

King Saud University
College of Medicine
2nd Year, Endocrine
Block



L2 DRUGS USED IN HYPOTHYROIDISM

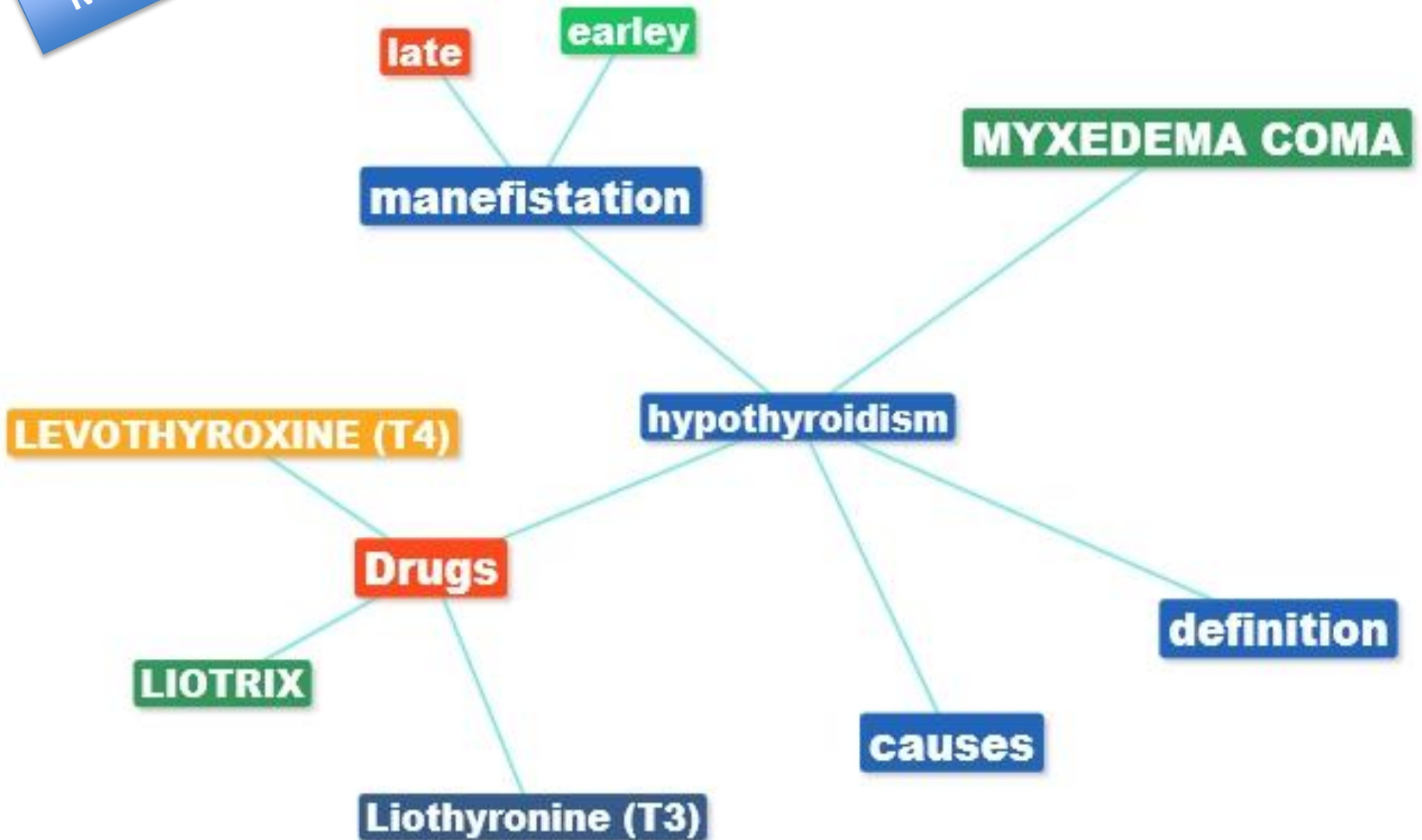




Objectives

- ✓ describe different classes of drugs used in hypothyroidism and their mechanism of action
- ✓ understand their pharmacological effects, clinical uses and adverse effects.
- ✓ Recognize treatment of special cases of hypothyroidism such as myxedema coma

Mind map



Hypothyroidism

- Thyroid gland **does not produce enough hormones** .
- Congenital (cretinism , dwarfism).
- People who are most at risk include those **over age 50** & mainly in **females**.
- Diagnosed by **low plasma levels of T3 & T4**.
- Prevalence is 14/1000 females and 1/1000 males.

introduction

Primary hypothyroidism-Causes:

- Autoimmune thyroiditis(Hashimoto's thyroiditis.(
- Radioactive iodine.
- Post thyroidectomy.
- Anti-thyroid drugs (CMZ , PTU.(
- Other drugs (Lithium, Amioderone.).
- Iodine deficiency.
- Sub-acute thyroiditis.
- Thyroid carcinoma.

Secondary hypothyroidism-causes

- Hypothalamic disease.
- Pituitary disease.

Early Manifestations of Hypothyroidism

- Fatigue and lack of energy.
- **Cold intolerance.**
- **Constipation.**
- Weakness.
- Muscle or joint pain.
- Paleness.
- Thin, brittle hair and fingernails.

Late Manifestations of Hypothyroidism

- Decreased sense of taste and smell.
- Dry flaky skin.
- Hoarseness.
- Menstrual disorders.
- Puffy face, hands, and feet.
- Thinning of eyebrows.

Treatment of Hypothyroidism

Replacement therapy with synthetic thyroid hormone preparations

Thyroid preparations : LEVOTHYROXINE(T_4), Liothyronine (T_3) and LIOTRIX

Thyroid preparation : LEVOTHYROXINE(T_4)

Pharmacokinetic

- A synthetic form of the thyroxine (T_4), is the drug of choice for replacement therapy.
- Stable and has a long half life (7 days).
- Administered once daily.
- Restores normal thyroid levels within 2-3 weeks.
- Absorption is increased when hormone is given on empty stomach.
- Oral preparations available from 0.025 to 0.3 mg tablets.
- Parenteral preparation 200-500 μ .
- in **old patient** and patient with any **cardiac problems**, start with reduced (12.5 – 25 μ g/day) for two weeks and then increased every two weeks.

Clinical uses

-Any **Hypothyroidism** case ,regardless of etiology (including Congenital ,Hashimoto thyroiditis , Pregnancy and Thyroid carcinoma) .

ADR:

Generally the manifestations of hyperthyroidism

- Over dose** in children:- restlessness , insomnia and accelerated bone maturation
- Over dose** in adult :-
- cardiac arrhythmias (Tachycardia, atrial fib.)
 - tremor , restlessness ,headache
 - heat intolerance
 - muscle pain
 - change in appetite, weight loss

Thyroid preparations

	Liothyronine (T ₃)	LIOTRIX = mix of T4&T3
Pharmacokinetic	<ul style="list-style-type: none"> -More potent (3-4 times) and rapid action than levothyroxine . -has a short half life, not recommended for routine replacement therapy (because it's given multiple daily doses). -oral preparation available. -parenteral use. <u>(used in life threatening cases)</u> 	<ul style="list-style-type: none"> -Combination of synthetic T4 & T3 in a ratio 4:1 that attempt to mimic the natural hormonal secretion . -The major limitations of this product are high cost and lack of therapeutic rationale because 35% of T4 is peripherally converted to T3, so the drug is under the study yet.
	should be avoided in <u>cardiac patients</u>	

Myxedema Coma

(Life –threatening hypothyroidism)

- ✓ The treatment of choice is loading dose of **levothyroxine** intravenously 300-400µg initially followed by 50µg daily.
- ✓ **I.V. liothyronine** for rapid response but it may provoke cardiotoxicity.
- ✓ **I.V. hydrocortisone** may be used in case of adrenal and pituitary insufficiency.

Hypothyroidism And Pregnancy

In pregnant hypothyroid patient, very important that the dose must increased 20-30 % more than the normal dose of non-pregnant women.

- ✓ elevated maternal thyroxine binding globulin (TBG) induced by estrogen
- ✓ early development of fetal brain which depends on maternal thyroxine

S U M M A R Y

Drug\ Catoegry	Uses	Mechanism Of Action	Adverse Effects
LEVOTHYROXINEa	<p>Hypothyroidism, regardless of etiology (even in pregnancy).</p> <p>Absorption is increased when hormone is given on empty stomach.</p> <p>In old patients and in patients with cardiac problems , treatment is started with reduced dosage</p>	A synthetic form of the thyroxine (T ₄)	<p>in overdose</p> <ul style="list-style-type: none"> ▪ IN CHILDREN : restlessness , insomnia, accelerated bone maturation. ▪ IN ADULTS : cardiac arrhythmias, tremors, restlessness ,headache, heat intolerance , muscle pain , change in appetite, weight loss (similar to symptoms of hyperthyroidism).
Liothyronine	<p>Hypothyroidism. It is also used as an augmentation strategy in treating Major Depressive Disorder when used in combination with antidepressants.</p> <p>not recommended for routine replacement therapy. <u>should be avoided in cardiac patients</u></p>	A synthetic form of thyroid hormone (T ₃)	mostly similar to symptoms of hyperthyroidism as weight loss and sensitivity to heat.
Liotrix	Hypothyroidism	Combination of synthetic T ₄ & T ₃	mainly due to overdose. similar to symptoms of hyperthyroidism .

Drugs used in treatment of Myxedema Coma

The <u>treatment of choice</u> is loading dose of Levothyroxine .	I.V. Liothyronine for rapid response but <u>it may provoke cardiotoxicity.</u>	I.V. hydrocortisone may be <u>used in case of adrenal and pituitary insufficiency.</u>
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Quiz yourself

1. Levothyroxine is a :

- A. Combination of synthetic T₄ & T₃
- B. (T₃)
- C. synthetic form of the thyroxine (T₄)

3. 83 year cardiac patient was diagnosed with hypothyroidism what to do if you'll prescribe

Levothyroxine :

- A. Reduce the dose
- B. Increase the dose
- C. It is contraindicated

5. A cardiac patient was diagnosed with hypothyroidism, which drug we should avoid :

- A. Levothyroxine
- B. Liotrix
- C. Liothyronine

7. What Is Myxedema Coma :

- A. Life –threatening hypothyroidism
- B. Severe hyperthyroidism
- C. Normal thyroid function

2. Absorption of Levothyroxine is increased when:

- A. Given after meal
- B. Combined with other drug
- C. Given on empty stomach

4. A child with hypothyroidism his mother noticed that he is recently become growing fast and can't sleep at night what is the drug :

- A. Liotrix
- B. Liothyronine
- C. Levothyroxine

6. Liotrix is a:

- A. Combination of synthetic T₄ & T₃
- B. (T₃)
- C. synthetic form of the thyroxine (T₄)

8. A patient with Myxedema Coma was diagnosed to have adrenal and pituitary insufficiency the treatment is :

- A. Liotrix
- B. I.V. hydrocortisone
- C. I.V. levothyroxine

Answers: 1.C 2.C 3.A 4.C 5.C 6.A 7.A 8.B

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We hope that we made this lecture easier for you
Good Luck !