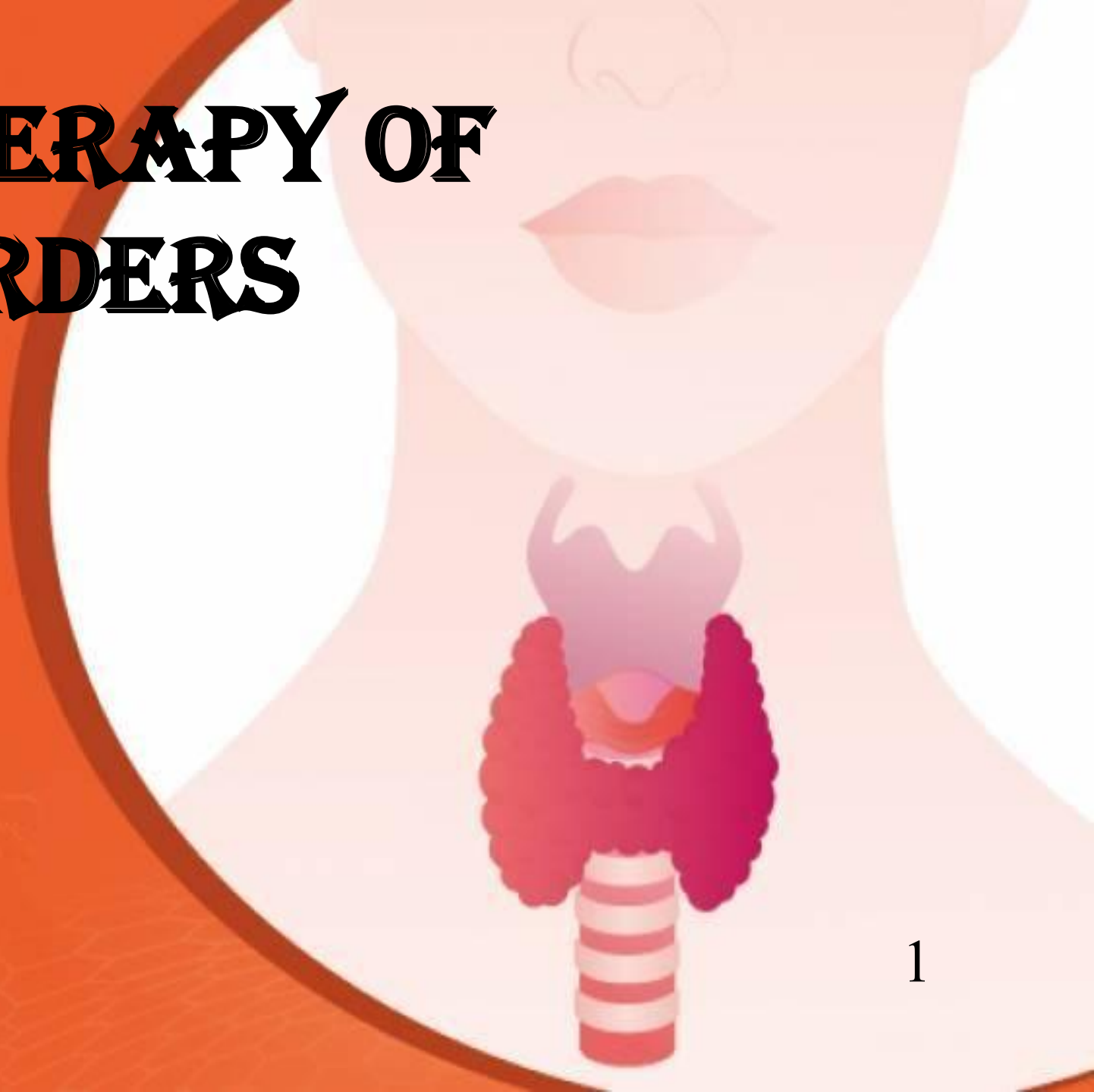
PHARMACOTHERAPY OF THYROID DISORDERS



Presented by-

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CASE 1

A 39 years old lady comes to Endocrine OPD with the complaints of nervousness, palpitation, with blurring of vision, can not watch upwards objects with problems in climbing upwards and unintentional weight loss for last 4 months.

On examination, she appears anxious, sweaty and there is a soft, rubbery, diffuse goiter with a soft bruit. There is tremors of outstretching fingers and lid lag is present. Her pulse is 120 beats/min, BP is 160/ 100 mmHg.

On investigation, her--

- T3 → 4 ng/ mL (Normal reference- 2.6-6.2 pmol/L)
- T4 → 140 ng/mL (Normal reference-9-21 pmol/L)
- TSH → 0.2 mU/L (Normal reference- 0.2-4.5mIU/L)
- TRAb → + ve

CASE:2

A 40 years old lady is a secretary in a private company, came to the OPD of Endocrinology department with her husband complaining of a 6 months history of generalized fatigue, feeling tired easily and tingling in her hands during her work and at night. She mentioned that she has gained weight about 10 kg over 6 months and also complained that she feels constipated and her periods had become irregular and heavier then previously. Her husband also commented that she had developed a deeper croaky voice.

On examination, Her pulse 60 beats/min, BP 140/100 mm/hg and present ankle oedema and a soft diffuse goiter on her neck .

On Investigation, her T3 → 1.6pmol/L (Normal reference- 2.6-6.2 pmol/L)
T4 → 6 pmol/L (Normal reference- 9-21 pmol/L)
TSH → 6.8 mIU/L (Norma reference- 0.2-4.5mIU/L)
Anti-TPO Ab→ +ve

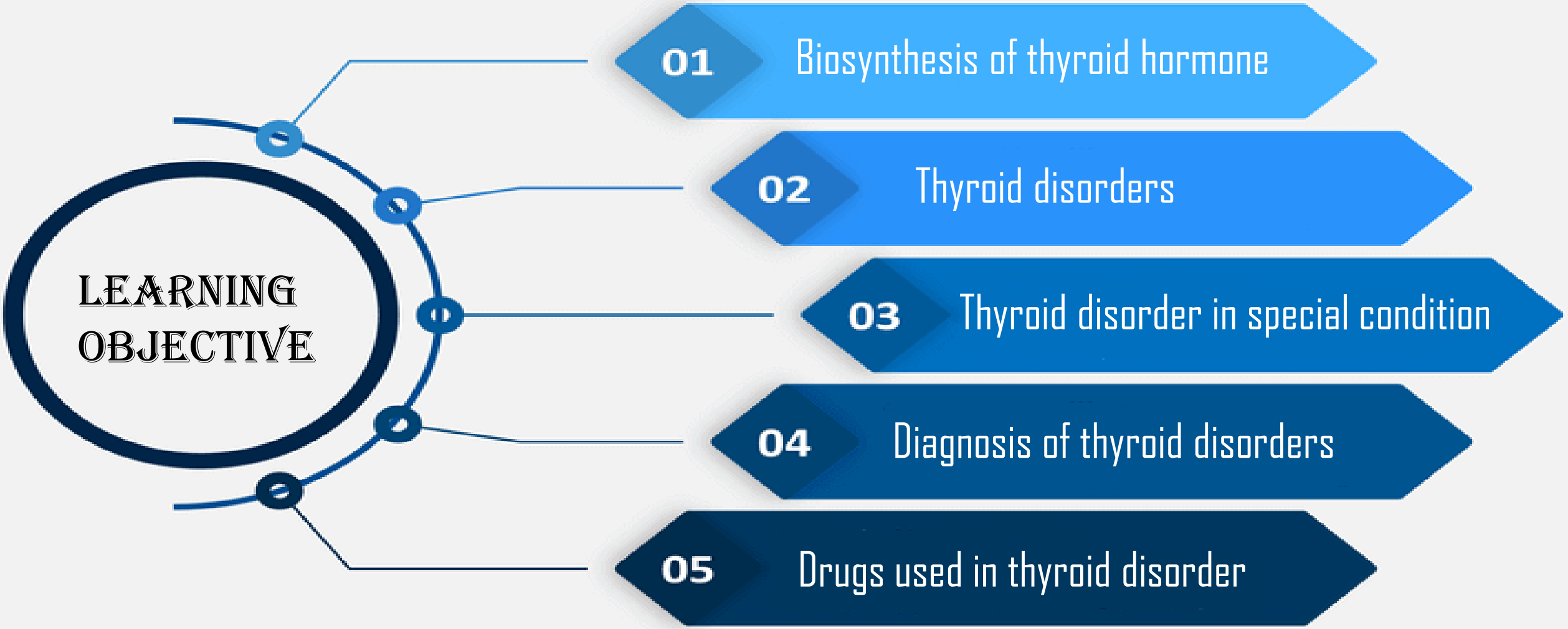
CASE:3

A 45 years old lady presented with fatigue, weight gain, and difficulty in concentration. On Investigation:

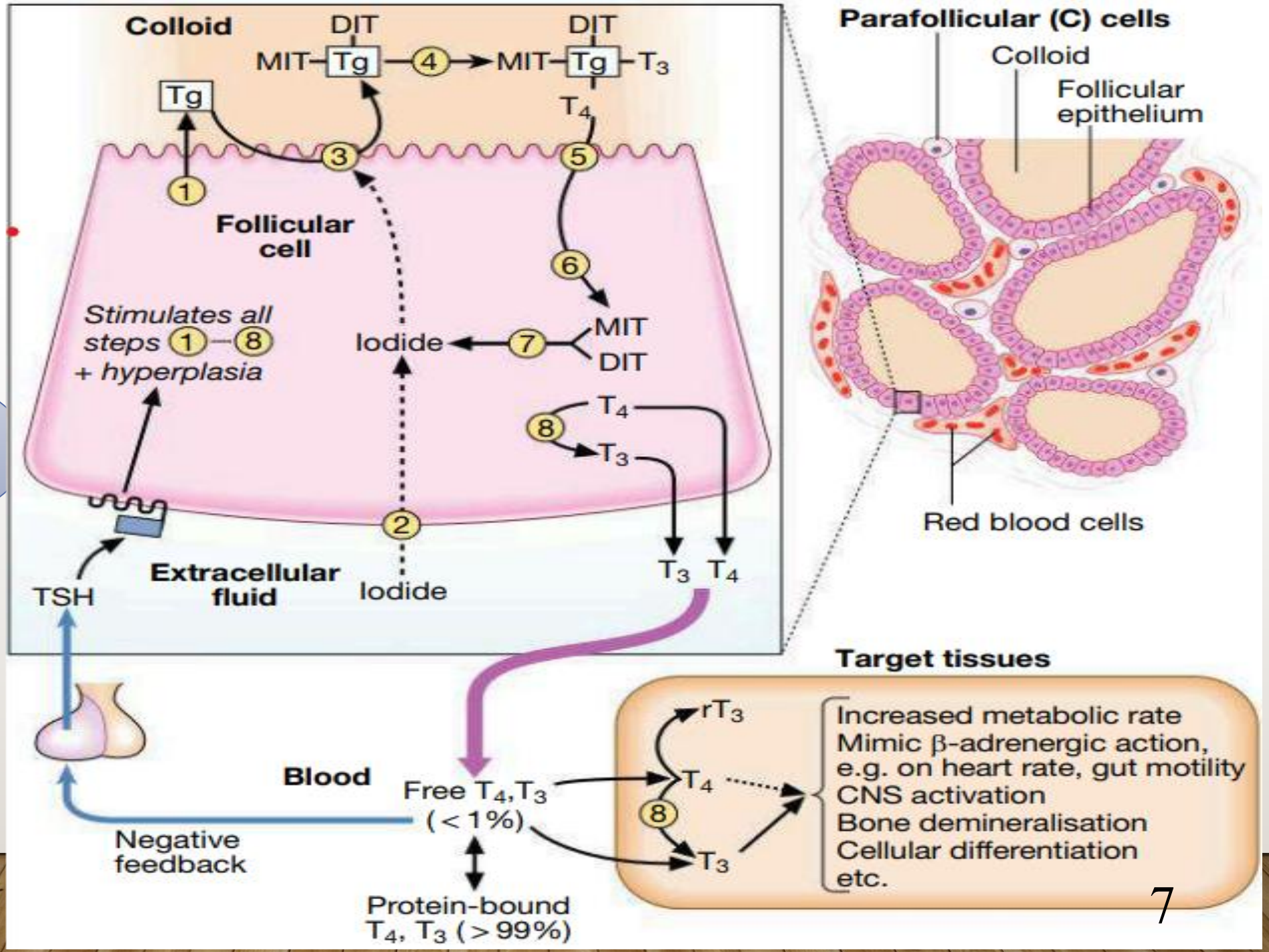
- **TSH:** Elevated at 6.5 mIU/L (reference range: 0.4-4.5 mIU/L).
- **Free T4:** Within the normal range (e.g., 1.2 ng/dL, reference range: 0.8-1.8 ng/dL)
- **Free T3:** Within the normal range (Normal reference- 0.69-2.15 ng/mL)

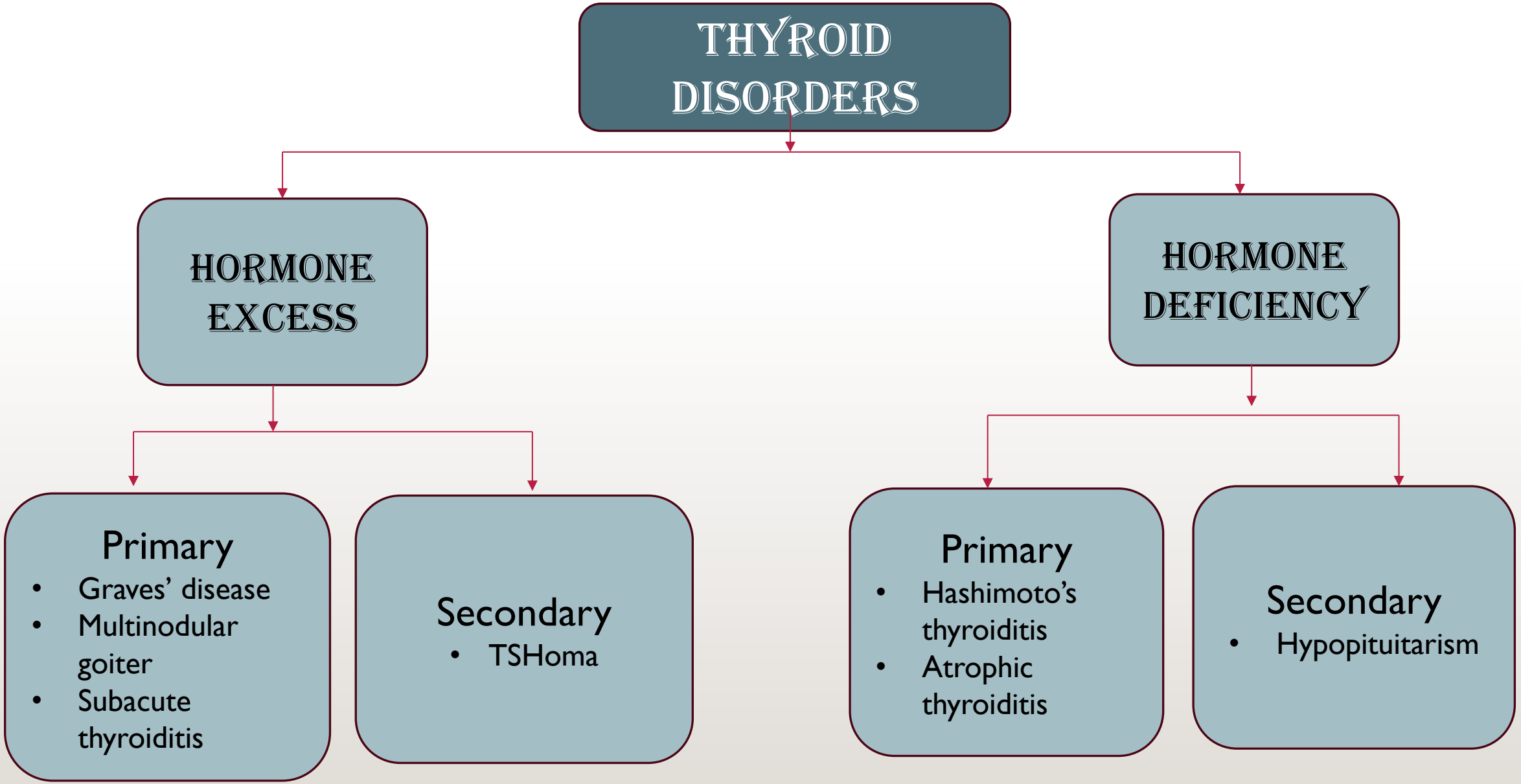
CASE:4

A 42-year-old lady presents to the Endocrine clinic for a recent screening laboratory test result showing a TSH level of 6.8 mU/L (reference range: 0.4 - 5.0 mU/L), while her free thyroxine (fT4) is within normal range (14 pmol/L, normal range 10-23 pmol/L). She also has a positive thyroid peroxidase antibody of 40 IU/mL (normal < 35 IU/mL). She has no past medical history, normal menstruation, no plans for pregnancy, takes no medications, and has no family history of thyroid disease. She experiences nonspecific complaints including fatigue, weight gain, hair loss, and a firm thyroid gland is palpable.


LEARNING OBJECTIVE
01
Biosynthesis of thyroid hormone
02
Thyroid disorders
03
Thyroid disorder in special condition
04
Diagnosis of thyroid disorders
05
Drugs used in thyroid disorder

BIOSYNTHESIS




THYROID DISORDERS
HORMONE EXCESS
HORMONE DEFICIENCY
Primary
• Graves' disease
• Multinodular goiter
• Subacute thyroiditis
Secondary
• TSHoma
Primary
• Hashimoto's thyroiditis
• Atrophic thyroiditis
Secondary
• Hypopituitarism

Hypothyroidsm

Causes

Features

Hashimoto thyroiditis

Subclinical Hypothyroidsm

Hyperthyroidsm

Causes

Features

Graves' diseases

Subclinical hyperthyroidsm

HYPOTHYROIDSM

Hypothyroidism is a condition where the thyroid gland doesn't produce enough thyroid hormones (T3 and T4) to meet the body's needs.

CAUSES

Auto immune

- Hashimoto's thyroiditis
- Grave's disease

Iatrogenic

Transient thyroiditis

- Sub acute thyroiditis

Iodine deficiency

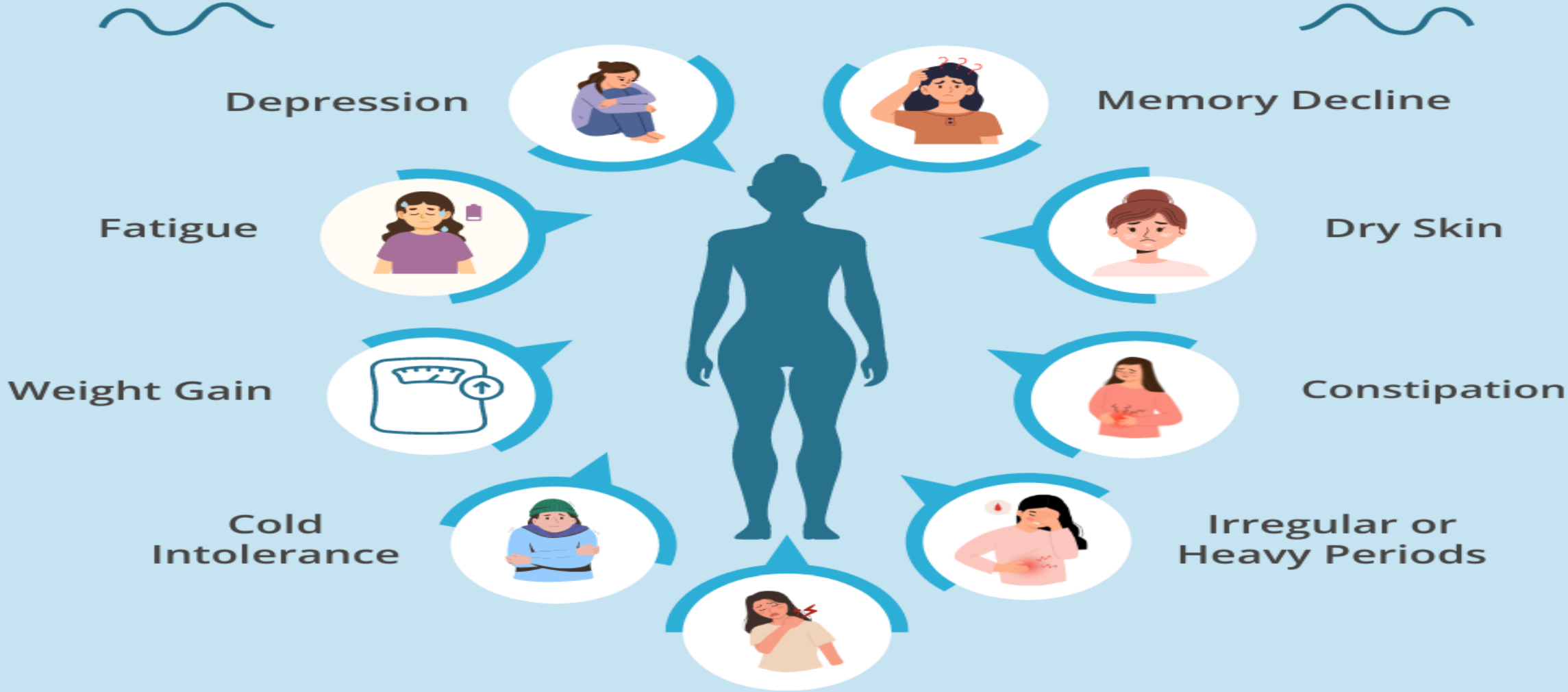
Congenital

- Dyshormonogenesis
- Thyroid aplasia

Secondary hypo Thyroidism

- TSH deficiency

How Hypothyroidism Affects the Body



EVERYDAY HEALTH

Hashimoto's Thyroiditis

- Is an autoimmune disorder of thyroid gland.
- It is typically associated with hypothyroidism or subclinical hypothyroidism although there may be a transient thyrotoxicosis in acute phase.
- It is 10 times more common in women.

Features:

- Features of hypothyroidism(or subclinical hypothyroidism.)
- Goiter: Firm, non-tender
- Anti-thyroid peroxidase antibody(Anti-TPO Ab) and also anti-thyroglobulin antibody(Anti-TG Ab)

Management:

Levothyroxine therapy is indicated as treatment

Five Symptoms of Hashimoto's Throiditis

Swelling of The Thyroid Gland

Thick Skin

Depression

Fatigue

Constipation

SUBCLINICAL HYPOTHYROIDISM:

- No obvious symptoms

Treat if :

1. TSH is more than 10 mIU / L
2. Positive thyroid autoantibodies.
3. Serum TSH is raised and serum T3 and T4 are at the lower end of reference range.

Laboratory Finding:

	TSH	Free T3	Free T4
Subclinical Hypothyroidism	High	Normal	Normal

HYPERTHYROIDISM

Hyperthyroidsm is a condition where the thyroid gland produce an excessive amount of thyroid hormones (T3 and T4) leading to an overactive metabolism.

CAUSES

Graves' diseases

Thyroiditis

- Sub acute thyroiditis

Solitary thyroid adenoma

Multinodular goiter

Iodide induced

Extra thyroid source of thyroid hormone

How Hyperthyroidism Affects the Body

EVERYDAY HEALTH

Graves' Diseases

- Is the most common cause of thyrotoxicosis.
- Typically seen in women aged 30-50 years.

Features:

- Eye signs(only in 30% of patients):
  Exopthalmous, opthalmoplegia.
- Pretibial myxoedema.
- Thyroid acropachy
- Thyroid bruit.

Autoantibodies:

1. Anti-TSH receptor stimulating autoantibodies (90%)
2. Anti-thyroid peroxidase (TPO) antibodies (50%)

Graves disease= thyrotoxicosis + Goiter + auto-antibodies ± Thyroid eye disease (only found in 30%)

Management:

A. Antithyroid drug titration:

- ✓ Carbimazole is started at 40 mg and reduced gradually to maintain euthyroidism.
- ✓ Typically continued for 12-18 months.

B. Block-and-replace:

- ✓ Carbimazole is started at 40 mg
- ✓ Thyroxin is added when the patient is euthyroid.
- ✓ Treatment typically lasts for 6 to 9 months
- ✓ Block and replace regimes should not be used in pregnancy

C. Radioiodine treatment.

D. Surgery.

SUBCLINICAL HYPERTHYROIDISM

- No obvious sign or symptoms of thyroid disease.
- This group of patient have increased risk of Atrial fibrillation and Osteoporosis.
- Serum TSH is undetectable and serum T3 and T 4 are at the upper end of reference range.

Laboratory findings:

	TSH	Free T3	Free T4
Subclinical Hyperthyroidism	Low	Normal	Normal

- Investigation
- Management
- Thyroid disorders in special conditions

INVESTIGATION

1. Thyroid function test:

	TSH	Free T4	Free T3
Hypothyroidism	High	Low	Low
Hyperthyroidism	Low	High	High
Subclinical Hypothyroidism	High	Normal	Normal
Subclinical Hyperthyroidism	Low	Normal	Normal
Sick euthyroid syndrome	Normal / High	Low	Normal / Low

2. Autoantibody screening test

- Antibody against thyroid peroxidase
- Antibody against thyroglobulin
- Antibody against TSH receptor

3. Others

- Radio active Iodine intake
- Thyroid scintigraphy (tecnicium99)
- USG of Thyroid gland
- FNAC

DRUGS USED IN THYROID DISORDER

DRUGS USED IN HYPOTHYROIDISM

- Synthetic preparation: Levothyroxine (T4)

  Liothyronine (T3)

  Liotrix


Thyrox®50
Levothyroxine Sodium USP
Each Tablet Contains:
Levothyroxine Sodium USP 50 mcg
3 x 30 Tablets
Thyrox®50

LEVOTHYROXINE

- Levo-thyroxine was 1st made at 1927.
- Levo-thyroxine is safe during pregnancy.
- Taken orally and also give in IV route
- Used cautiously in people with age 50 or older.
- Better absorption in empty stomach.

LEVOTHYROXINE

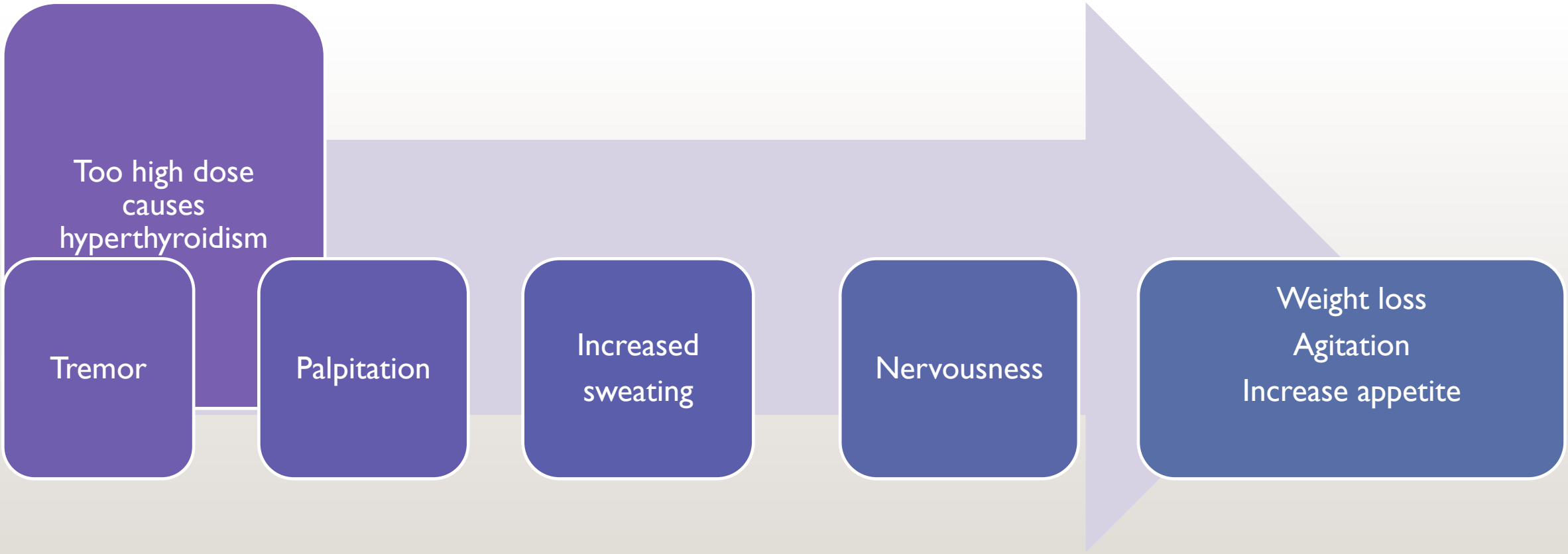
INDICATION

I. Hypothyroidism
II. Subclinical hypothyroidism
III. Nodular thyroid disease associated with hypothyroidism
IV. Thyroid cancer after thyroidectomy.

CONTRAINDICATION

I. Acute MI
II. Pericarditis
III. Acute adrenal insufficiency

LEVOTHYROXINE ADVERS EFFECTS



Levothyroxine:

Is the drug of choice for replacement & suppression therapy.

Because of- Low cost

Long half life (once daily dose)

Lack of allergic foreign protein / Stability

Easy measurement of serum levels

Liothyronine:

Although 3 – 4 times more potent than levothyroxine.

Not recommended for routine replacement therapy.

DRUGS USED IN HYPERTHYROIDISM

1)**Thioamides:**

- ✓Methimazole
- ✓Carbimazole
- ✓Propylthiouracil

2) **Anion inhibitors:**

- ✓Perchlorate(ClO_4^-)
- ✓Pertechnetate(TcO_4^-)
- ✓Thiocyanate(SCN^-)

3) **Iodides:** Potassium iodide

4) **Radioactive iodine:** ^{131}I

5) **Adrenoceptor blocker:** β-blockers without intrinsic sympathomimetic activity (ISA)
e.g. Propranolol.


100 tablets
Carbizol®
Carbimazole BP 5 mg
SQUARE
Carbizol®
Carbizol®
Carbizol®

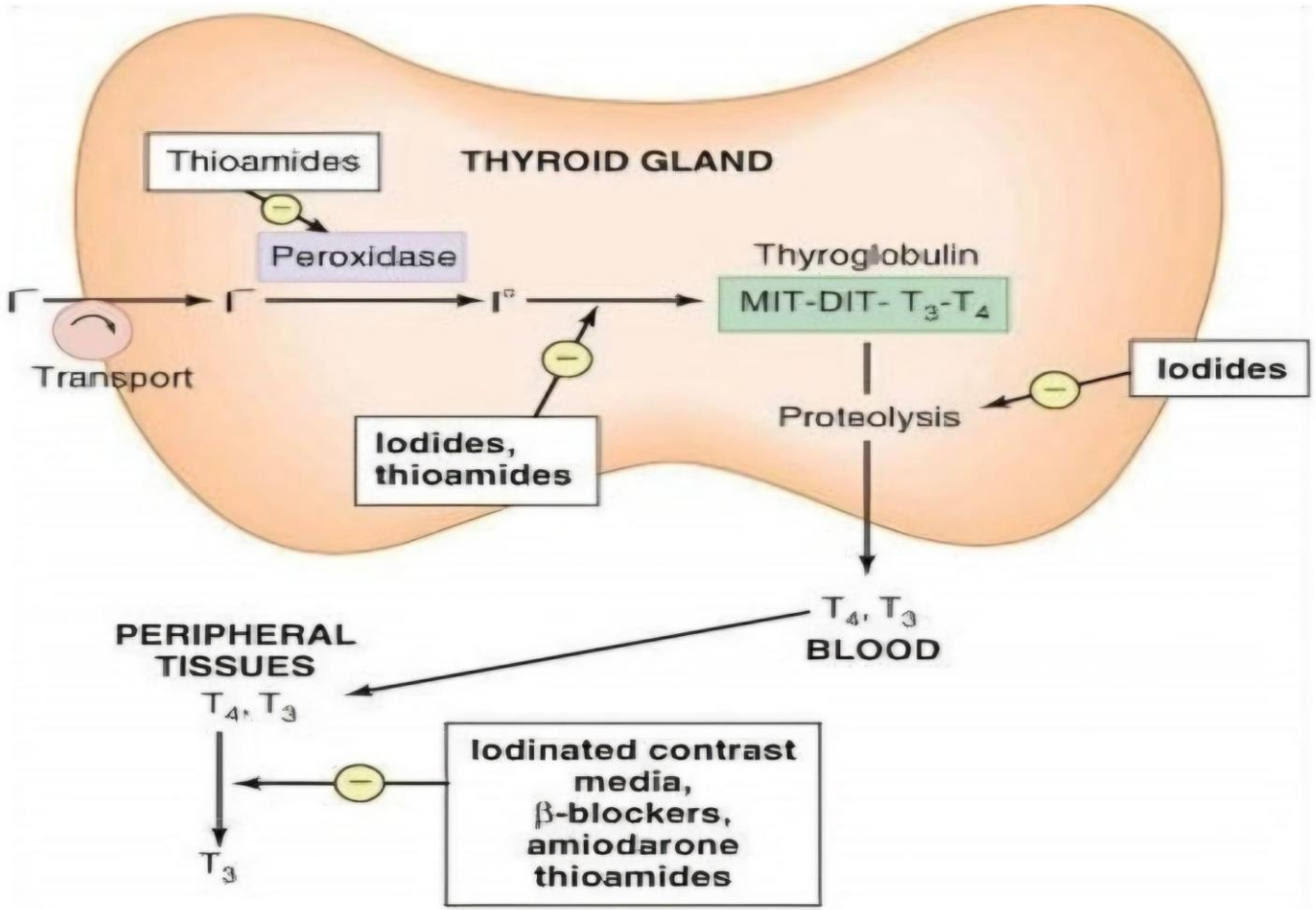
CARBIMAZOLE

Uses:

- It is the first line antithyroid drug except in 1st trimester of pregnancy and during lactation.

ADE:

- Rash (most common)
- Agranulocytosis (most dangerous).



Anti-thyroid Drugs

PROPYLTHIOURACIL

Uses:

- It is 2nd line antithyroid drug indicated in 3 situation:
  - Pregnancy
  - Lactation
  - If the patient is intolerable to Carbimazole

ADE:

- Hepatic dysfunction- fulminant hepatic failure.

RADIOIODINE TREATMENT

Indication :

Toxic multinodular goiter or a single toxic adenoma

Contraindications :

- Pregnancy and lactation
- Age < 16 years
- Thyroid eye disease is a relative contraindication.

THYROID DISORDERS IN SPECIAL CONDITIONS

THINGS TO KNOW ABOUT

PREGNANCY & THYROID

THYROID PROBLEMS IN PREGNANCY

Hypothyroidism in pregnancy:

- Women with hypothyroidism require an increase dose of levothyroxine (30%-50%) in pregnancy.
- In adequatly treated hypothyroidism has been associated with impaired cognitive development in the fetus.

Hyperthyroidism in pregnancy:

- Gestational thyrotoxicosis is associated with multiple pregnancies and hyperemesis gravidarum.
- Antithyroid drugs:
- Propyl thiouracil should be used in the first trimester with Carbimazole substituted in the 2nd and 3rd trimester.

THYROID DISORDER IN SPECIAL CONDITION

Sick euthyroidism:

- It is now referred to as non-thyroidal illness.
- The primary abnormality is decreased peripheral production of T3 from T4.
- Usually occurred in hospitalized patient at ICU, severe sepsis, heart failure, liver failure, renal failure, end-stage malignancy and starvation.

Treatment: Usually no treatment is required, except to treat the underline disease process.

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