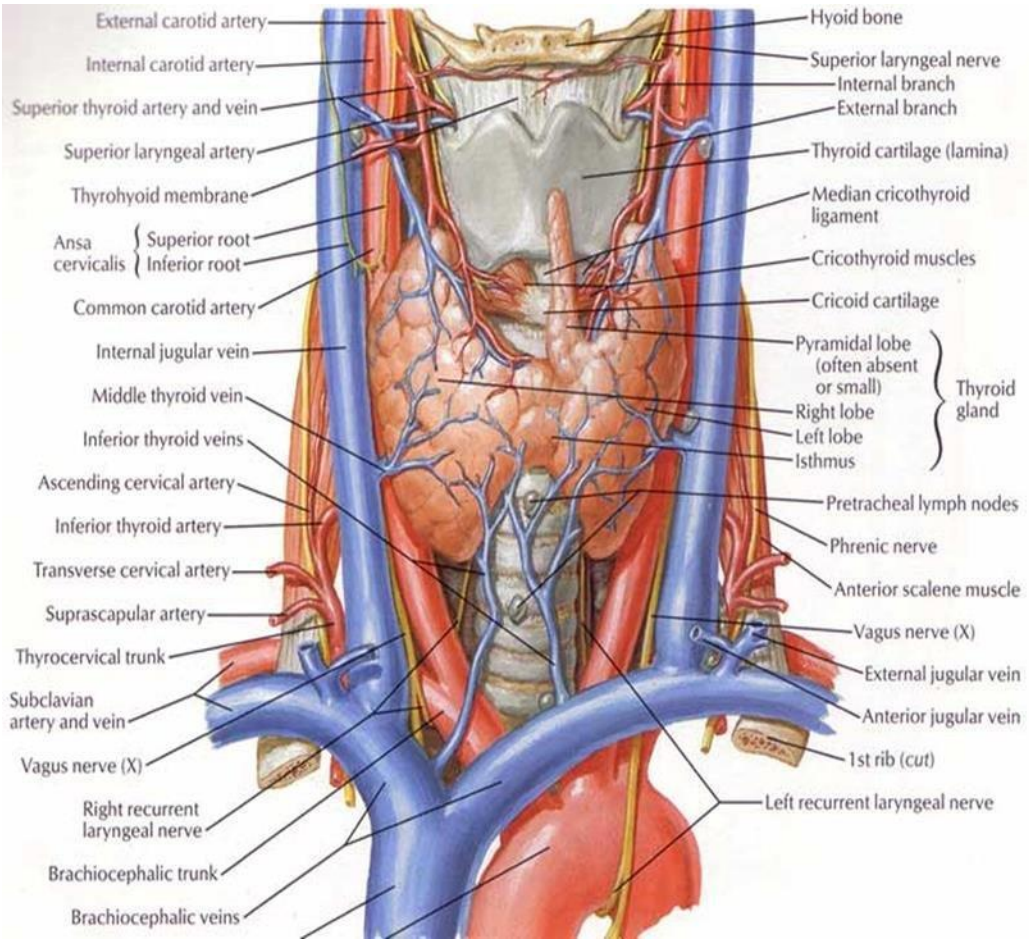


FIGURE-4 THYROID ANATOMICAL RELATION

COVERINGS:

- True capsule
- False capsule

- True capsule or fascia propria is a fibrous capsule which envelops the gland and gives enormous fibrous septa into the gland.

- False capsule:

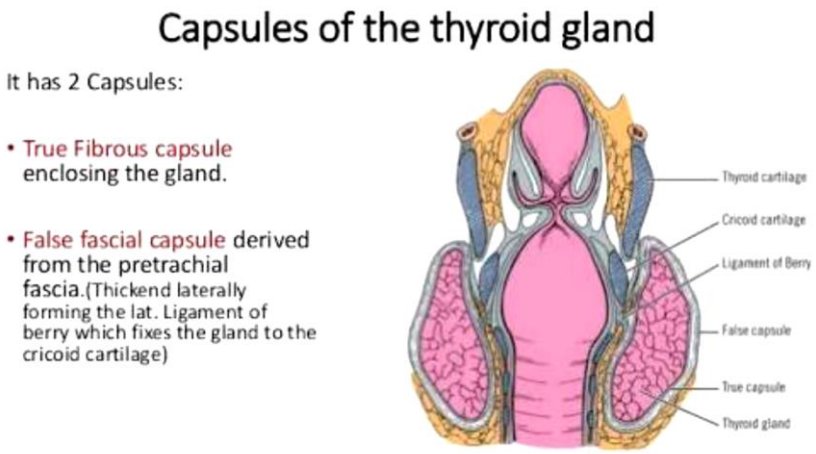


FIGURE-5 CAPSULES OF THYROID GLAND

It is derived from the pretracheal layer of deep cervical fascia. this sheath is thickened on the posteromedial aspect of each lobe which is known as ligament of berry, near the cricoids cartilage and upper tracheal ring.

BLOOD SUPPLY:

- **SUPERIOR THYROID ARTERY:**

It is the first branch of external carotid artery.it enters the gland near superior pole as a larger anterior branch and smaller posterior branch.it supplies upper one third of upper half of isthmus.

- **INFERIOR THYROID ARTERY:**

A branch of thyrocervical trunk of subclavian artery enters behind the carotid sheath, running medially reaching the posterolateral aspect of the gland.

It supplies lower two-third of the lobe and lower half of the isthmus.

- **THYROIDEA IMA ARTERY**

A branch of aorta or brachiocephalic artery enters the isthmus or lower pole.

- **ACCESSORY THYROID ARTERIES**
- **TRACHEAL AND OESOPHAGEAL ARTERIES**

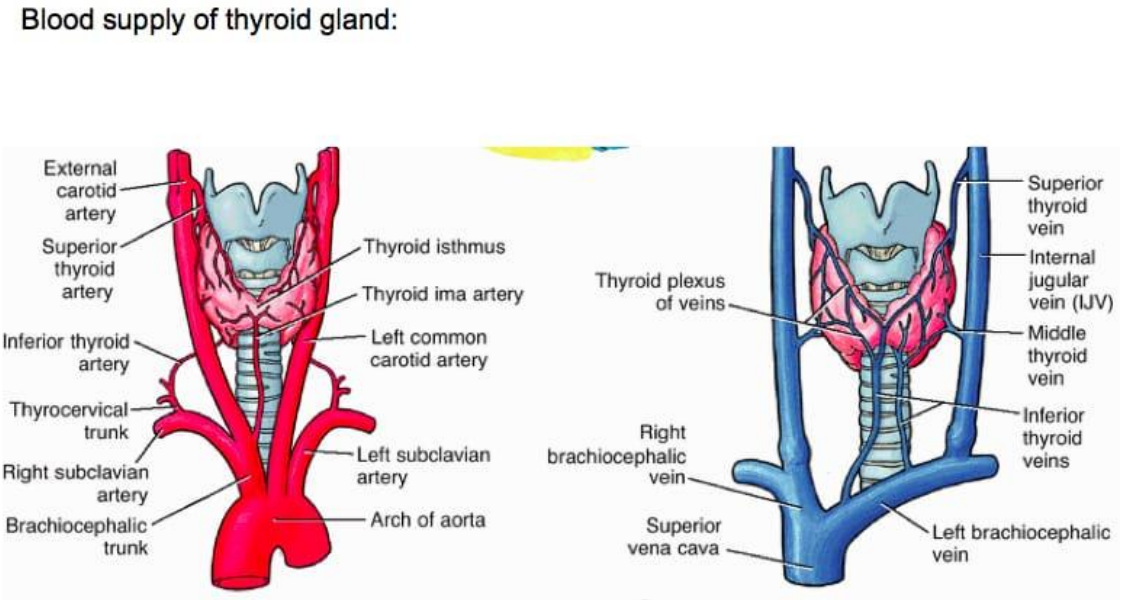


FIGURE-6 BLOOD SUPPLY OF THYROID GLAND

VENOUS DRAINAGE:

- Superior thyroid vein and
- Middle thyroid vein drains into internal jugular vein.
- Inferior thyroid vein – drains into left brachiocephalic vein.
- Kocher's 4^{th} thyroid vein – found in between the middle and inferior thyroid veins joins the internal jugular vein.

LYMPHATIC DRAINAGE:

- Ascending medial lymph vessels from the upper border of the isthmus drains into prelaryngeal or cricothyroid or delphian node.
- Ascending lateral vessels from the upper pole of the gland along the superior thyroid artery drains into deep cervical nodes.
- Descending medial vessels begin at lower part of the isthmus to reach pretracheal nodes.
- Descending lateral vessels run from the deep surface of the thyroid to recurrent laryngeal chain nodes.

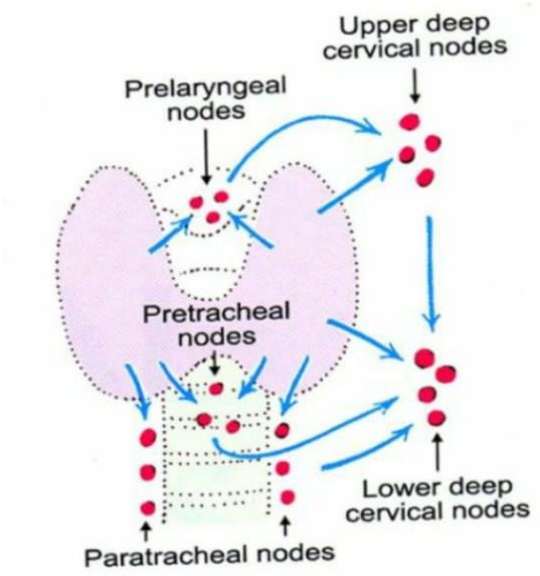


FIGURE-7 LYMPHATIC DRAINAGE OF THYRIOD GLAND

NERVE SUPPLY:

- Nerve supply is derived from sympathetic and parasympathetic nerves.
- **Sympathetic supply** from the superior, middle and inferior cervical ganglia.
- The fibers enters the gland along with blood vessels which are vasomotor in action.
- **Parasympathetic supply** is derived from external laryngeal nerve and recurrent laryngeal nerve which are branches of vagus nerve.

- **Superior laryngeal nerve –** after its origin at the base of the skull, superior laryngeal nerve comes along with internal carotid artery and divided into internal and external branches at the level of hyoid bone.
- Internal branch is the sensory nerve to the supraglottis. Injury to this nerve is rare in thyroid surgery, but its occurrence may results in aspiration.
- External branch lies on the inferior constrictor muscle and descend along the superior thyroid vessels before innervating the cricothyroid muscle. During surgery, ligation of superior thyroid artery should be as close to the superior pole of the thyroid as possible because this nerve passes deeper and escapes injury.

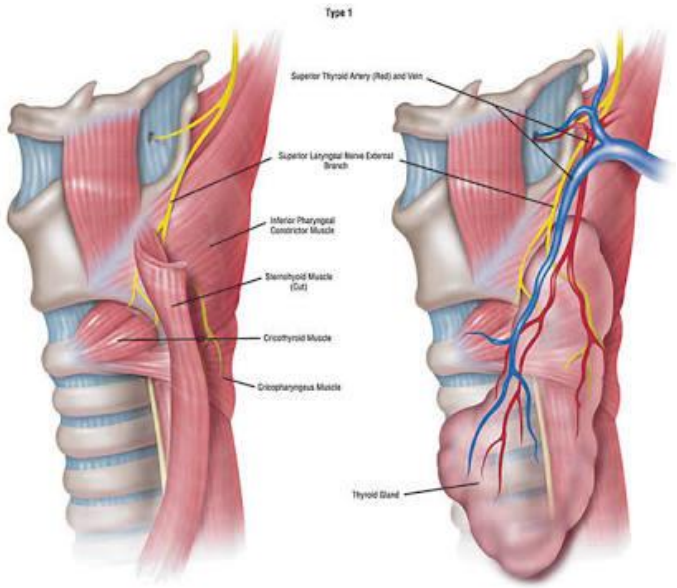


FIGURE-8 NERVE SUPPLY OF THYROID GLAND

RIGHT RECURRENT LARYNGEAL NERVE: Nerve hooks round the 1st part of the right subclavian artery and ascends obliquely to the side of the trachea behind the commom carotid artery. then enters into trachea-oesophageal groove. Near the lower pole this nerve is closely related to inferior thyroid artery.

LEFT RECURRENT LARYNGEAL NERVE: hooks round the arch of aorta, ascends to the side of trachea and follows the groove between trachea and oesophagus.

- Injury to one recurrent laryngeal nerve may leads to ipsilateral vocal cord palsy which causes paramedian or abducted position of vocal cords.
- Paramedian position results in a normal but weak voice,whereas abducted position may cause hoarseness of voice and ineffective cough.
- Bilateral recurrent laryngeal nerve injury which causes obstruction which requires emergency tracheostomy or may lead to loss of voice.

PHYSIOLOGY OF THYROID GLAND:

- Largest endocrine gland.it has two secretory cells.
  - Follicular cells – which secretes thyroid hormones.
  - T_4 – thyroxine (93%)
  - T_3 – triiodothyronine (7%)
  - Parafollicular cells – which secretes calcitonin.
  - Thyroglobulin also secreted into follicle by cuboidal epithelial cells.

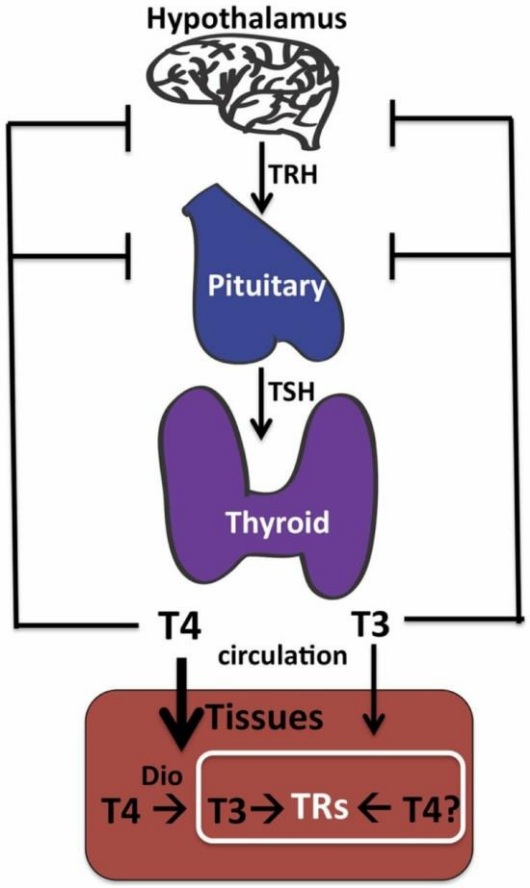


FIGURE-9 PHYSIOLOGY OF THYROID GLAND

- Hypothalamus- pituitary – thyroid axis regulates thyroid hormone production and releases in a classic feedback system.
- TRH is a regulatory hormone from hypothalamus.
- Thyroid stimulating hormone is a regulatory hormone from anterior pituitary.
- TSH stimulates iodide trapping and thyroid hormone synthesis and release.

- Thyroid hormones synthesis from iodine and tyrosine by the process of
  - ✓ Iodide trapping by thyroid cells
  - ✓ Binding of iodine to tyrosine
  - ✓ Coupling to form T_3 and T_4

TABLE 1 : NORMAL THYROID HORMONE VALUES:

TSH	3-3.3 mU /L
Total T_3	1.5-3.5 n mol/L
Total T_4	55-150 n mol/L
Free T_3	3.5-7.5 micro mol/L
Free T_4	10-30 n mol/L

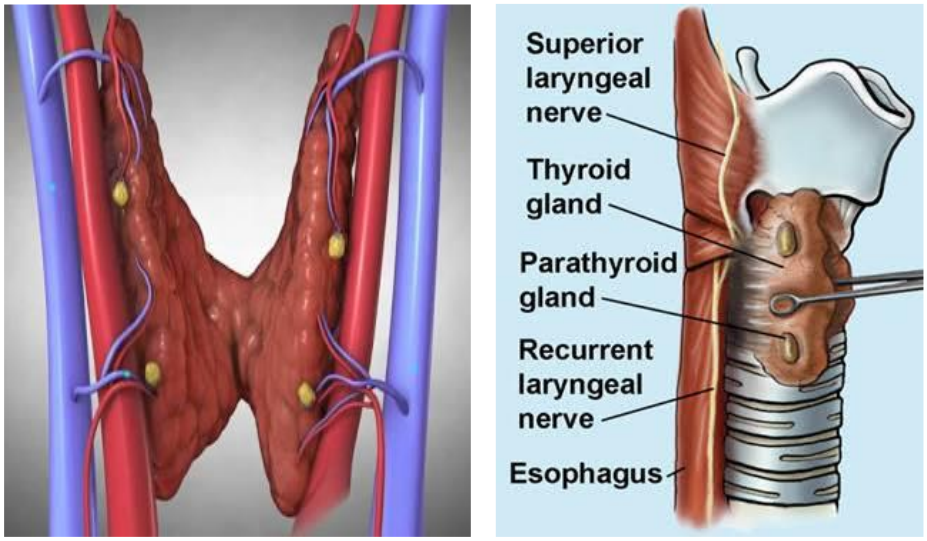
FUNCTIONS OF THYROID GLAND:

- Regulation of basal metabolic rate.
- Required to normal psychosomatic growth.
- It has chronotropic and inotropic effect on heart.
- Increases sensitivity of receptors to catecholamines and also increases number of receptors.
- Required for normal respiratory drive.
- Required for normal haematopoiesis.
- Thyroxine has opposite effect on insulin.
- Increases the bone turnover.

PARATHYROID GLAND:

- Parathyroid glands are 4 in number.
- Two on each sides which are situated behind the thyroid gland.
- Superior parathyroids are derived from endoderm of 4^{th} pharyngeal pouch. these are constant in position.it usually lies behind the recurrent laryngeal nerve.
- Inferior parathyroids develops from 3^{rd} pharyngeal pouch which are variable in position.it is usually in front of recurrent laryngeal nerve.

FIGURE-10 PARATHYROID GLAND



- Each gland weighs 40-50 grams , brownish in colour, firm in consistency which sinks in the fluid unlike fat which floats.
- Both superior and inferior parathyroids are supplied by inferior thyroid artery and its anastomotic branch.
- It contains chief cells, oxyphil cells.
- It secretes parathormone which controls the calcium metabolism.

FUNCTIONS OF PARATHORMONE:

- Increases absorption of the Ca^{2+} from the gut.
- Mobilizes calcium from the bone.
- Increases the Ca^{2+} reabsorption from renal tubules.

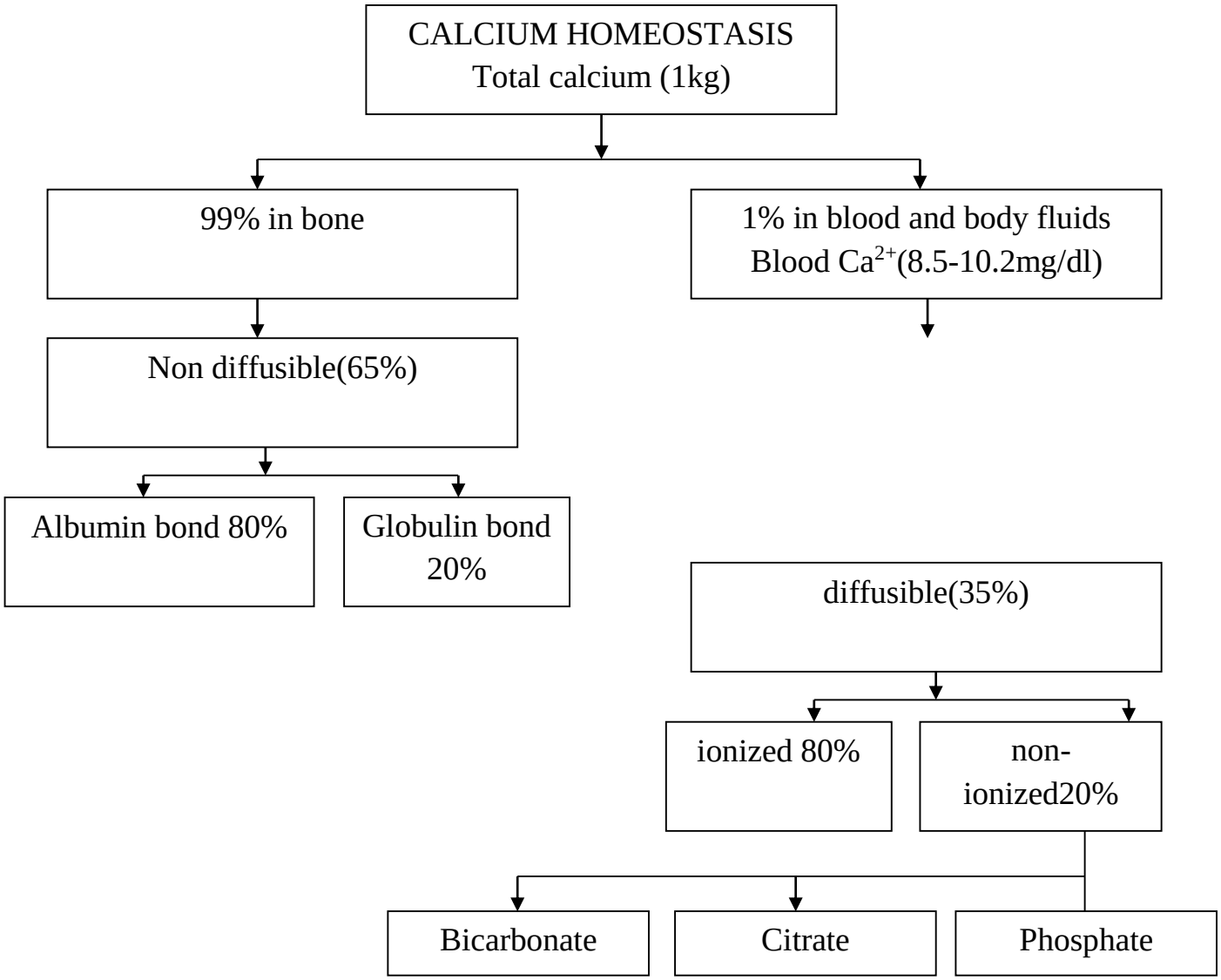


Chart 1 CALCIUM HOMEOSTASIS

ROLE OF CALCIUM:

- Excitability of cell membranes.
- Neuromuscular transmission and muscle contraction
- Releasing of transmitters from synapses.
- Stimulates secretory activity of exocrine glands and releasing hormones.
- Helps in myocardial contraction.
- In blood coagulation.
- Second messenger.

REGULATION OF CALCIUM HOMEOSTASIS:

3 Hormones involved.

- **Vitamin D**
- **Parathormone**
- **Calcitonin**

  Acting at 3 target organs

  - Intestine
  - Bone
  - Kidneys

CALCITONIN:

- Secretes from the parafollicular C cells in thyroid.
- Calcitonin is stimulated by an increase in serum calcium, gastrin and pentagastrin.
- Functions – direct inhibition of osteoclasts.

  Promotes deposition of Ca^{2+} in bone.

  Lowers Ca^{2+} in bone.

VITAMIN D:

- 1,25 dihydroxy cholecalciferol – active form.
- Stimulates GI calcium and phosphate absorption.
- Together with parathormone, it mobilises Ca^{2+} from bones.

FACTORS FAVOURING Ca^{2+} ABSORPTION:

- Acidic pH.
- High protein diet
- Presence of vitamin D
- Ca:P ratio >2:1 adequate for optimal absorption

  <1:2 reduces absorption

FACTORS INHIBITING Ca^{2+} ABSORPTION:

- Alkaline pH
- High fat diet
- Presence of phytates and oxalates
- Excessive dietary fibres
- Advanced age, intestinal inflammatory disorders.

PATHOLOGY:

CLASSIFICATION OF THYROID SWELLINGS:

1.GOITER:

1.Toxic

Primary thyrotoxicosis

Nodular thyrotoxicosis

1.Solitary

2. Multinodular

Non-toxic

1.Colloid goiter

2.Multinodular goiter

2.INFLAMMATORY SWELLINGS:

1.Auto immune

Hashimoto's thyroiditis

Chronic lymphocytic thyroiditis

2.Granulamatous - de-Quervain's thyroiditis

3.Fibrosing – Riedel's thyroiditis

4.Infective – Bacterial/viral thyroiditis

5.Others – Amyloidosis

3.TUMOURS:

BENIGN

Adenoma

MALIGNANT

Papillary carcinoma

Follicular carcinoma

Medullary carcinoma

Anaplastic carcinoma

Lymphoma

DIAGNOSTIC TESTS:

1. ASSESSMENT OF THYROID GLAND FUNCTION:

- Total T_3, total T_4, Free T_3 , Free T_4 , TSH
- Radioactive iodine uptake
- Thyroxine binding globulin
- T_3 resin uptake study
- Free thyroxine index

2.ASSESSMENT OF AUTOIMMUNITY:

- Anti thyroglobulin antibodies
- Anti microsomal antibodies
- Long acting thyroid stimulators
- Thyroid stimulating immunoglobulins

ASSESSMENT OF THYROID AND PITUITARY RESPONSIVENESS:

- T_3 supression test
- TSH stimulation test

ASSESSMENT OF THYROID ANATOMY:

- Ultrasound scan
- Thyroid isotope scan

ASSESSMENT OF THYROID HISTOLOGY:

- FNAC
- Core needle biopsy

ASSESSMENT OF LOCAL EXTENSION AND DISTANT METASTASIS :

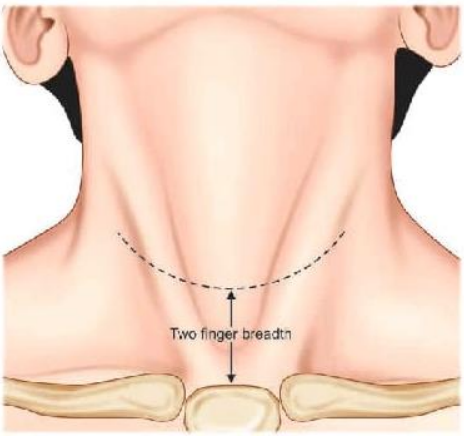
- CT Scan
- MRI

SURGICAL PROCEDURE – TOTAL THYROIDECTOMY:

- Entire thyroid gland is removed without retaining any tissue.
- Nowadays it is the procedure of choice in most of the thyroid diseases except benign diseases limited to one lateral lobe.
- It is done at present in non toxic MNG, toxic goiter, carcinoma thyroid.
- Anaesthesia – general anaesthesia
- Position – neck is extended by placing sandbag or small pillow, head ring should be kept under the occiput. Patient's body and hands are tucked.
- Head end of the table is elevated to 15° to improve venous return so as to reduce the dozing.

- Incision: horizontal skin crease incision is placed two finger breadth above the supra sternal notch.

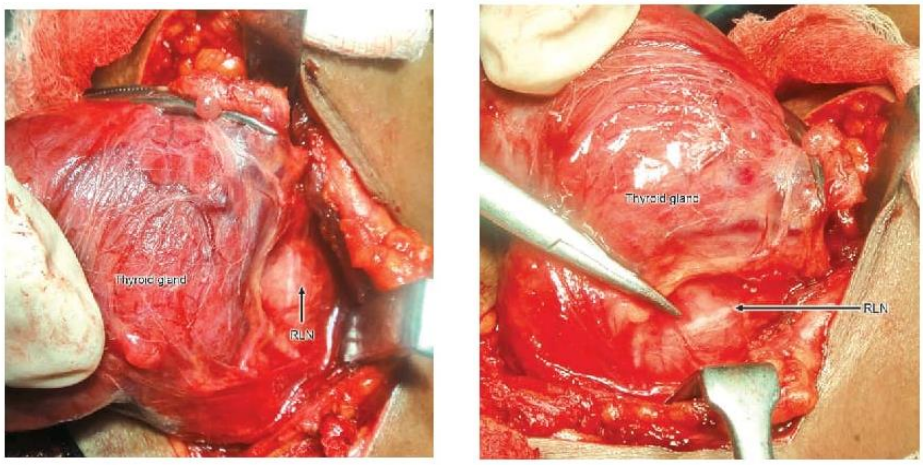
FIGURE-11 THYROIDECTOMY INCISION



- Subplatysmal flap is raised superiorly upto thyroid cartilage, inferiorly upto sternoclavicular joint or supraclavicular region.
- Care should be taken not to injure anterior jugular vein running on either side of midline.

FIGURE-12

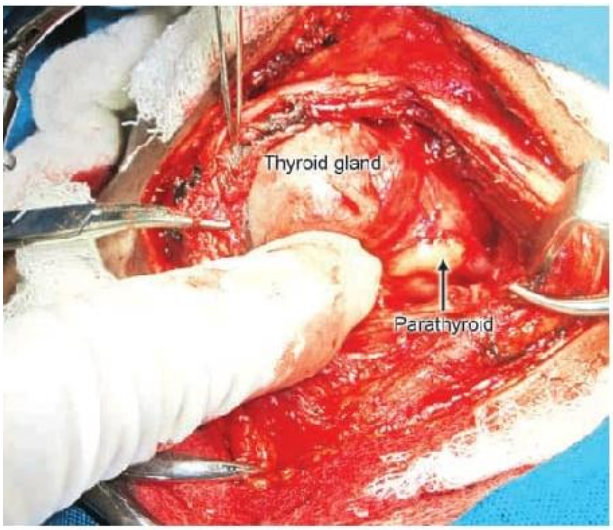
RELATION BETWEEN THYRIOD GLAND AND RLN



- Deep cervical fascia opened by midline vertical incision.
- Strap muscles are retracted from underlying thyroid gland.
- If gland is large, OR difficulty in mobilising the gland, strap muscles can be cut at their upper part.
- Dissection is carried through the loose areolar tissue between thyroid and carotid sheath exposing middle thyroid vein by gentle anteromedial traction of thyroid lobe.
- Gland is now retracted downwards and laterally to expose the superior pedicle. Superior thyroid artery and vein supplies the gland from superior pole. This space infront of cricothyroid is called as cricothyroid space of Reeves. In this space external laryngeal nerve which is just proximal to superior pole deviates

towards cricothyroid muscle. Artery and vein are individually ligated close to the gland to avoid injuring the nerve.

FIGURE-13 RELATION BETWEEN THYROID GLAND AND PARATHYROIDS



- Inferior pedicle is identified , ligated and cut adjacent to the gland.
- Often thyroid ima venous plexus may be present in front of trachea in midline which should be ligated properly.
- Both blunt and sharp dissection using peanut , fine scissor or mosquito forceps with gentle traction over the gland medially will expose the recurrent laryngeal nerve and parathyroid glands.
- Recurrent laryngeal nerve passes behind the inferior thyroid artery in trachea-oesophageal groove.
- Beahrs triangle which is a landmark for identification of recurrent laryngeal nerve. It is formed by common carotid artery, inferior

thyroid artery and recurrent laryngeal nerve. If any troublesome oozing occurs here, cauterization or clamps to be avoided.

- Branches of inferior thyroid artery while entering the gland should be ligate using with 3-0 vicryl or silk.
- Ligate inferior thyroid artery or its branches close the gland avoid injury to artery of parathyroid.
- Berry's ligament which is adherent to thyroid is cut with care to properly mobilise the gland medially because recurrent laryngeal nerve is very close to the berry's ligament.
- Opposite lateral lobe is also dissected similarly.
- In total thyroidectomy entire gland is removed without injuring the posterior structures.
- Wound should be examined for bleeding sites after saline irrigation after flexing the neck. complete haemostasis is essential.
- A small soft tube drain /corrugated rubber drain should be kept through a small incision in the lower flap.
- Wound should be closed in layers.
- Usually drain is kept for 24-48 hrs , sutures are removed on 4^{th} or 5^{th} day.

POST-OPERATIVE COMPLICATIONS:

It is divided into 2 groups.

IMMEDIATE OR EARLY

1. Hemorrhage – tension hematoma ,early life threatening complications which leads to airway obstruction. Immediate surgical intervention is needed.

2. Respiratory obstruction.

3. Recurrent laryngeal nerve palsies

4. Ruperipr laryngeal nerve palsy.

5. Parathyroid insufficiency or tetany.

6. Thyroid crisis/storm

7. Infection

LATE:

1. Thyroid insufficiency

2. Recurrent thyrotoxicosis

3.Progressive exophthalmos

4. Hypertropic or keloid scar.

HYPOPARATHYROIDISM:

- Hypoparathyroidism is the most common cause for hypocalcemia after total thyroidectomy.
- In 1979 , EDIS reported that injury, devascularisation or inadvertent removal of parathyroid tissue must be the first practical consideration in development of hypocalcemia.
- Ligation of the main trunk of inferior thyroid artery lateral in the neck during thyroidectomy provide good haemostasis and avoids injury to recurrent laryngeal nerve, but it may also interfere with the blood supply of parathyroid which leads to hypoparathyroidism with hypocalcemia.
- Devascularisation may be transient or permanent based on the following factors.
    - ✓ Collaterals from paratracheal vessels.
    - ✓ Response of remaining parathyroid glands to hypocalcaemia.
    - ✓ Endothelin 1 which is an acute phase reactant which suppresses the parathormone release.
    - ✓ Hypothermia of parathyroid.
    - ✓ Calcitonin release.
    - ✓ Hungry bone syndrome.

- Hypocalcemia may occur even after hemithyroidectomy due to if one or two parathyroids are devascularised the remaining parathyroids either become hyperplastic or compensated or remain insufficient.
- Incidence of temporary hypoparathyroidism is 25% and that of the permanent is 0.5%[***bailey and love]***

TABLE 2 : INCIDENCE OF POST OP HYPOPARATHYROIDISM

TEMPORARY	More common (2-50%)	Usually lasts for 2 months maximum upto 6 months
PERMANENT	Less common (0.4-13%)	Continues beyond 6 months
HUNGRY BONE SYNDROME	Common (5-13%)	Severe, rapid begins immediate post-operative period

CLINICAL FEATURES:

NEUROLOGICAL EFFECTS:

- Circumoral numbness
- Tingling and paraesthesia.

} early stage

- Seizure
- Carpopedal spasm

} later

CHVOSTEK'S SIGN:

FIGURE-14 CHVOSTEK'SIGN

- Tapping over the branches of facial nerves anterior to ear which produce twitching of facial muscles at angle of mouth , ala of the nose and eye lids.

TROUSSEAU'S SIGN:

Carpopedal spasm is elicited by occluding blood flow to the forearm after inflation of a sphygmomanometer cuff to 20 mmHg above the patient's systolic blood pressure for 2-3 mins.

FIGURE-15 TROUSSEAU'S SIGN

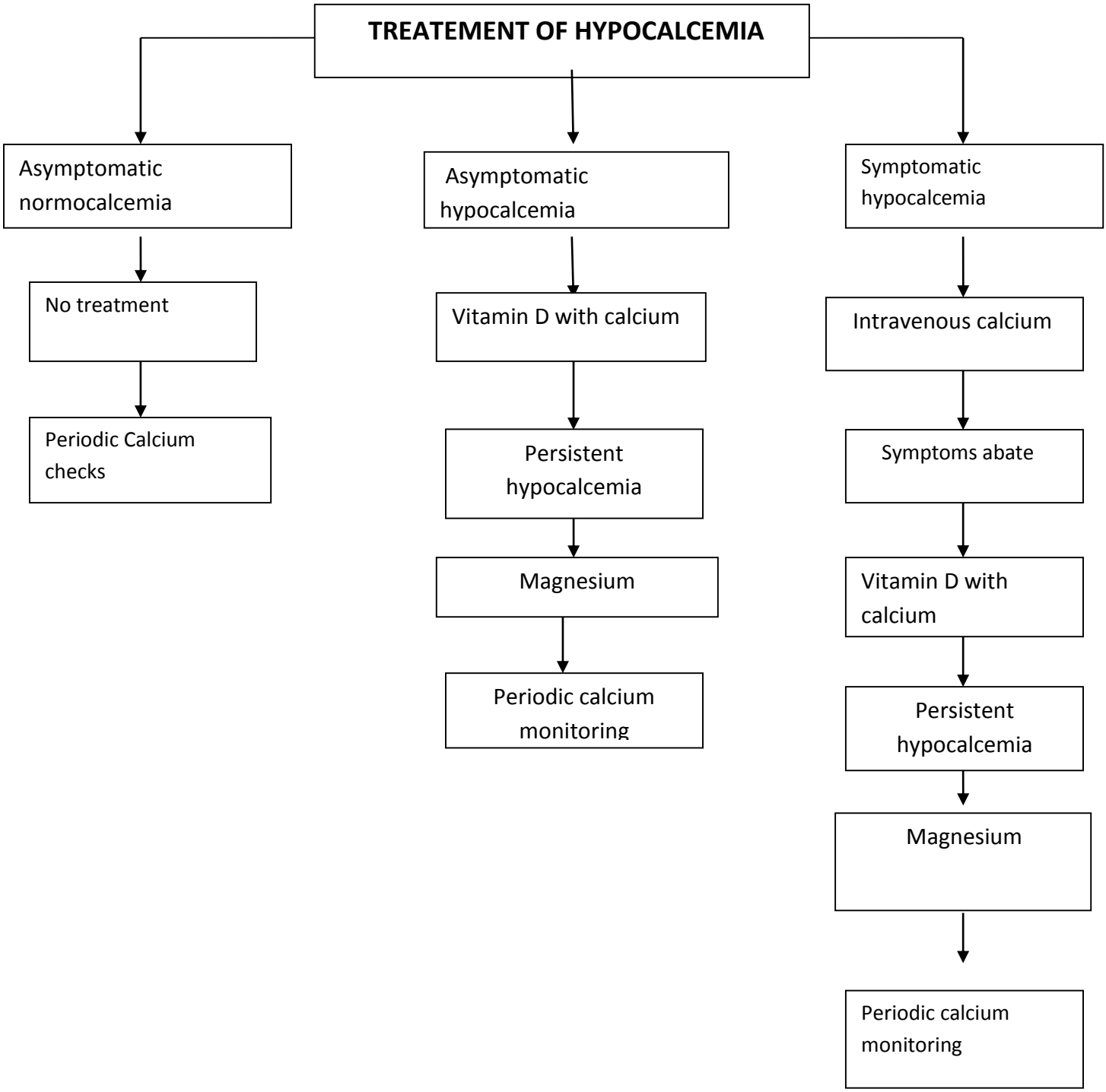
TETANY:

Characterised by tonic-clonic seizures, carpopedal spasm and laryngeal stridor and bronchospasm.

ECG CHANGES:

- Prolongation of QT interval.

CHART 2 TREATENT OF HYPOCALCEMIA:



Patient should be simultaneously started with fast acting vitamin D compound which can be discontinued in two weeks .

- Patients who are asymptomatic in the early post-operative period would not require calcium supplementation.
- Patients who are symptomatic or whose calcium continue to fall require treatment.
- Severe hypocalcaemic or symptomatic patient should treated with intra venous calcium gluconate.10 ml of 10% solution (1g) of calcium gluconate administered over 10 minutes under careful monitoring.
- If the symptoms are not resolved, continue calcium gluconate drip at 1-2 mg/kg.
- Titrate the infusion based on patient's symptoms with serum calcium level.
- If the patient is able to tolerate, start on oral calcium tablets 1-2 gram of elemental calcium per day, 1250 mg of calcium carbonate provides 500mg of elemental calcium. So patients should take 2500-5000 mg of calcium carbonate per day.
- Vitamin D supplementation in the form of calcitriol with dosage of 0.25 to 1 mcg/day requires subsequently.

- Patient should be on follow up and an attempt to wean the oral calcium after 2-3 months according to serum calcium level.

PREVENTION:

1.IDENTIFICATION OF PARATHYROIDS AND PRESERVATION OF BLOOD SUPPLY:

Parathyroids are identified by its colour, consistency, sliding movement on manipulation, also called "rowboat riding on a wave" and by presence of vascular hilum.

TABLE 3 : CHARACTERISTICS FEATURES

STRUCTURE	**COLOUR**	**CONSISTENCY**	**SLIDING MOVEMENT**	**VASCULAR HILUM**
Thyroid	Red	firm	No	No
Parathyroid	Yellow with brown tan	firm	Yes	Yes
Fat	Yellow	soft	No	No
Lymph node	White with grey tan	firm	No	No
Thymus	White	soft	No	No

Many authors follow various techniques for identification of parathyroid glands intra operatively which helps them to prevent post operative hypocalcemia**. Esselstyn[1].,1974** used parathyroid blush on table**, Silverberg.,1984** used metheleneblue staining, **Sofola et al[2].,2001** used polarized spectral imaging, **Yao et al[3].,2003** used touching print preparations, still studies going on.,

2.**IF THE GLAND IS DEVASCULARISED OR REMOVED PROCEED TO RE-IMPLANT.**

Vascularised parathyroids usually appears as yellow with varying quantity of brown tan. If devascularised it may turn as greyish in colour. In such a condition the gland should be cut into 1-2 mm pieces, then implant into sternocleidomastoid muscle as pockets and marked with non-absorbable sutures to facilitate easy identification , because primary hyperparathyroidism has been reported in implanted tissue.

According to the study conducted by ***lo et al[4] .,1998*** parathyroid autotransplantation decreases the incidence of hypocalcaemia after total thyroidectomy.

PREDICTORS OF POST-OPERATIVE HYPOCALCAEMIA:

- ✓ Total serum calcium level.
- ✓ Intact PTH level.

- ✓ Combination of serum calcium and PTH level.
- ✓ Ionized calcium level.

1.PARATHORMONE LEVEL:

- ***Fewins J et al[5].,2012*** found preoperative and perioperative estimation of PTH level in the blood is the most common predictor for post thyroidectomy hypocalcaemia.
- Estimation of parathormone is usually done intra-operatively , 1 hour and 24 hours after the surgery.
- According to the study of ***Ker et al[6].,2007*** , a fall in parathormone level 1 hour after surgery and continuing fall in 24 hours is strongly associated with post operative hypocalcaemia.
- ***Asari et al[7].,2008*** described that day 1 post-operative parathormone level considered as most reliable predictor for the estimation of transient or permanent hypoparathyroidism.
- Availability of this test and cost are the limiting factors for estimation of PTH level.

- Normal parathormone level is 10-65 pg/ml.

2.CALCIUM AS PREDICTOR:

- Serum calcium monitoring and post-operative analysis shows important predictor of post-operative hypocalcaemia in many studies.
- According to the study by ***Reza et al[8].,2003*** the estimation of total serum calcium level at 1st post-operative day,2nd and 3rd post-operative day and founded any decrease in serum calcium level which is used as a predictor of post-operative hypoparathyroidism.

TABLE 4 : POST OP SERUM CALCIUM

	1st POD(%)	2nd POD(%)	3rd POD(%)
sensitivity	18.6	62	72.1
specificity	96.1	92.9	92.9

- The study conducted by ***Ancuta leahu et al[9].,2009*** found patients with positive calcium trend like rise of post-operative calcium levels on serial estimation shows normocalcemic pattern and excluded hypocalcaemia successfully in 96.2% patients.

- The patients with negative calcium trend like that serial fall in post-operative calcium level may result in hypocalcaemia in 51.6% patients.
- From this result pattern he concluded that patient can be discharged earlier in positive calcium trend pattern. In negative calcium trend pattern should be monitored with serial calcium level for some more days.
- Normal calcium level is 8.5-10.2 mg/dl.

3.IONISED CALCIUM:

- Ionised calcium represents 50% of the total calcium which is used as a predictor for post-operative hypocalcaemia.
- It is calculated by the formula

  $i(Ca)= 0.9+[0.55\times t(Ca)]-[0.3\times alb]$
- Normal ionized calcium level is 4.64 to 5.3 mg/dl.
- Estimation of free/ionized calcium levels in post thyroidectomy patients is the predictor because decrease in serum total calcium level due to haemodilution or stress because of fall in total proteins which is unrelated to parathyroid function.

MATERIALS AND METHODS:

The present study included 104 patients who underwent total or completion thyroidectomy in various surgical units from July 2017 to June 2019 in the Department of General Surgery, Tirunelveli Medical College Hospital, Tirunelveli

INCLUSION CRITERIA:

AGE: all age groups from 14 to 75 years

SEX: both male and female patients

PATHOLOGY: all benign, malignant, toxic and nontoxic goitre cases who underwent total or completion thyroidectomy

EXCLUSION CRITERIA:

AGE: less than 14 years

Patient undergoing hemithyroidectomy

Primary parathyroid pathology

Patient already on calcium supplementation

STUDY DESIGN: CROSS SECTIONAL STUDY

STATISTICAL METHODS:

Collected data will be analysed using descriptive statistical principles like mean proportions and percentage.

INVESTIGATIONS:

Basic hematological and biochemical investigations including serum calcium levels, serum albumin.

Chest x ray PA view

X ray neck AP and Lateral view

ECG

Thyroid function test

Ultrasound neck

FNAC-thyroid

Vocal cord examination

Post op histopathological analysis.

All toxic patients were well controlled preoperatively with use of antithyroid drugs and beta blockers

SURGICAL MANAGEMENT:

Surgery was done in 104 cases of which 101 underwent total thyroidectomy and 3 were completion thyroidectomy.

Serum calcium levels measured during pre and post operative period. Cases who were asymptomatic, discharged on fourth or fifth POD except those who had complications.

FOLLOW UP:

Post operative follow up was done for six months in transient hypocalcemic patients and for one year in permanent hypocalcemic patients for two weeks interval during first two months then monthly once for one year.

Clinical examination was done for all cases .

Serum calcium levels and thyroid function tests was monitored for all cases who had post op hypocalcemia.

There was no mortality in this study .

There was no ectopic thyroid noted in this study.

RESULTS

- This study was performed in a series of 104 patients of which 97 were females and 7 males
- Most commonly middle age group (30-50 years) were affected by thyroid diseases
- Majority of patients had non toxic multi nodular goitre
- Incidence of hypocalcemia following total thyroidectomy was 37%

  Transient hypocalcemia-33.5%

  Permanent hypocalcemia-1.9%

- Incidence of post op hypocalcemia was more common in Thyroid malignancy, Toxic goitre and Hashimoto's thyroiditis
- Post op hypocalcemia was commonly reported in third POD and they had perioral numbness as the most common symptom.
- Patient treated with oral or IV calcium supplementation according to the serum calcium levels and severity of hypocalcemia

TABLE 5: AGE WISE DISTRIBUTION OF TOTAL THYROIDECTOMY

AGE IN YEARS	NO OF PATIENTS	PERCENTAGE
< 30	10	10%
31-40	36	34%
41-50	34	33%
> 50	24	23%

FIGURE 16 : AGE DISTRIBUTION OF STUDY POPULATION

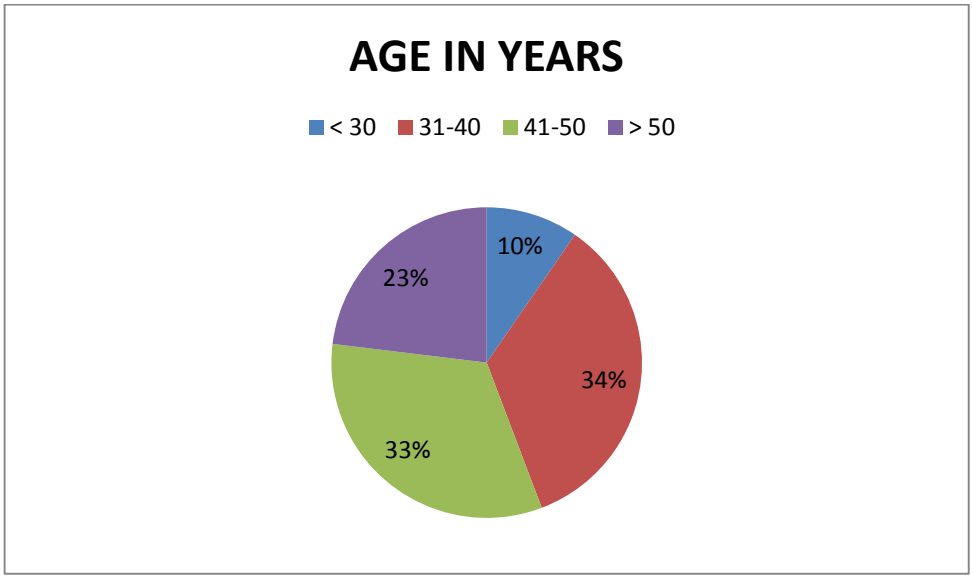


TABLE 6 : INCIDENCE OF POST OPERATIVE HYPOCALCEMIA IN RELATION TO AGE GROUP

AGE IN YEARS	HYPOCALCEMIA	
	PRESENT	ABSENT
< 30	4	6
31-40	14	22
41-50	8	26
> 50	11	13

In this study postoperative hypocalcemia was observed for 4 cases in the age group of < 30 years, 14 cases in the age group of 31 – 40 years, 8 cases from 41-50 years and 11 cases aged > 50 years

FIGURE 17 : INCIDENCE OF HYPOCALCEMIA RELATED TO AGE GROUP

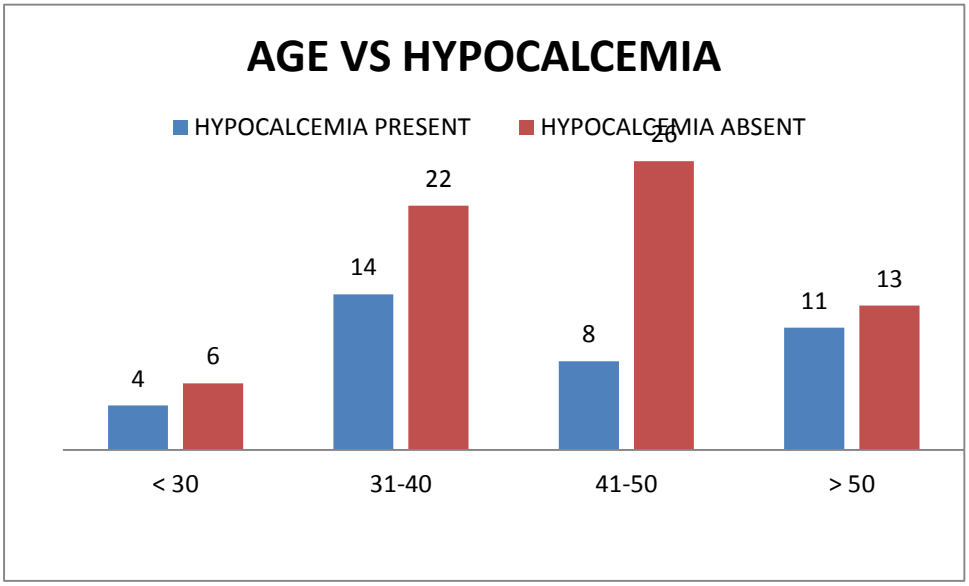


TABLE 7 : INCIDENCE OF POST OPERATIVE HYPOCALCEMIA IN RELATION TO SEX DISTRIBUTION

SEX	HYPOCALCEMIA	
	PRESENT	ABSENT
MALE	2	5
FEMALE	35	62

In this study, Out of 7 male cases operated, 2 were developed post operative hypocalcemia.

Out of 97 female cases operated, 35 were developed post operative hypocalcemia.

TABLE 8 : INCIDENCE OF POST OPERATIVE HYPOCALCEMIA

TYPE OF HYPOCALCEMIA

HYPOCALCEMIA	NO OF PATIENTS	PERCENTAGE
TRANSIENT	35	33.5%
PERMANENT	2	1.9%

In this study, 33.5% cases developed transient hypocalcemia and 1.9% cases developed permanent hypocalcemia.

FIGURE 18 : INCIDENCE OF TRANSIENT AND PERMANENT HYPOCALACEMIA

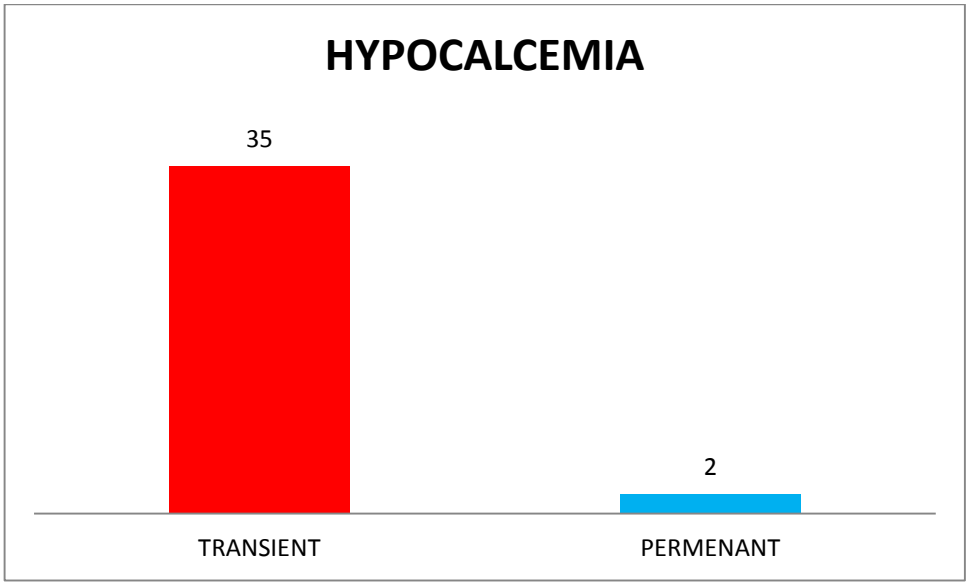


TABLE 9 : INCIDENCE OF POST OP HYPOCALCEMIA IN RELATION TO TYPE OF SURGERY

TYPE OF SURGERY	NO OF PATIENTS	HYPOCALCEMIA PRESENT
TOTAL THYROIDECTOMY	101	35
COMPLETION THYROIDECTOMY	3	2

In this study, out of 101 cases who underwent total thyroidectomy, 35 cases developed post operative hypocalcemia and out of 3 cases who underwent completion thyroidectomy, 2 developed post operative hypocalcemia.

FIGURE 19 : INCIDENCE OF POST OP HYPOCALCEMIA IN RELATION TO TYPE OF SURGERY

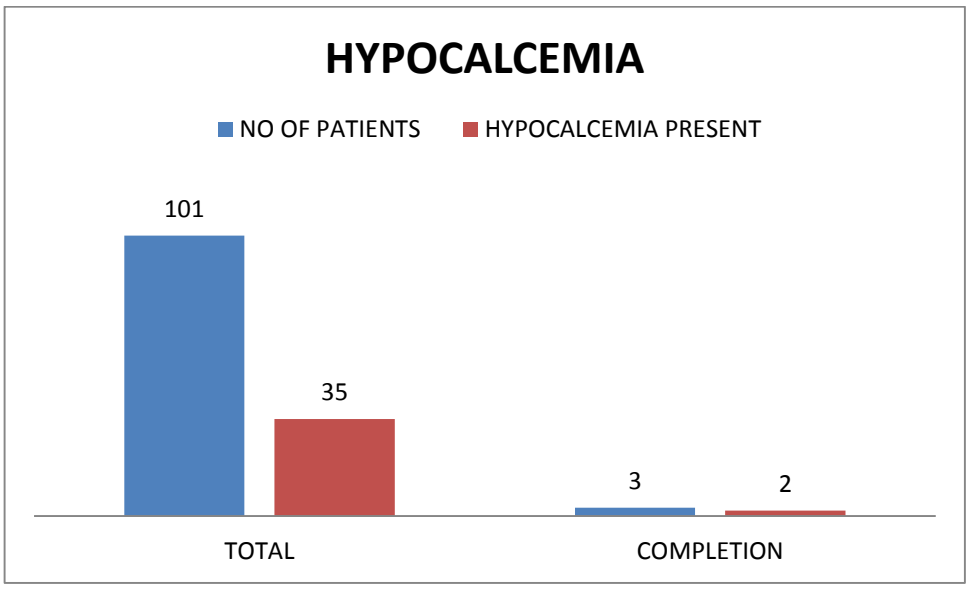


TABLE 9 : INCIDENCE OF POST OP HYPOCALCEMIA IN RELATION TO RISK FACTORS

RISK FACTORS	TOTAL CASES	HYPOCALCEMIA PRESENT
HUGE GOITRE	9	7
NECK NODE DISSECTION	1	1
SHORT NECK/OBESITY	6	3
PREVIOUS THYROID SURGERY	2	2

- In this study, out of 9 cases with huge goitre, 7 developed post operative hypocalcemia
- Out of 6 cases with short neck / obesity, 3 developed post operative hypocalcemia.
- Out of 2 cases with histoy of previous thyroid surgery, both developed post operative hypocalcemia.
- 1 case operated for neck dissection, developed post operative hypocalcemia

FIGURE 20 : INCIDENCE OF POST OP HYPOCALCEMIA IN RELATION TO RISK FACTORS

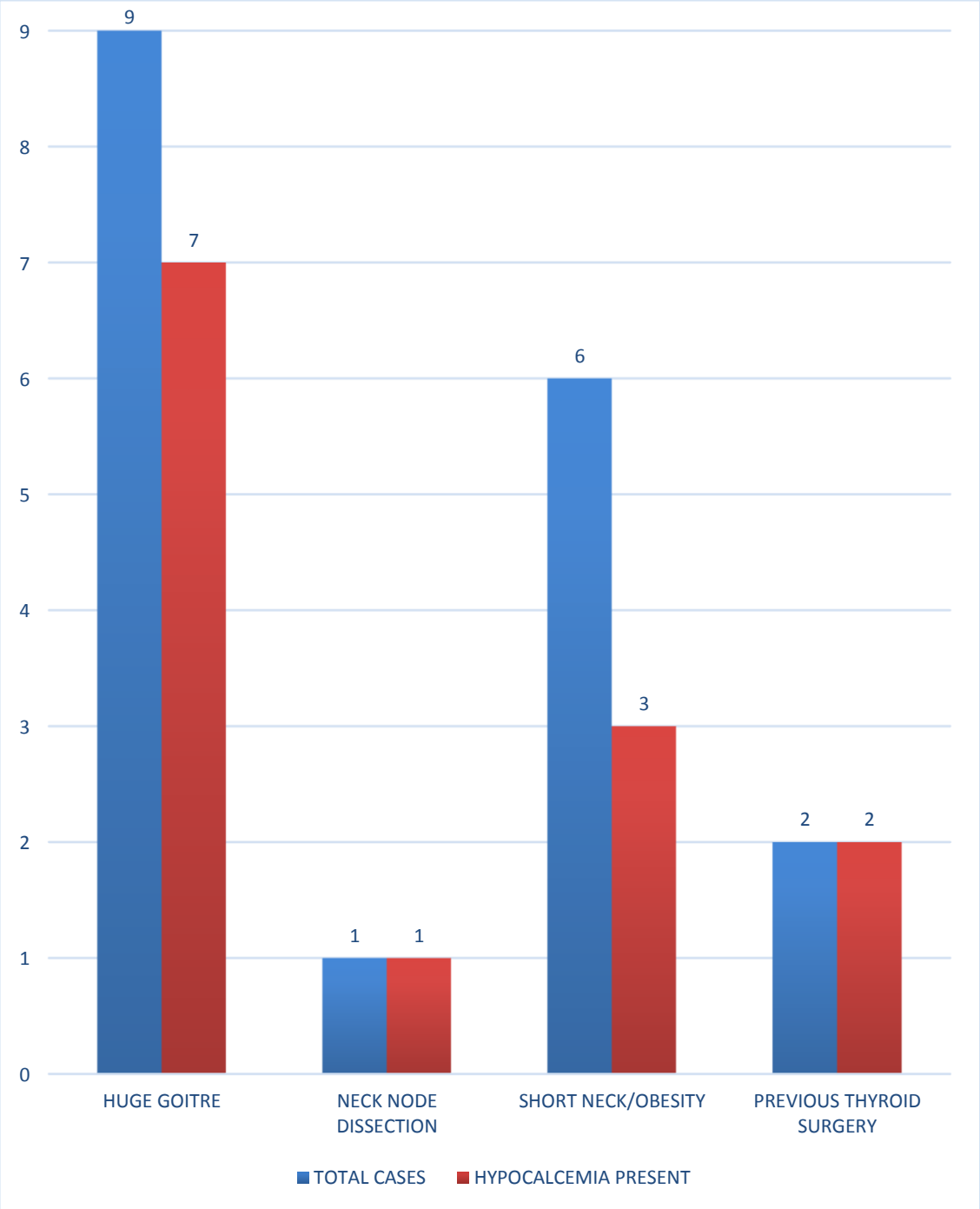


TABLE 10 : **PRE OP DISTRIBUTION OF THYROID DISEASES**

PRE OP INDICATION	NO OF PATIENTS	PERCENTAGE
MULTI NODULAR GOITRE	81	78%
PAPILLARY CA	10	9%
TOXIC MNG	8	8%
GRAVE'S DISEASE	2	2%
RECURRENT THYROID NODULE	3	3%

In this study, 78 % of MNG cases, 9% of Papillary carcinoma cases, 10 % of Toxic goitre cases underwent total thyrodicectomy and 3 % recurrent thyroid nodule cases underwent completion thyroidectomy

FIGURE 21 : PRE OP DISTRIBUTION OF THYROID DISEASES

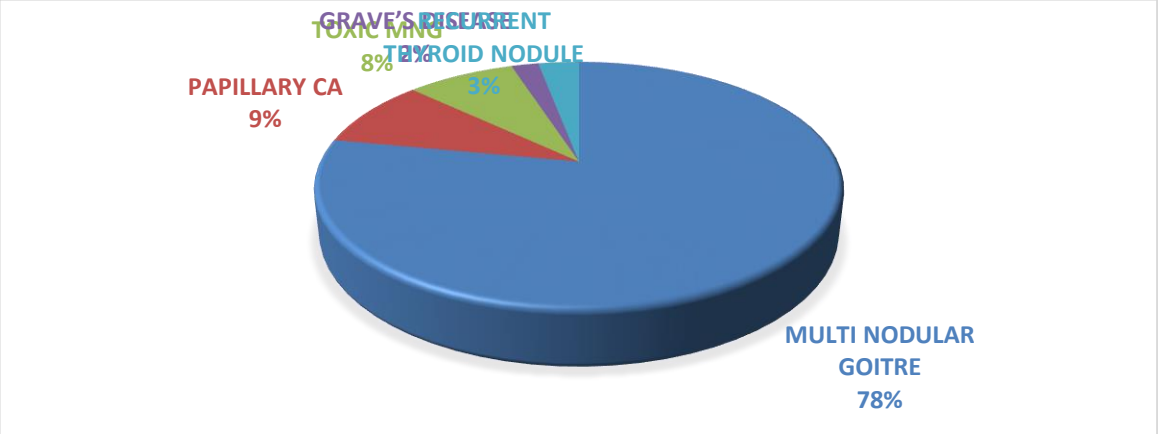


TABLE 11 : : DISTRIBUTION OF POST OP HPE REPORTS

POST OP HPE	NO OF PATIENTS	PERCENTAGE
NODULAR/COLLOID GOITRE	40	39%
CARCINOMA	25	24%
GRAVES DISEASE	3	3%
TOXIC MNG	4	4%
ADENOMA	15	14%
HASHIMOTO THYROIDITIS	17	16%

In this study, post op HPE of 39 % cases showed Nodular / Colloid Goitre, 24 % showed Papillary carcinoma thyroid, 3 % showed Graves disease, 4% showed Toxic MNG, 14% showed thyroid adenoma, 16% showed Hashimoto's / Lymphocytic Thyroiditis.

FIGURE 22 : DISTRIBUTION OF POST OP HPE REPORTS

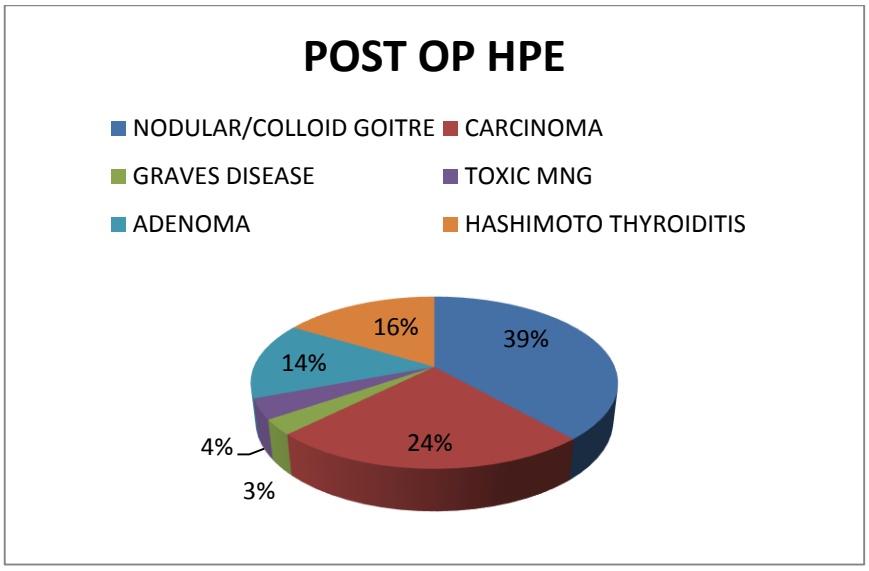


TABLE :12: DISTRIBUTION OF PRE OPERATIVE SERUM CALCIUM LEVEL

HPE DIAGNOSIS	PRE OP SERUM CALCIUM LEVEL	
	MEAN	SD
NODULAR/COLLOID GOITRE	10.27	0.87
CARCINOMA	9.62	0.7
GRAVES DISEASE	9.33	0.38
TOXIC MNG	9.82	0.61
ADENOMA	9.87	0.76
HASHIMOTO THYROIDITIS	9.56	0.82

In this study, Mean Pre operative Serum Calcium levels were normal for all cases.

FIGURE 23 : : DISTRIBUTION OF PRE OP SERUM CALCIUM LEVEL

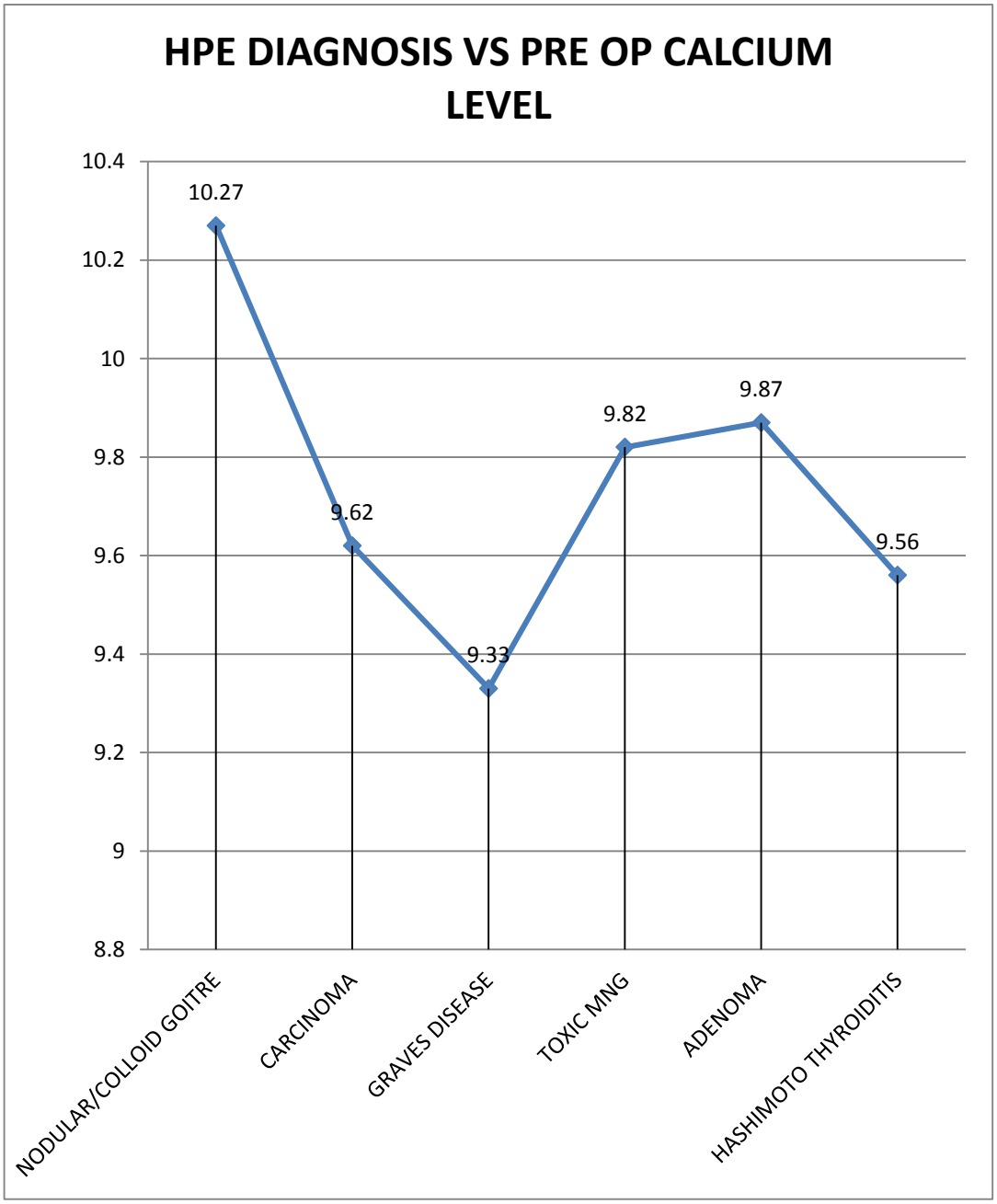


TABLE :13 CORRELATION OF DAY 1 SERUM CALCIUM LEVEL AND POST OP HPE

HPE DIAGNOSIS	DAY 1 SERUM CALCIUM LEVEL	
	MEAN	SD
NODULAR/COLLOID GOITRE	9.78	0.6
CARCINOMA	9	0.73
GRAVES DISEASE	9.03	0.75
TOXIC MNG	8.82	0.95
ADENOMA	9.47	0.59
HASHIMOTO THYROIDITIS	9.37	0.61
P VALUE - 0.001 SIGNIFICANT		

In this study, mean serum calcium level in 1st POD were found to be normal in all the cases. P value is 0.001 statistically significant.

TABLE 14 : CORRELATION OF DAY 2 SERUM CALCIUM LEVEL AND POST OP HPE

HPE DIAGNOSIS	DAY 2 SERUM CALCIUM LEVEL	
	MEAN	SD
NODULAR/COLLOID GOITRE	9.66	0.84
CARCINOMA	8.14	0.9
GRAVES DISEASE	8.56	0.73
TOXIC MNG	8.3	0.87
ADENOMA	9.6	0.81
HASHIMOTO THYROIDITIS	9.18	0.9
P VALUE - 0.001 SIGNIFICANT		

In this study, Toxic goitre cases and Malignancy cases on 2nd POD showed decreasing mean Serum Calcium levels. P value is 0.001 statistically significant.

FIGURE 24 : CORRELATION OF POST OP DAY 2 SERUM CALCIUM LEVEL AND POST OP HPE

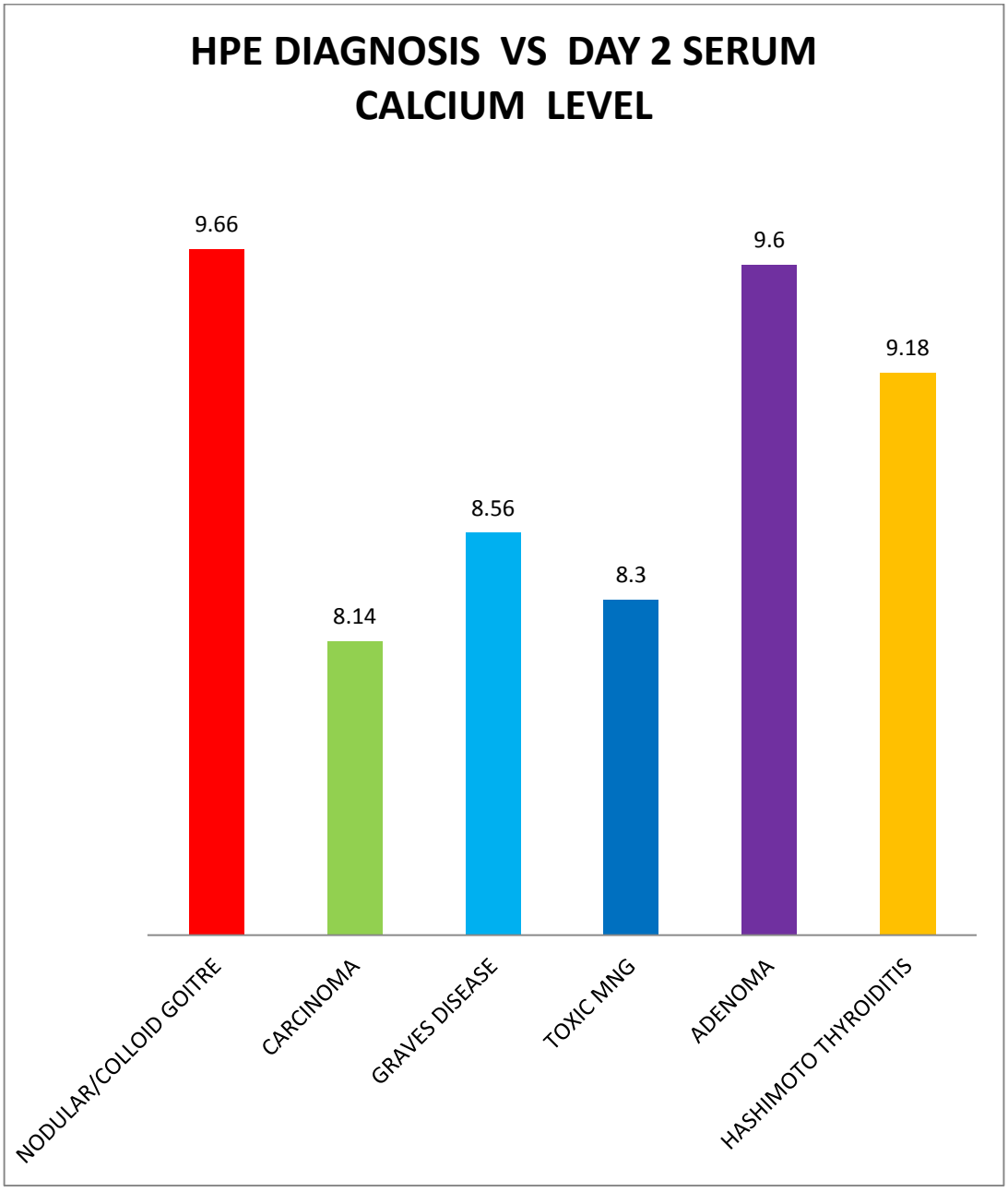


TABLE : 15 CORRELATION OF POST OP DAY 3 SERUM CALCIUM LEVEL AND POST OP HPE

HPE DIAGNOSIS	DAY 3 SERUM CALCIUM LEVEL	
	MEAN	SD
NODULAR/COLLOID GOITRE	9.54	1.15
CARCINOMA	7.96	1.21
GRAVES DISEASE	8.13	0.41
TOXIC MNG	7.65	0.57
ADENOMA	9.52	0.96
HASHIMOTO THYROIDITIS	8.95	1.21
P VALUE - 0.001 SIGNIFICANT		

In this study, on 3rd POD, Graves disease cases, Toxic MNG cases and thyroid malignancy cases showed significant decrease in Mean Serum Calcium Levels. P value is 0.001 statistically significant.

FIGURE 25 : CORRELATION OF POST OP DAY 3 SERUM CALCIUM LEVEL AND POST OP HPE

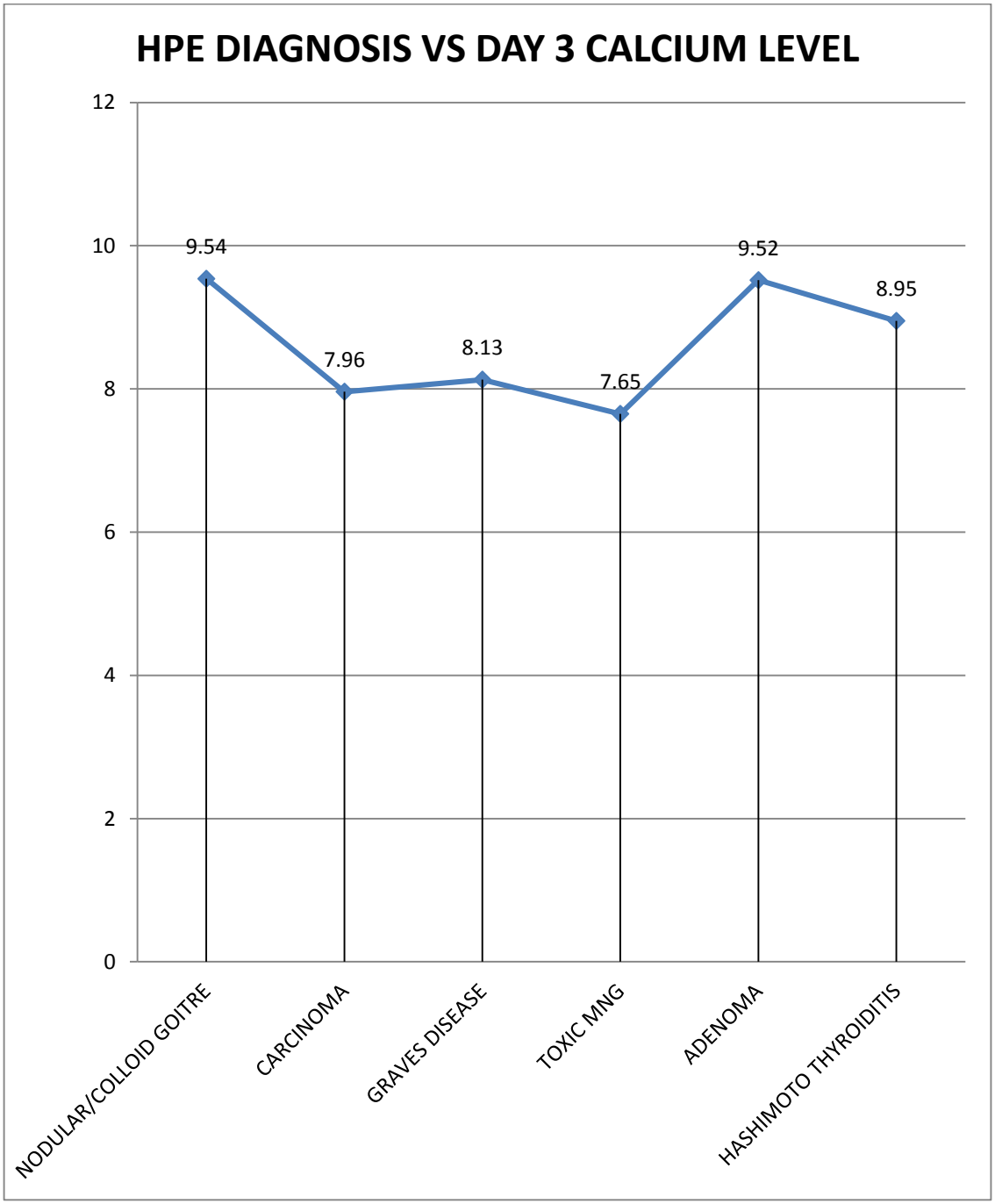


TABLE : 16 CORRELATION BETWEEN IONISED CALCIUM AND POST OP HPE

HPE DIAGNOSIS	IONISED CALCIUM LEVELS	
	MEAN	SD
NODULAR/COLLOID GOITRE	5.04	0.53
CARCINOMA	4.12	0.35
GRAVES DISEASE	4.33	0.28
TOXIC MNG	4.35	0.35
ADENOMA	4.94	0.48
HASHIMOTO THYROIDITIS	4.62	0.6
P VALUE - 0.001 SIGNIFICANT		

In this study, Toxic MNG cases, Graves Disease cases and malignancy cases showed decreased mean Ionised Calcium levels. P value is 0.001 , statistically significant.

FIGURE 26 : CORRELATION BETWEEN IONISED CA AND POST OP HPE

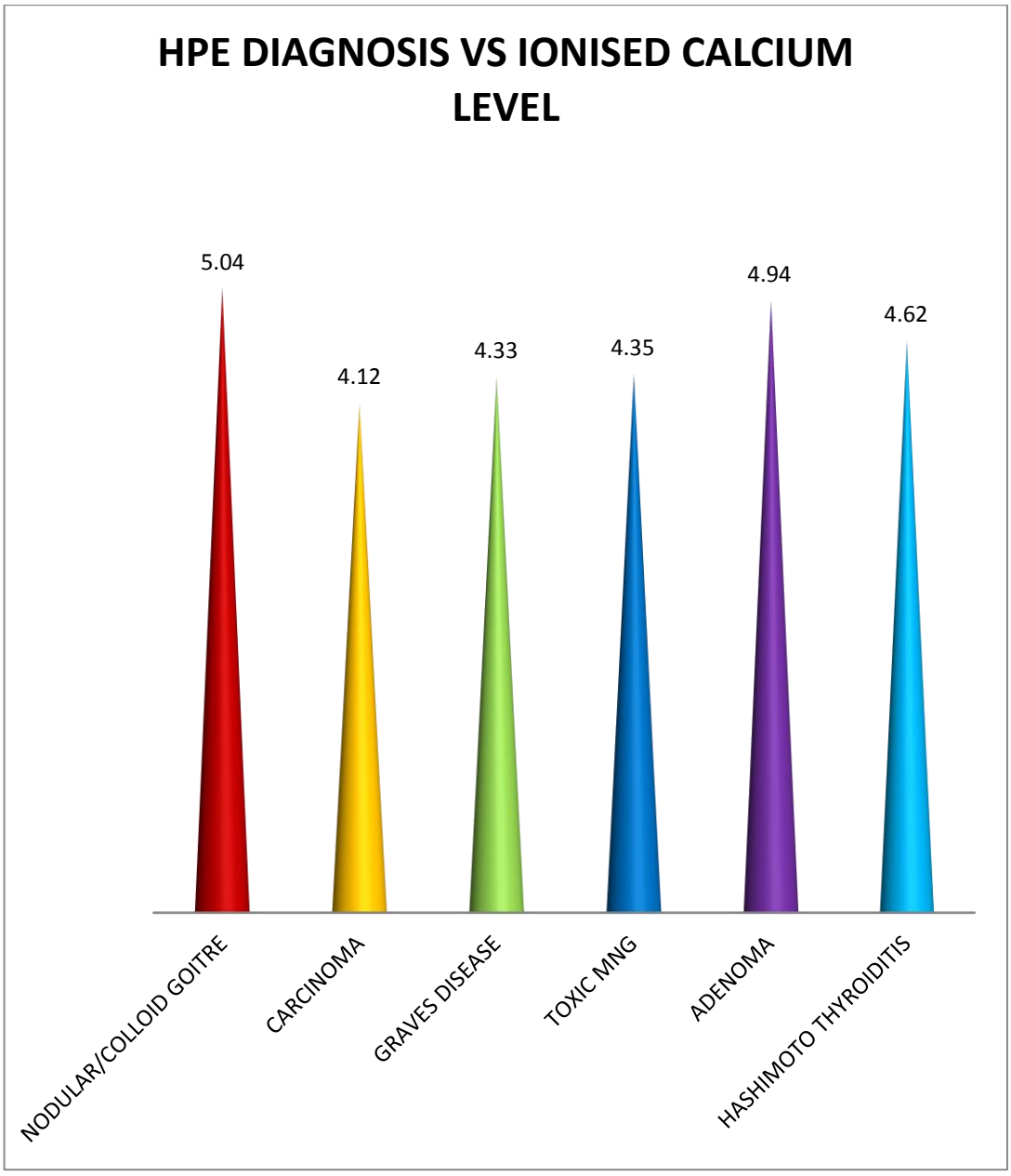


TABLE :17 CORRELATION OF POST OP HYPOCALCEMIA AND POST OF HPE

HPE DIAGNOSIS	MEAN SERUM CA LEVELS			
	PRE OP	DAY 1	DAY 2	DAY 3
NODULAR/COLLOID GOITRE	10.27	9.78	9.66	9.54
CARCINOMA	9.62	9	8.14	7.96
GRAVES DISEASE	9.33	9.03	8.56	8.13
TOXIC MNG	9.82	8.82	8.3	7.65
ADENOMA	9.87	9.47	9.6	9.52
HASHIMOTO THYROIDITIS	9.56	9.37	9.18	8.95

Post operative hypocalcemia is more in third POD in this study.

TABLE : 18 INCIDENCE OF POST OPERATIVE HYPOCALCEMIA IN RELATION TO POST OP HPE

HPE DIAGNOSIS	HYPOCALCEMIA		Percentage
	PRESENT	ABSENT	
NODULAR/COLLOID GOITRE	6	34	15%
CARCINOMA	15	10	60%
GRAVES DISEASE	2	1	66%
TOXIC MNG	4	0	100%
ADENOMA	3	12	20%
HASHIMOTO THYROIDITIS	7	10	41%

In this study,

Out of 104 cases, 15 % of nodular / colloid goitre , 60 % of thyroid malignancy cases, 85 % of Toxic Goitre cases, 20 % of Thyroid adenoma cases and of Hashimoto's / Lymphocytic thyroiditis cases had developed Post operative hypocalcemia.

FIGURE 27 : INCIDENCE OF POST OP HYPOCALCEMIA IN RELATION TO POST OP HPE

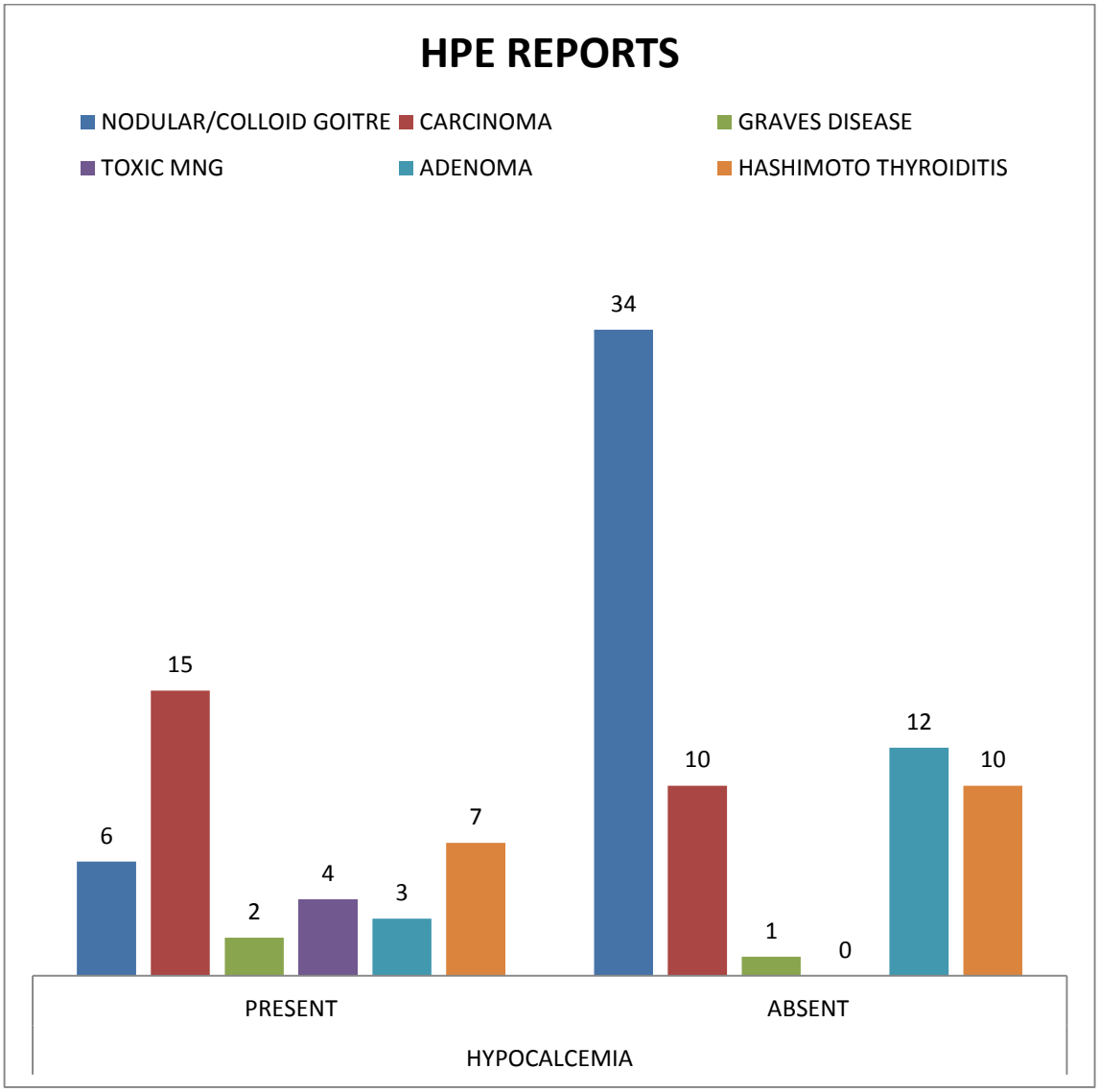


TABLE : 19 INCIDENCE OF POST OPERATIVE HYPOCALCEMIA IN RELATION TO DAY OF PRESENTATION

HPE DIAGNOSIS	HYPOCALCEMIA		
	DAY 1	DAY 2	DAY 3
NODULAR/COLLOID GOITRE	1	1	6
CARCINOMA	3	8	15
GRAVES DISEASE	0	1	2
TOXIC MNG	1	2	4
ADENOMA	0	0	3
HASHIMOTO THYROIDITIS	0	3	7

In this study, Totally 37 cases developed post operative hypocalcemia on 3rd POD.

FIGURE 28 : DAY OF PRESENTATION OF POST OPERATIVE HYPOCALCEMIA

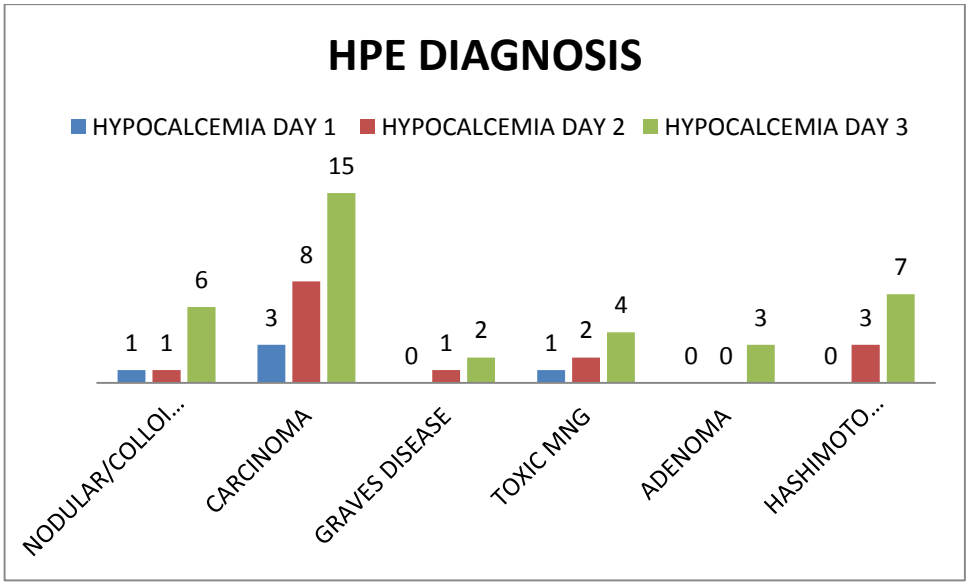


TABLE : 20 CORRELATION OF POST OP HYPOCALCEMIA AND IONISED CALCIUM LEVEL

IONISED CALCIUM LEVELS	NO OF PATIENTS	PERCENTAGE	Post op Hypocalcemia
< 4.5	57	55%	13
> 4.5	47	45%	0

Out of 57 patients with low ionized calcium 13 developed hypocalcemic features in this study.

FIGURE 29 : CORRELATION OF POST OP HYPOCALCEMIA AND IONISED CALCIUM LEVEL

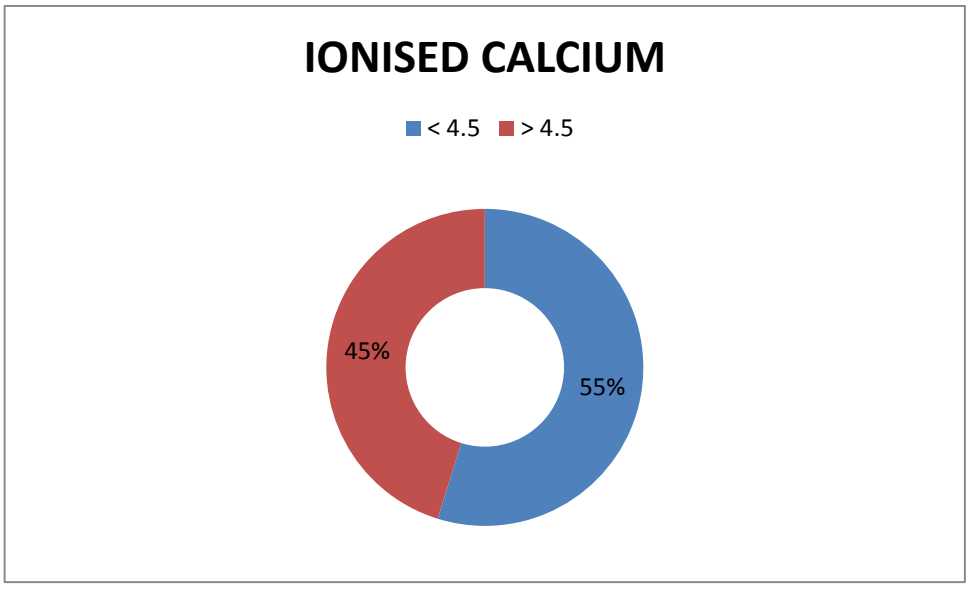


TABLE 21 : INCIDENCE OF CLINICAL PRESENTATION OF POST OP HYPOCALCEMIA

SYMPTOMS	NO OF PATIENTS	PERCENTAGE
PRESENT	25	24%
ABSENT	79	76%

In this study, 24 % of post operative cases were symptomatic ; remaining were asymptomatic.

FIGURE 30 : INCIDENCE OF CLINICAL PRESENTATION OF POST OP HYPOCALCEMIA

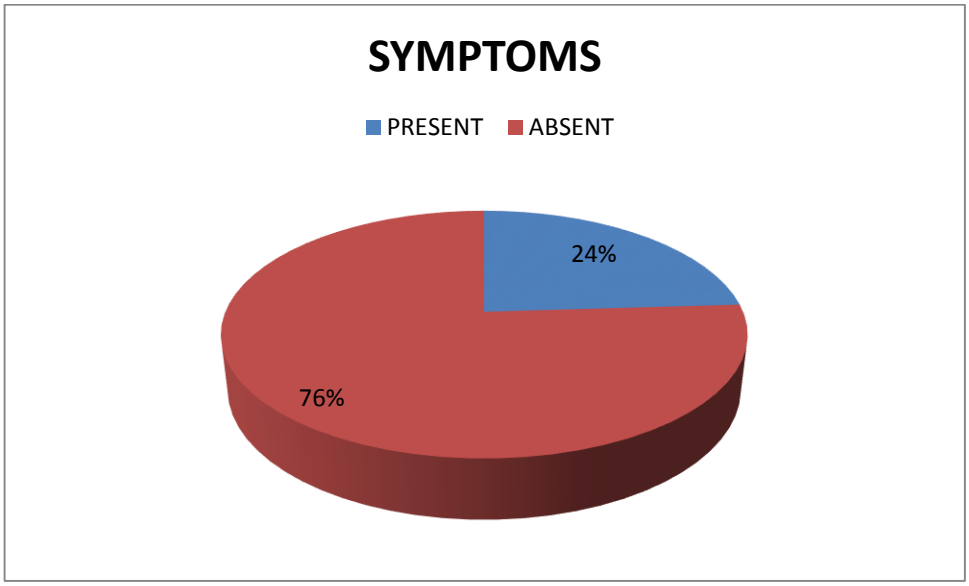


TABLE 22 : CLINICAL FEATURES OF POST OP HYPOCALCEMIAOF STUDY POULATION

SYMPTOMS	PRESENT	ABSENT
CARPOPEDAL SPASM	10	94
PERIORAL NUMBNESS	15	89
CHOVSTEK SIGN	7	97

Out of 104 cases ,37 were developed hypocalcemia,

10 cases developed carpopedal spasm, 15 cases had peri oral numbness and 7 cases had Chovstek Sign and 5 cases were asymptomatic hypocalcemia.

FIGURE 31 : INCIDENCE OF CLINICAL FEATURES OF POST OP HYPOCALCEMIA

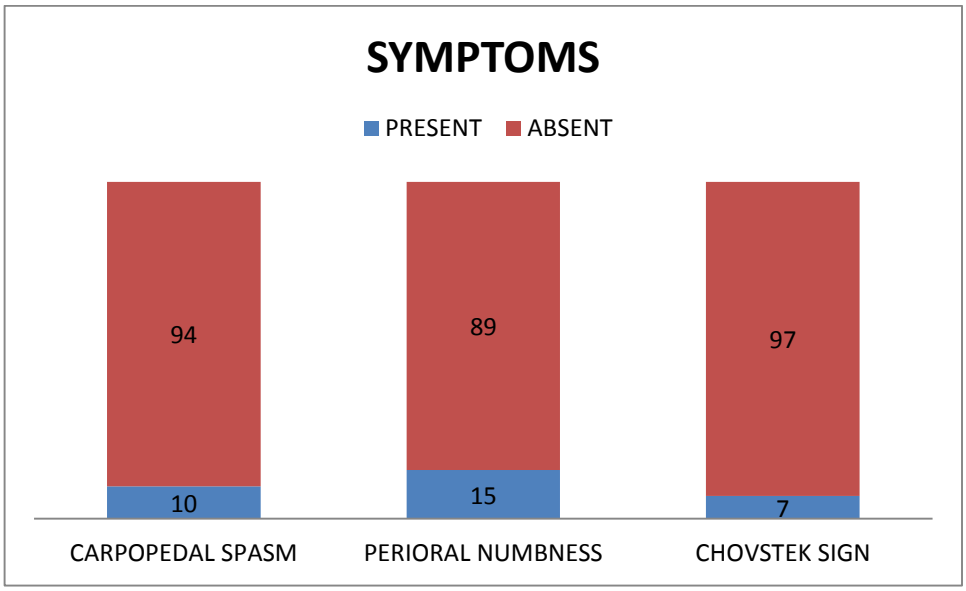


TABLE 23 : TREATMENT OF POST OP HYPOCALCEMIA

TREATMENT GIVEN	NO OF PATIENTS	PERCENTAGE
YES	37	35%
NO	67	65%

In this study out of 37 post operative hypocalcemia cases 25 were improved with oral calcium with vitamin D, 12 cases improved by IV calcium supplementation.

FIGURE 32 : TREATMENT OF POST OP HYPOCALCEMIA

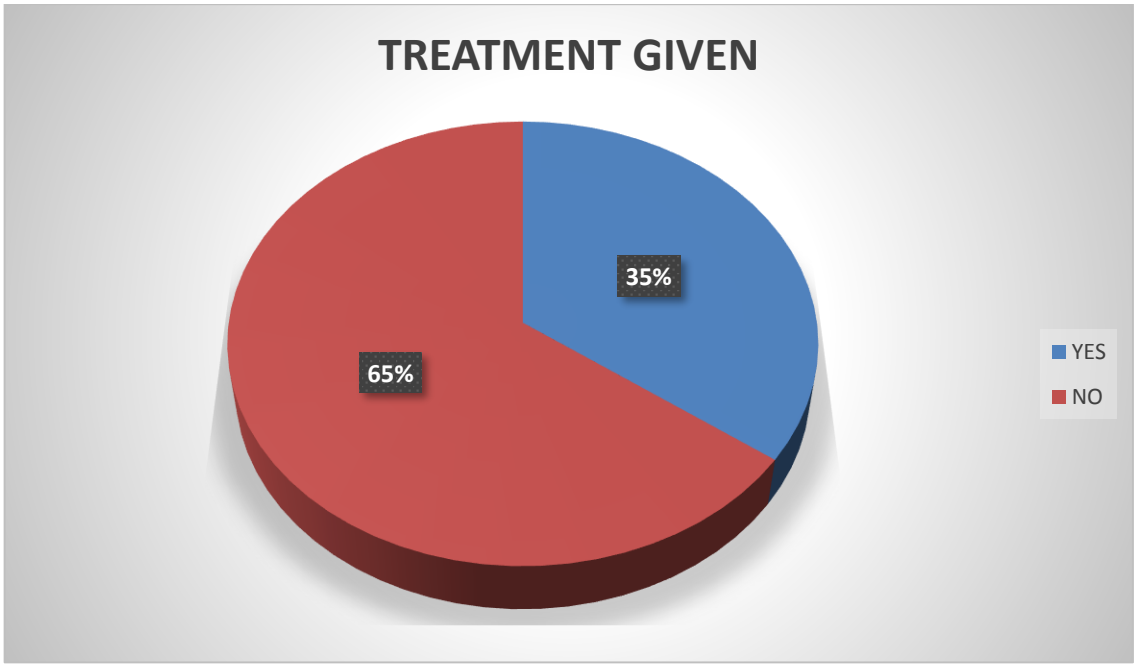
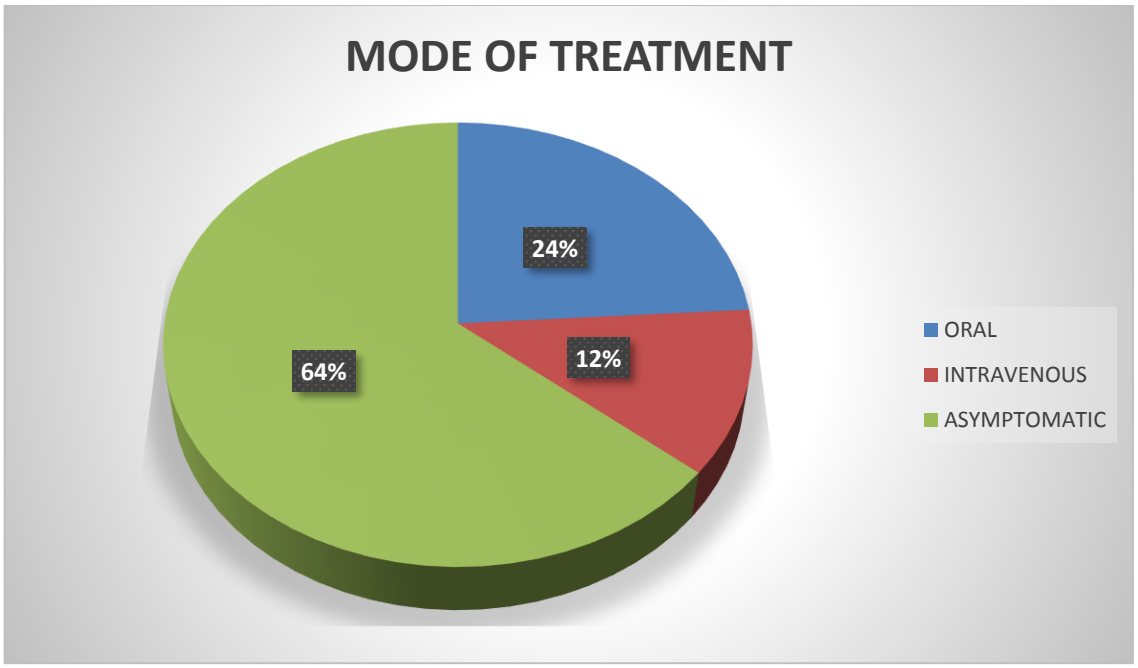


TABLE 24 : MODE OF TREATMENT

MODE OF TREATMENT	NO OF PATIENTS	PERCENTAGE
ORAL	25	24%
INTRAVENOUS	12	12%
ASYMPTOMATIC	67	64%

FIGURE 33 : MODE OF TREATMENT OF POST OP HYPOCALCEMIA



DISCUSSION

- In my study of 104 patients who with various thyroid pathology underwent total thyroidectomy or completion thyroidectomy consecutively during the period from July 2017 – June 2019.
- Most of our cases who underwent total thyroidectomy were female[female-97,male-7] most of them in the age group of 30-50 years.
- Colloid goitre or multi nodular goitre is the most common indication for surgery in my study.
- Risk factors like huge goitre, short neck, obesity, previous thyroid surgery, associated neck node dissection which increases the incidence of post operative hypocalcemia observed in my study**. Sakouti et al[(10)].,2010** was noted thyroid malignancy combined with neck node dissection increases the incidence of post operative hypocalcemia where as in **Noureldine et al[(11)].,2014** there is no association between neck node dissection and hypocalcemia but randomised controlled trial showed that patients who undergone neck node dissection along with thyroidectomy were at high risk of developing post operative hypocalcemia.

- Incidence of post operative hypocalcemia [serum ca <8.5mg/dl].

According to various study

Table 25: Incidence of post operative hypocalcemia

Thomson et al (2005)	4.1%
Sesson et al[12]., (2007)	6.6%
American college of surgeons.,[6] (2013)	8%
McKenzie et al[13]., (2013)	27%
Present study	**37%**

Transient/temperory hypocalcemia usually lasts for 2 months maximum upto 6 months.permanent hypocalcemia which continues beyond 6 months.

Table 26: Incidence of Transient and permanent hypocalcemia

Study	**Transient**	**Permanent**
Thomusch et al[14](2003)	7.3%	1.5%
Ganecalvesseries(2010)	25.5%	5.1%
Fahmy et al[15](2004)	5.4-26%	0.5-24%
Karamanakos et al[160(2010)	6.9-46%	0.4- 33%
present study	**33.5%**	**1.9%**

In my study thyroid malignancy and toxic goitre which were increases the incidence of post operative hypocalcemia where as **Burge et al[17].,1998** in his study he also found that permanent post operative hypocalcemia common in thyroid malignancy and the patients with graves disease had transient hypocalcemia following total thyroidectomy.

Wingert et al[18].,1986 noted postop hypocalcemia in thyroid malignancy patients was 25%, toxic goitre -11.4%, multi nodular goitre - 3.6%.

Present study – the incidence of hypocalcemia in thyroid malignancy -60%, toxic goitre -85%, hashimoto's thyroiditis -41%, nodular goitre -15%.

Postop hypocalcemia commonly occurred in 3rd POD. Perioral numbness is the most common early symptom observed in my study.

Symptomatic hypocalcemia according to various studies

Table 27: Incidence of symptomatic hypocalcemia

GacEP et al.,[19] (2014)	15%
Wingert et al.,[18] (1986)	12.5%
Scanlon et al.,[20] (2006)	20%
Jacobs et al (2013)	27.77%
Present study	**24%**

Identification of parathyroid glands and its preservation of blood supply by meticulous dissection and auto transplantation of parathyroid gland while accidental removal which may decreases the incidence of post operative hypocalcemia.

Gavilan et al[21].,1986 used intravenous methylene blue , **Sofola et al[2].,2001** used polarized spectra imaging, **Pederson et al[22].,2003** used portal gamma camera with setstambi radio tracer used for identification of parathyroid glands.

In my study Parathyroid autotrasplantation which decreases the incidence of post operative hypocalcemia. **Zedenius et al[23].,1999 and Lo and lam[4].,1998** concluded that after routinely transplanting atleast one parathyroid gland into sternocleidomastoid muscle , there is no permanent hypoparathyroidism in 100 consecutive cases undergoing total thyroidectomy.

Postoperative monitoring of serum calcium and parathormone level is essential for treating hypocalcemia. **Asari et al[7].,2008** and **O Edafe et al[24].,2014** noted parathormone level **Terries et Al[25].,2009** estimation of serum calcium level are effective predictor for monitoring and correcting postop hypocalcemia.

Adequate and timely intervention and finally proper followup is necessary in patients at risk and developing transient or permanent hypocalcemia following total thyroidectomy. **Kanis et al[26].,2012** recommended the duration of oral calcium supplementation with or without vitamin D3 for 3-6 months in correcting severe hypocalcemia [seru ca <7.5mg/dl]. **Moore et al[27].,2001** recommended that routine calcium supplementation prior to discharge for all total thyroidectomy patients.

CONCLUSION

1. I concluded that transient hypocalcemia is the most common complication following total thyroidectomy.
2. The incidence of post operative hypocalcemia is 36% [transient hypocalcemia 33.5% and permanent hypocalcemia 1.9%].
3. Proper planning and meticulous surgical techniques needed in localisation and preserve blood supply to the parathyroids by ligating the branches of inferior thyroid artery individually without any compromise in parathyroid blood supply especially in thyroid malignancy ,toxic goitre and Hashimoto's thyroiditis.
4. Incidence of post operative hypocalcemia more in thyroid malignancy and toxic goitre.
5. The risk factors like huge goitre , short neck, obesity,previous thyroid surgery and associated neck node dissection increases the incidence of postop hypocalcemia.
6. To implement the newer techniques like parathyroid autotranplantation , use of ultrasonic enhanced bipolar diathermy which may help in decreasing the incidence of postop hypocalcemia.
7. Pre and postop monitoring of serum calcium levels is essential for diagnosis , treatment and follow up of patients with hypocalcemia.

8. Adequate and timely intervention is necessary in patients at risk for post operative hypocalcemia and for treatment of all symptomaric patients with calcium and vitamin D3 supplementation .
9. Finally a proper follow up schedule is mandatory in all patients undergoing total thyroidectomy who developed hyopocalcemia in their post operative period.

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PROFOMA

Name of the patient:

Age:

Sex:

IP number:

Unit:

Address:

Date of admission:

Date of surgery:

Date of discharge:

Number of stay in hospital: Pre operative: Post operative:

Clinical presentation:

H/O Swelling preset over the front of neck/Pain/Compressive symptoms/Features of hyper or hypothyroidism/Others

Duration:

Size of the swelling:

Type of the swelling: Nodular/ Diffuse swelling

Any other systemic illness:

Indication for surgery:

Surgery done:

Surgical notes:

Complete haemogram:

FNAC:

Histopathology:

Anaesthesia:

Difficulty in intubation: Yes/No

Duration of surgery:

Any excessive bleeding during surgery: Yes/No

Any transfusion during surgery: Yes/No

Recurrent laryngeal nerve identified or not

Parathyroid identified or not

Any evidence of parathyroid in thyroidectomy specimen

Reimplantation of parathyroid done or not

Drain

After extubation vocal cord examination

Any immediate post operative complication – prolonged recovery / tension hematoma / stridor / tracheal or oesophageal perforation / thyroid crisis

Post operative infection – yes / no

Antibiotics used

Post op serum calcium

POD1

POD2

POD3

Clinical features of hypocalcemia in postoperative period –

Time of onset

Initial presentation

நோயாளிகளுக்கு அறிவிப்பு மற்றும் ஒப்புதல் படிவம்
(மருத்துவ ஆய்வில் பங்கேற்பதற்கு)

ஆய்வு செய்யப்படும் தலைப்பு:
பங்கு பெறுவரின் பெயர்:
பங்கு பெறுவரின் வயது:

		பங்கு பெறுவர் இதனை ✓ குறிக்கவும்
1.	நான் மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்களை படித்து புரிந்து கொண்டேன். என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டுள்ளது என அறிந்து கொண்டேன்.	☐
2.	நான் இவ்வாய்வில் தன்னிச்சையாக தான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும், எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.	☐
3.	இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்து மேலும் ஆய்வு மேற்காள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.	☐
4.	இந்த ஆய்வின் மூலம் கிடைக்கும் தகவலையோ, முடிவையோ பயன்படுத்திக் கொள்ள மறுக்க மாட்டேன்.	☐
5.	இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக் கொள்கிறேன் எனக்கு கொடுக்கப்பட்டஅறிவுரைகளின் படி 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 அளிக்றேன்.	☐

பங்கேற்பவரின் கையொப்பம் / ..... இடம் .....
கட்டைவிரல் ரேகை
பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....
ஆய்வாளரின் கையொப்பம் /..... இடம் .....
ஆய்வாளரின் பெயர் .....
மையம் .....
கல்வியறிவு இல்லாதவற்கு (கைரேகை வைத்தவர்களுக்கு) இது அவசியம் தேவை
சாட்சியின் கையொப்பம் /..... இடம் .....
பெயர் மற்றும் விலாசம் ....

Sl.No.	PATIENT NAME	AGE	SEX	IP NO	PRE OP INDICATION	DOS	POST OP HPE		RISK FACTORS	PRE OP S.CALCIUM	POD-1	POD-2	POD-3	S.ALBUMIN	HYPOCALCEMIA OR NOT	IONIZED CA	SIGNS & SYMPTOMS ON 4TH POD	TREATMENT	TRANSIENT/PERMANENT
1	RAMALAKSHMI	39	F	695	MNG	1-13-2017	LYHOCYTIC THYROIDITIS	HASHIMOTO S THYROIDITIS		10.4	9.6	10	9.7	4	NO	5.5	NIL		
2	BACKIYAMANI	35	F	4739	TOXIC MNG	1-31-2017	COLLOID RICH NODULAR GOITRE	NODULAR/COLLOID GOITER		8.8	8.6	9.2	9.6	3.5	NO	5	NIL		
3	PUSHPAVALLI	65	F	3176	RECURRENT THYROID NODULE	2-2-2017	SIMPLE COLLOID GOITRE	NODULAR/COLLOID GOITER	SHORT NECK/OBESITY	8.9	8.8	8.5	8	3	YES	4	PERIORAL NUMBNESS	ORAL	T
4	GURUVAMMAL	53	F	4773	TOXIC MNG	1-20-2017	FOLLICULAR ADENOMA	ADENOMA		9	9.2	8.8	9	4.5	NO	5.2	NIL		
5	KALIAMMAL	52	F	8908	MNG	2-18-2017	COLLOID RICH NODULAR GOITRE	NODULAR/COLLOID GOITER		10.8	9.6	10.2	10.8	3.5	NO	5.8	NIL		
6	VALLIAMMAL	63	F	3701	TOXIC GOITER	1-28-2017	GRAVES DISEASE	GRAVE S DISAESE		8.8	9	8.3	8	3.5	YES	4.5	NIL	ORAL	T
7	LATHA	49	F	4775	MNG	2-7-2017	COLLOID RICH NODULAR GOITRE	NODULAR/COLLOID GOITER		10.8	9.6	10.2	10.8	4	NO	5	NIL		
8	ANGAMMAL	40	F	9615	MNG	3-3-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		10.5	8.9	6.8	6.2	3	YES	3.7	CARPOPEDAL SPASM	I.V	T
9	USHA	34	F	6364	MNG	1-26-2017	HYPERPLASTIC GOITRE	NODULAR/COLLOID GOITER		10.7	9.6	8.8	9	4	NO	4.5	NIL		
10	CHANDRA	50	F	14598	MNG	3-17-2017	COLLOID RICH NODULAR GOITRE	NODULAR/COLLOID GOITER		11	10.2	10.7	9.7	4	NO	5.5	NIL		
11	RAJAMMAL	60	F	48292	MNG	7-20-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		8.8	9.5	8.8	9.8	3.5	NO	4.5	NIL		
12	ANTHONY MARY	43	F	12912	TOXIC MNG	2-19-2017	NODULAR GOITRE WITH TOXIC FEATURE	TOXIC MNG	HUGE GOITER	10.2	7.4	7.2	6.8	3	YES	3.8	CARPOPEDAL SPASM	I.V	T
13	PREMA	32	F	14462	SNG - PAPILLARY CA	2-20-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		8.9	9	8.8	8.2	3.5	YES	3.7	PERIORAL NUMBNESS	ORAL	T
14	MALLIGA	40	F	16181	MNG	3-21-2017	GOLLOID GOITRE WITH CYSTIC DEGENERATION	NODULAR/COLLOID GOITER		9.8	10.2	10	9.6	4	NO	5	NIL		

Sl.No.	PATIENT NAME	AGE	SEX	IP NO	PRE OP INDICATION	DOS	POST OP HPE		RISK FACTORS	PRE OP S.CALCIUM	POD-1	POD-2	POD-3	S.ALBUMIN	HYPOCALCEMIA OR NOT	IONIZED CA	SIGNS & SYMPTOMS ON 4TH POD	TREATMENT	TRANSIENT/PERMANENT
15	KARUNAI POOBATHI	36	F	17886	MNG	3-24-2017	NODULAR GOITRE WITH CYSTIC DEGENERATION	NODULAR/COLLOID GOITER	SHORT NECK/OBESITY	11.2	10.2	9.2	7.8	3	YES	4.4	PERIORAL NUMBNESS	ORAL	T
16	PARVATHI	47	F	22886	MNG	4-20-2017	HYPERPLASTIC GOITRE	NODULAR/COLLOID GOITER		9.6	9.2	10	10.6	3.5	NO	5	NIL		
17	PAUL THAI	35	F	32668	MNG	5-18-2017	FOLLICULAR ADENOMA BACKGROUND - COLLOID	ADENOMA		9.2	10.2	10.6	9.8	4	NO	5.5	NIL		
18	MARIYAMMAL	42	F	53242	MNG	8-4-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		9.6	9.4	8	7.9	3.5	YES	4	CHVOSTEK SIGN ,PERIORAL NUMBNESS	ORAL	T
19	ARPUTHAKANI	29	F	43560	MNG	7-4-2017	FOLLICULAR ADENOMA	ADENOMA		10.6	9.2	10.6	9.4	4	NO	5.5	NIL		
20	ROOBAVATHI	23	F	53281	PAPILLARY CA THYROID	7-18-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		10.2	8.9	7.6	7.5	3	YES	4	NIL	ORAL	T
21	RADHA	42	F	56862	MNG	8-20-2017	COLLOID RICH NODULAR GOITRE	NODULAR/COLLOID GOITER		11.2	10	10.2	9.8	4	NO	5.5	NIL		
22	POONGODI	49	F	60350	MNG	9-9-2017	ADENOMATOUS GOITRE	ADENOMA		10.8	9.6	8.5	8	3.5	YES	5	NIL	ORAL	T
23	ROSALI	40	F	60298	MNG	10-12-2017	COLLOID GOITRE	NODULAR/COLLOID GOITER		10.2	10.6	10.4	10.8	4	NO	5.5	NIL		
24	LINGAMMAL	50	F	62043	MNG	9-16-2017	NODULAR GOITRE	NODULAR/COLLOID GOITER	HUGE GOITER	9.6	10.2	8.8	9	3.5	NO	5.5	NIL		
25	IYAMMAL	33	F	62044	MNG	11-2-2017	HYPERPLASTIC GOITRE	NODULAR/COLLOID GOITER	SHORT NECK/OBESITY	11	10.5	9.8	10.6	4	NO	5	NIL		
26	SELVI	51	F	66338	MNG	11-7-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		8.8	9	6.8	7.6	3	YES	4	CHVOSTEK SIGN ,PERIORAL NUMBNESS	ORAL	T
27	KANI	37	F	79830	MNG	11-2-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		11.6	10	11.4	10.8	3.5	NO	6	NIL		

Sl.No.	PATIENT NAME	AGE	SEX	IP NO	PRE OP INDICATION	DOS	POST OP HPE		RISK FACTORS	PRE OP S.CALCIUM	POD-1	POD-2	POD-3	S.ALBUMIN	HYPOCALCEMIA OR NOT	IONIZED CA	SIGNS & SYMPTOMS ON 4TH POD	TREATMENT	TRANSIENT/PERMANENT
28	GEETHA	37	F	94144	MNG	11-19-2017	NODULAR GOITRE	NODULAR/COLLOID GOITER	HUGE GOITER	10.8	9.8	8.9	8	3.5	YES	5	NIL		
29	NANGAI	40	F	42218	MNG	6-22-2017	COLLOID GOITRE	NODULAR/COLLOID GOITER		11.2	9.7	10.2	10	4	NO	5.5	NIL		
30	ESAKKIAMMAL	35	F	34640	MNG	6-10-2017	FOLLICULAR ADENOMA BACKGROUND - COLLOID	ADENOMA		10	8.9	8.8	8	3.5	YES	4	NIL	ORAL	T
31	POTTU	67	F	88695	MNG	12-25-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.7	10.2	9	10.6	4	NO	4.5	NIL		
32	MARIYAMMAL	50	F	55684	MNG	8-31-2017	NODULAR GOITRE	NODULAR/COLLOID GOITER	OBESITY/SHORT NECK	11.6	9.2	10	10.8	4	NO	4.5	NIL		
33	RAMASAMY	34	M	57383	MNG	8-24-2017	NODULAR COLLOID GOITRE	NODULAR/COLLOID GOITER		9.8	10.2	9.8	10	4	NO	5	NIL		
34	PITCHAMMAL	66	F	25501	MNG	5-12-2017	LYHOCYTIC THYROIDITIS	HASHIMOTO S THYROIDITIS		9.6	9.4	8.8	10.7	4	NO	4.5	NIL		
35	BALAMMAL	65	F	21285	MNG	4-14-2017	NODULAR GOITRE	NODULAR/COLLOID GOITER		10.1	9.8	8.5	8.8	4	NO	5	NIL	ORAL	T
36	SHENBAGAVALLI	38	F	26642	MNG	5-9-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		9.8	8.6	8.7	8	3.5	YES	4.5	NIL	ORAL	T
37	PAPPATHI	35	F	21286	MNG	4-14-2017	NODULAR GOITRE	NODULAR/COLLOID GOITER		10.2	10.8	10.4	10.3	4	NO	5.5	NIL		
38	RAMANI	55	F	36504	MNG	6-2-2017	NODULAR GOITRE	NODULAR/COLLOID GOITER		9.6	9.5	8.5	8	3	NO	4.5	NIL		
39	SORNAKILI	39	F	34522	MNG	6-12-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.4	9	8.5	7.8	3	YES	4	PERIORAL NUMBNESS	ORAL	T
40	POORNAM	50	F	30762	MNG	5-12-2017	COLLOID GOITRE	HASHIMOTO S THYROIDITIS	HUGE GOITER	11	9.2	8.4	8	4	YES	4.5	CHVOSTEK SIGN ,PERIORAL NUMBNESS		
41	VELLAMMAL	43	F	47563	MNG	7-14-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		10.2	9.3	9	7.8	3.5	YES	4	NIL	ORAL	T
42	VASANTHA	46	F	47578	MNG	7-14-2017	LYHOCYTIC THYROIDITIS	HASHIMOTO S THYROIDITIS		8.8	8.5	8.9	8.6	4	NO	4	NIL		

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43	ESAKKIAMMAL	31	F	44116	MNG	6-28-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		10.6	9.8	10.1	11.2	4	NO	5	NIL		
44	SARASWATHI	53	F	43079	MNG	7-3-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		9.2	9.5	8.6	8.5	3.5	NO	4.5	NIL	ORAL	
45	JEYALAKSHMI	49	F	50282	MNG	8-20-2017	ADENOMATOUS GOITRE	ADENOMA		9.6	9.2	9.8	10	4	NO	5	NIL		
46	BATRAKHALI	55	F	43071	SNG - RIGHT LOBE THYROID	6-27-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID	PREVIOUS THYROID SURGRY	8.8	7.6	7.4	6.8	3	YES	3.5	CARPOPEDAL SPASM	I.V	P
47	ESAKKIAMMAL	32	F	44103	TOXIC MNG	7-4-2017	NODULAR GOITRE WITH TOXIC FEATURE	TOXIC MNG		10.1	9.3	8	7.8	3.5	YES	4.5	CHVOSTEK SIGN ,PERIORAL NUMBNESS	ORAL	T
48	PARAMESHWARI	31	F	45901	MNG	7-7-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		9.8	8.7	9.2	10	4	NO	5	NIL		
49	VICTORIA	63	F	83193	MNG	12-2-2017	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS	HUGE GOITER	9.6	9.6	9	8.2	3	YES	4	NIL	ORAL	T
50	SHANTHI	45	F	88728	MNG	12-19-2017	MNG	NODULAR/COLLOID GOITER		10.1	9.4	9.6	10	4	NO	5	NIL		
51	BHARATARATHNA	49	F	85741	MNG	12-23-2017	MNG	NODULAR/COLLOID GOITER		10.8	9.3	9	8.9	3.5	NO	4	NIL	ORAL	T
52	ARULSELVI	52	F	90729	PAPILLARY CA THYROID	12-25-2017	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		8.8	8.8	8.5	7.9	3	YES	4	CHVOSTEK SIGN ,PERIORAL NUMBNESS	ORAL	T
53	KANAGAMANI	65	F	38384	TOXIC MNG	6-10-2017	TOXIC MNG	TOXIC MNG		8.9	9.2	9	8	3.5	YES	4.5	PERIORAL NUMBNESS	ORAL	T
54	RAJESWARI	45	F	92838	MNG	12-31-2017	COLLOID GOITRE	NODULAR/COLLOID GOITER	SHORT NECK/OBESITY	10.8	9.8	10.2	11.2	4	NO	5	NIL		
55	NOORJHAHAN	60	F	27739	TOXIC GOITER	6-2-2017	GRAVES DISEASE	GRAVE S DISAESE		8.9	8.9	9.4	8.6	3	NO	4.5	NIL		
56	GURUTHAI	37	F	14681	MNG	12-28-2017	NODULAR GOITRE	NODULAR/COLLOID GOITER		9.2	8.6	8.8	9	4	NO	5	NIL	ORAL	T

Sl.No.	PATIENT NAME	AGE	SEX	IP NO	PRE OP INDICATION	DOS	POST OP HPE		RISK FACTORS	PRE OP S.CALCIUM	POD-1	POD-2	POD-3	S.ALBUMIN	HYPOCALCEMIA OR NOT	IONIZED CA	SIGNS & SYMPTOMS ON 4TH POD	TREATMENT	TRANSIENT/PERMANENT
57	RAKKAMMAL	50	F	5611	MNG	2-9-2018	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		10.2	9.6	8.7	8.9	3	NO	4.5	NIL		
58	SELVABAKIYAM	63	F	18122	RECURRENT THYROID NODULE	3-12-2018	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		8.7	8.8	7.2	7	3.5	YES	4	CARPOPEDAL SPASM	I.V	T
59	JEBAMANI	49	F	35949	MNG	6-4-2018	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		10	9.7	9.7	8.6	3.5	NO	4.5	NIL		
60	MAHALAKSHMI	45	F	50287	MNG	7-12-2018	FOLLICULAR ADENOMA - BACKGROUND COLLOID	ADENOMA		10.8	10.2	10.7	10.4	4	NO	5.5	NIL		
61	GANDHI	33	F	60478	SNG - PAPILLARY CA	9-3-2018	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		10.4	9.9	8.6	8.5	3	NO	4.5	NIL		
62	LATHA	39	F	6786	MNG	6-24-2018	NODULAR GOITRE	NODULAR/COLLOID GOITER		10.2	9.8	8.8	10	3.5	NO	4.6	NIL		
63	MADASAMY	37	M	66550	TOXIC MNG	10-9-2018	NODULAR GOITRE WITH TOXIC FEATURE	NODULAR/COLLOID GOITER		11.2	10.6	10	9.8	4	NO	5	NIL		
64	MAHESHWARI	38	F	71451	SNG LEFT LOBE OF THYROID	10-24-2018	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.7	7.4	7	6.8	3	YES	3.8	CARPOPEDAL SPASM	I.V	T
65	ANISHA FATHIMA	42	F	76736	MNG	11-6-2018	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.2	8.6	8.9	8	3.5	YES	4	NIL	ORAL	T
66	THANGAMARIAPPAN	45	M	80012	MNG	11-20-2018	NODULAR GOITRE WITH LYPHOCYTIC THYROIDITIS	NODULAR/COLLOID GOITER		10.2	9.8	10.6	9.2	4	NO	5.5	NIL		
67	AROGYA ALPHONSE	34	M	90554	MNG	12-12-2018	FOLLICULAR VARIANT OF PAPPILARY CA	CARCINIMA THYROID	HUGE GOITER	9.2	9	8.8	8	3	YES	4	PERIORAL NUMBNESS	ORAL	T
68	RAJESWARI	45	F	92838	MNG	12-23-2018	FOLLICULAR ADENOMA	ADENOMA		10.8	9.7	10.7	11	4	NO	5.5	NIL		
69	SORNALASKHMI	32	F	32898	MNG	5-28-2018	NODULAR GOITRE	NODULAR/COLLOID GOITER		10.6	9.7	9	8	3.5	YES	4.5	NIL	ORAL	T
70	SARALBEEVI	46	F	45443	MNG	7-5-2018	COLLOID GOITRE	NODULAR/COLLOID GOITER		11.8	10.2	10.6	9.8	4	NO	5.5	NIL		

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71	SUBBULAKSHMI	45	F	45283	MNG	6-29-2018	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		10.6	11	10.4	10.2	3.5	NO	5.5	NIL		
72	MUTHULAKSHMI	40	F	47536	MNG	7-12-2018	FOLLICULAR ADENOMA BACKGROUND-HASHIMOTO	ADENOMA		9.9	9.4	8.6	10.2	4	NO	4.5	NIL		
73	VALLIAMMAL	42	F	32900	MNG	5-20-2018	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.8	9.7	8.5	8.8	3.5	NO	4.5	NIL		
74	THIRUPATHI	37	F	30847	TOXIC MNG	5-11-2018	GRAVES DISEASE	GRAVE S DISAESE	SHORT NECK/OBESITY	10.3	9.2	8	7.8	4	YES	4	CHVOSTEK SIGN ,PERIORAL NUMBNESS	ORAL	T
75	ANISHA FATHIMA	25	F	76736	MNG	7-28-2018	COLLOID GOITRE	NODULAR/COLLOID GOITER		9.9	8.8	10.2	10	3.5	NO	5.5	NIL		
76	MEENAKSHI	38	F	33285	MNG	6-11-2018	ADENOMATOUS GOITRE	ADENOMA		10.2	10.8	9.6	10	4	NO	5	NIL		
77	SUNDAR	43	M	25755	MNG	4-15-2019	FOLLICULAR ADENOMA	ADENOMA		9.6	8.5	9.6	8	3.5	YES	5	CHVOSTEK SIGN ,PERIORAL NUMBNESS		
78	KALAIVANI	20	F	23902	MNG	4-7-2019	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.6	8.8	8.5	8.8	3	NO	4.5	NIL		
79	THAMARAISELVI	45	F	23453	MNG	4-21-2019	NODULAR COLLOID GOITRE	NODULAR/COLLOID GOITER	HUGE GOITER	10.2	9.6	10.3	10	4	NO	5.5	NIL		
80	MURUGAN	51	M	803	MNG	1-22-2019	FOLLICULAR ADENOMA	ADENOMA		9.2	9.6	9	10.2	4	NO	4.5	NIL		
81	ESAKKIAMMAL	26	F	10977	MNG	2-23-2019	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		10.4	8.6	6.7	6.6	3	YES	3.7	CARPOPEDAL SPASM	I.V	T
82	DHANAROSELIN	34	F	12934	MNG	3-7-2019	COLLOID G0ITRE	NODULAR/COLLOID GOITER		11.4	10.9	11	11.6	3.5	NO	5.6	NIL		
83	SHANTHI	52	F	14681	RECURRENT THYROID NODULE	3-8-2019	COLLOID GOITRE	NODULAR/COLLOID GOITER	PREVIOUS THYROID SURGRY	8	8.2	7.4	6.2	3	YES	3.5	CARPOPEDAL SPASM	I.V	T

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84	PANNERSELVAM	58	F	15263	MNG	3-9-2019	FOLLICULAR NEOPLASM	CARCINIMA THYROID		8.8	9.2	9.6	10	4	NO	5	NIL		
85	AVUDAIAMMAL	44	F	15462	MNG	3-18-2019	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.2	9	8.8	8.5	3	NO	4	NIL	ORAL	T
86	ANADHALAKSHMI	38	F	18065	TOXIC MNG	4-4-2019	NODULAR GOITRE WITH TOXIC FEATURE	TOXIC MNG		10.1	9.4	9	8	3	YES	4.5	PERIORAL NUMBNESS	ORAL	T
87	PETCHIAMMAL	42	F	19325	MNG	4-18-2019	NODULAR GOITRE	NODULAR/COLLOID GOITER		11.2	10.8	11.6	10.6	4	NO	6	NIL		
88	DHANALAKSHMI	38	F	20306	MNG	3-21-2019	FOLLICULAR ADENOMA	ADENOMA		9.8	8.8	8.8	8.8	3.5	NO	4.5	NIL	ORAL	
89	THANGALASKHMI	38	F	20306	MNG	3-20-2019	ADENOMATOUS GOITRE	ADENOMA		10.4	9.6	10	10.4	4	NO	4.5	NIL		
90	ARUNKUMAR	17	M	28488	MNG	4-27-2019	NODULAR GOITRE	NODULAR/COLLOID GOITER		10.3	9.8	10	10.3	4	NO	5.2	NIL		
91	SAFIYABEGAM	29	F	28066	PAPILLARY CA THYROID	5-4-2019	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		9.6	9.2	8.6	6.2	3	YES	4	CARPOPEDAL SPASM	I.V	T
92	KANIAMMAL	50	F	29879	MNG	4-30-2019	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		8.8	8.6	9.4	7.2	3.5	YES	4	PERIORAL NUMBNESS	ORAL	T
93	CHANDRA	44	F	36859	MNG	5-30-2019	NODULAR GOITRE	NODULAR/COLLOID GOITER		9.2	9.6	9.2	8.7	3.5	NO	5.3	NIL		
94	CHANDRAKALA	28	F	37476	SNG RIGHT LOBE THYROID	5-25-2019	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID		10.2	9.6	8.5	8.6	3	NO	4.5	NIL	ORAL	
95	ANUSHA FATHIMA	25	F	33285	PAPILLARY CA THYROID	5-25-2019	PAPILLARY CARCINOMA THYROID	CARCINIMA THYROID	NECK NODE DISSECTION	10.5	7.4	6.3	6	3	YES	4	CARPOPEDAL SPASM	I.V	P
96	VADIVUKARASI	39	F	39455	MNG	6-8-2019	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		10	9.5	8	8.3	3.5	YES	4.5	NIL	ORAL	T
97	VINYAGAM	59	F	39470	PAPILLARY CA THYROID	6-8-2019	FOLLICULAR VARIANT OF PAPPILARY CA	CARCINIMA THYROID		11.2	10.2	9.6	8.5	3.5	NO	4	NIL	ORAL	T
98	REGINA MARY	50	F	40460	MNG	6-13-2019	NODULAR GOITRE	NODULAR/COLLOID GOITER		10.8	11.1	10.4	11	3.5	NO	5.5	NIL		

Sl.No.	PATIENT NAME	AGE	SEX	IP NO	PRE OP INDICATION	DOS	POST OP HPE		RISK FACTORS	PRE OP S.CALCIUM	POD-1	POD-2	POD-3	S.ALBUMIN	HYPOCALCEMIA OR NOT	IONIZED CA	SIGNS & SYMPTOMS ON 4TH POD	TREATMENT	TRANSIENT/PERMANENT
99	RAMALAKSHMI	53	F	32947	MNG	5-22-2019	FOLLICULAR VARIANT OF PAPPILARY CA	CARCINIMA THYROID	HUGE GOITER	10	9.2	7.2	6.8	3.8	YES	4	CARPOPEDAL SPASM	I.V	T
100	PETCHIAMMAL	29	F	38946	MNG	1-6-2019	FOLLICULAR ADENOMA	ADENOMA		8.2	9.2	10	9.6	3.5	NO		NIL	ORAL	T
101	VANASUNDARI	60	F	36532	MNG	06-06-2019	COLLOID GOITRE	NODULAR/COLLOID GOITER		8.8	9	9.4	8.6	4	NO	5	NIL		
102	KAMALA	68	F	38631	MNG	6-16-2019	NODULAR GOITER WITH CYSTIC DEGENERATION	NODULAR/COLLOID GOITER	HUGE GOITER	9	10.2	8.8	8	3.5	YES	4.5	NIL		
103	SUNDARI	47	F	33012	MNG	6-17-2019	COLLOD GOITER	NODULAR/COLLOID GOITER		10.5	9.8	9.4	8.8	4	NO	5.2	NIL		
104	MARIYAMMAL	44	F	39539	MNG	6-20-2019	HASHIMOTO THYROIDITIS	HASHIMOTO S THYROIDITIS		9.6	9	8.5	8.6	3.5	NO	4.5	NIL	ORAL	T