Thyroid Disorders

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Thyroid Hormone

- Thyroid gland is the largest endocrine gland.
- Thyroid regulates how the body uses and stores energy (metabolism).
- Thyroid function is controlled by the small gland below the brain called pituitary (TSH) and hypothalamus (TRH).

Hypothyroidism

- The deficiency in the hormones → slowing of metabolic processes → fatigue, cold intolerance, weight gain, cognitive dysfunction, constipation and growth failure.

- Hypothyroidism can be misdiagnosed as Alzheimer's in elderly and depression in women.

Hypothyroidism

- TSH is best initial test to determine if the pt has hypothyroidism or not. If TSH is < 2x the nml, get antithyroid peroxidase/ antithyroglobulin antibodies.

Primary Hypothyroidism

- Characterized by a high serum thyroid-stimulating hormone (TSH) and a low serum free T4.
- Hashimoto's thyroiditis is the most common cause of non-iatrogenic hypothyrodism in the US.
- Once the diagnosis is made, further imaging or serologic testing is not needed if the thyroid gland is normal on physical exam.
- All patients with primary hypothyroidism require treatment regardless of symptoms unless it is transient or secondary to medications.

Hashimoto's Thyroiditis

- Autoimmune-mediated destruction of the thyroid gland. Thyroid peroxidase antibody (TPOAb) and anti-thyroglobulin antibody (TGAb) are positive in most cases.
- Patients may present with goiter.

Subclinical Hypothyroidism

- Characterized by a high serum TSH and a normal serum free T4.
- Most patients are asymptomatic.

Central Hypothyroidism

- Caused by hypothalamic or pituitary disease that is characterized by a low serum T4 and a low, normal or slightly elevated serum TSH.
- Get TRH test to determine the level of the lesion.
- Usually have history of intracranial irradiation or pituitary adenoma surgery.

Treatment of Hypothyroidism

4 goals of therapy

1. Symptomatic relief
2. Normalization of serum TSH
   (keep at 0.5-5.0 mU/L)
3. Reduction in the size of goiter
4. Preventing iatrogenic thyrotoxicosis

Standard replacement therapy

- Synthetic thyroxine (levothyroxine) to replace the hormone that is deficient.
- Most patients improve within 2 weeks of initiation of the therapy.
- The combination of T4-T3 therapy is not recommended especially in elderly, pregnant women and patients with underlying cardiovascular disease because an excess in T3 can increase the risk of arrhythmias.

	Young & healthy patients	Elderly & CVD patients
Initial dose of levothyroxine	Full dose (1.6 mcg/kg/day)	Lower dose (1 mcg/kg/day)
Reevaluate symptomatic improvement & measure serum TSH in 6 wks. (No early than 4 wks after dose adjustment)		
Dose adjustment	↑ by 12-25 mcg/day every 3-6 wks until TSH levels return to normal. If symptoms persist after 2-3 wks of treatment => reevaluate and repeat free T4 & TSH in 3 wks Patients with factors that increase the requirement for T4 require a higher dose. They are pregnancy, estrogen therapy, weight gain and conditions that change T4 absorption, metabolism and excretion.	↑ by 25 mcg/day every 3-6 wks until TSH normalizes or cardiac symptoms appear. TSH should be monitored annually in elderly patients to avoid overreplacement.
Side effects	Iatrogenic subclinical hyperthyroidism especially in postmenopausal women. Thyrotoxicosis (heat intolerance, dyspnea, tachycardia, tremors, atrial fibrillation), accelerated bone loss, anxiety, weight loss and sweating.	

Hyperthyroidism

- Hyperthyroidism is characterized by an elevation of serum T4 level and a suppressed serum TSH.
- The classic symptoms are weight loss, increased appetite, hyperdefecation, tremor, palpitations, anxiety, heat intolerance and amenorrhea.
- In older patients, cardiopulmonary symptoms such as tachycardia, atrial fibrillation and dyspnea on exertion may predominate.

Symptoms of Hyperthyroidism

Mnemonic: **SWEATING**

S Sweating
W Weight loss
E Emotional lability
A ↑ Appetite
T Tremor/Tachycardia due to AF
I Intolerance to heat/Irregular menstruation/Irritability
N Nervousness
G Goiter and GI problems(hyperdefecation)

- Once the diagnosis has been made, the cause of the hyperthyroidism should be identified.

The following diagnostic testings can be used:

- Thyrotropin receptor antibodies (TRAb)
- Radioactive Iodine Updake
- Thyroidal blood flow on ultrasonography

Grave's Disease

- Most common cause of hyperthyroidism.
- F>M; HLA-B8, DR3 association
- Often incited during stress i.e. childbirth and infection
- Autoimmune activation of TSH receptors leads to excessive thyroid gland growth (a diffuse goiter) and thyroid hormone synthesis.
- Thyroid-stimulating immunoglobulins (TRAb) are highly specific for Graves.
- Hallmark of Graves' are presence of TRAb in the serum and ophthalmopathy.
- ↑ total serum T4, ↑ free T4, ↓ serum TSH, diffusely ↑ 123I uptake.

Conditions	Treatment	Side effects & CI
Graves' Disease	Acute: Use antithyroid drugs (thionamides) like Methimazole > PTU to ↓ thyroid hormone synthesis.	Skin rash, aplastic anemia, agranulocytosis (rare). PTU: liver toxicity. Pregnancy: PTU for 1st trimester (less severe birth defects) then switch Methimazole (to avoid liver toxicity) after 1st trimester.
	Long term: Radioactive iodine ablation	Hypothyroidism. Transient worsening of symptoms (PreRx with glucocorticoids) CI in pregnancy.
	Symptomatic tx: propranolol	Impotence, insomnia, tiredness
Subacute Thyroiditis	None	
Pituitary Adenoma	Initial: short-acting somatostatin analog 50 mcg SQ BID -> TID then 100 mcg SQ TID -> increase by 50 mcg/injections PRN. Measure TSH, free T4 at 2-3 wk intervals.	Steatorrhea, diarrhea, malabsorption, gallstones.
	Surgical: Transsphenoidal resection. Criteria for cure: normalization of thyroid function tests, absence of tumor on MRI, clinical remission of symptoms.	Anterior pituitary hormone insufficiency. Parasellar structure damage => CSF rhinorrhea, ICA hemorrhage, optic nerve/chiasm damage.

Thyroid Storm

- An acute hypermetabolic state caused by the sudden release of excessive thyroid hormone into circulation. Patients typically have fever, confusion, psychotic-like behavior, tachycardia, elevated BP and dysarrhythmias.

- Medical emergency

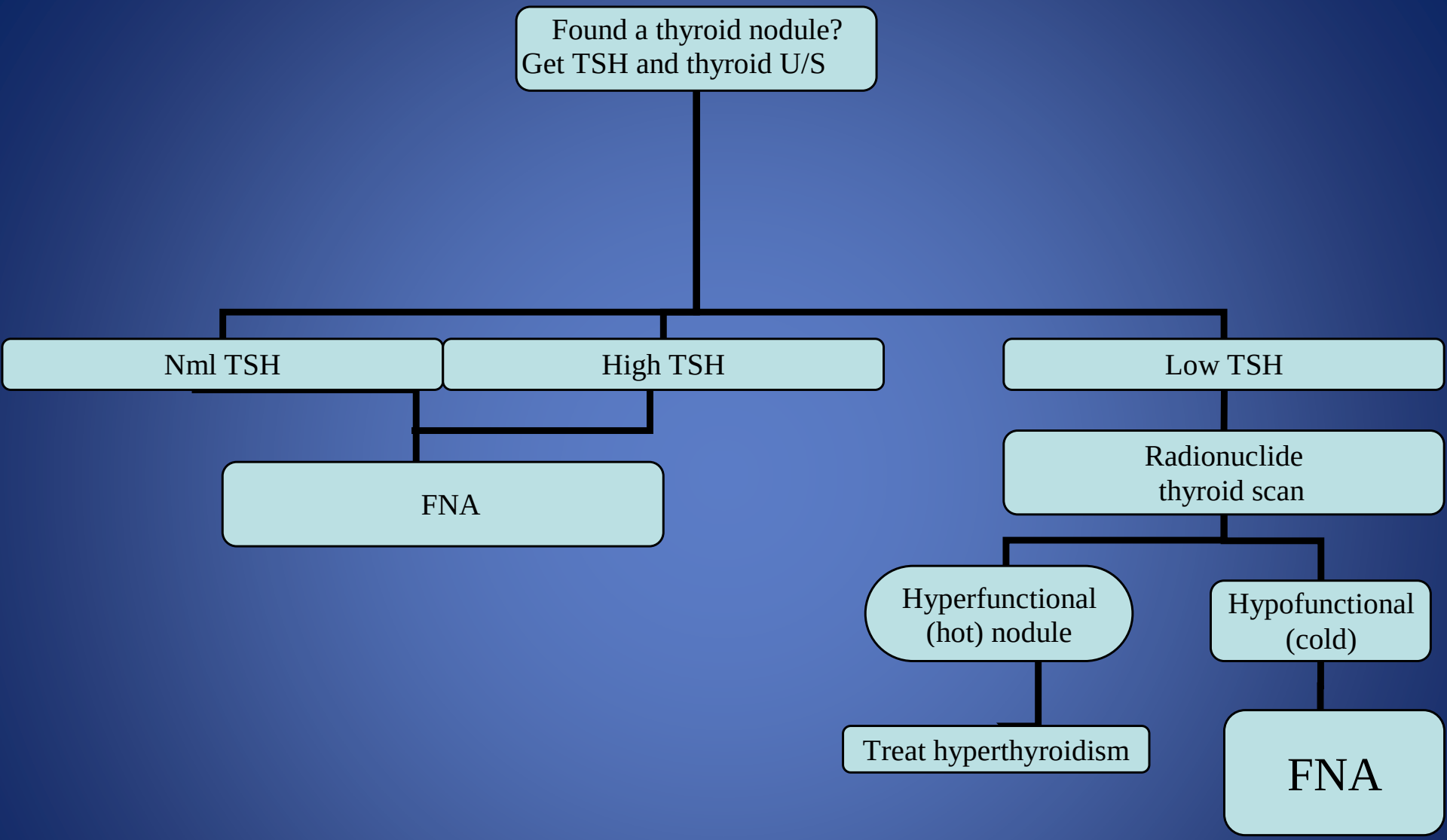
- Tx:

1. Propranolol to block target organ effect and block conversion of T4->T3 (active form).
2. Methimazole or PTU to block the hormone production
3. Iopanoic acid: block the conversion and release of the hormone that's already made.
4. Steroids for Graves opthalmopathy

Thyroid Nodular Disease

- Given that thyroid nodules are common in general population, differentiating a malignant nodule from benign nodules is very important.

- Luckily, about 95% of all thyroid nodules are benign.
- RULE OUT CANCER as it can be deadly..


Found a thyroid nodule?
Get TSH and thyroid U/S
Nml TSH
High TSH
Low TSH
FNA
Radionuclide thyroid scan
Hyperfunctional (hot) nodule
Hypofunctional (cold)
Treat hyperthyroidism
FNA

Questions

A 32 year-old female with PMH of asthma comes into a clinic complaining of recent weight loss of 24 lbs over 3 months. She also reports having palpitations at rest. She recently gave birth to a baby 8 months ago and her pregnancy was uncomplicated. Her vital signs are normal except HR of 120. Her recent routine blood work showed TSH of 0.1 mlU/L. What is the most likely diagnosis in this patient?

A. Normal postpartum physiology
B. Hashimoto thyroiditis
C. Panic disorder
D. Side effect of her Albuterol inhaler
E. Grave's disease

A 36 y/o woman presents with neck swelling that has been going for a couple months. She came to see you as the swelling has gotten worse. Her recent blood work showed serum TSH of 5.5 ml U/L. Further testing is most likely reveal which one of the following?

A. Elevated serum calcitonin level
B. Elevated serum thyroglobulin
C. Positive thyroid peroxidase antibodies
D. C1 inhibitor deficiency
E. A nodule on thyroid scan

A 76 y/o female with no PMH is noted to have persistent serum TSH elevation in the 7.0-8.0 ml U/L range, with normal serum free T4. She is asymptomatic. On PE, she has no goiter and deep tendon reflexes are normal. Her CBC and lipid panels were all within normal limits. What is the next step in the management?

A. Observe for now, repeat TSH in 6 months
B. Start levothyroxine at 0.4 mcg/kg QD
C. Start levothyroxine at 0.8 mcg/kg QD
D. Start levothyroxine at 1.6 mcg/kg QD
E. Order Echo first before starting levothyroxine at 1.6 mcg/kg QD

A 75 y/o male with PMH of stroke and alcoholism comes into your office complaining of depressed mood and forgetfulness over the past few months. He was asked to get his blood work done few months ago and it shows that his TSH was 5.9. His H&H was borderline low. What is the most likely diagnosis in this patient?

A. Post stroke depression
B. Alzheimer's
C. Vitamin B12 deficiency
D. Iron deficiency anemia
E. Hypothyroidism

A 26 y/o female primigravida at 24 weeks of gestations presents to your office complaining of palpitations, tremor, irritability and sweating for few days. Her 18-week check-up was unremarkable. She needs to be on an antithyroid medication. Which of the following is most appropriate medication for her?

A. PTU
B. Methimazole
C. Propranolol
D. Hydralazine
E. Lorazepam

Patient Education

Do's	Don'ts
▪ **Take** thyroxine as soon as you wake up in the morning on an empty stomach (ideally 1 hour before eating).	▪ **Do Not** skip thyroxine pills. Hypothyroidism has no cure but it can completely be controlled if you take it every day.
▪ **Follow- up** with your doctor because your thyroid level needs to be checked 6-10 weeks after a dose change.	▪ **Avoid** carbs, fatty food and soy products. These can worsen your symptoms.
▪ **See** your doctor before starting any new medications including over the counters and supplements as some meds can interact with thyroxine and it won't work well.	▪ **Do Not** go to bed late. One way to feel less tired is establishing a sleep schedule and sticking to it. 7-9 hours is enough.
▪ **Do** exercises as it can boost energy, decrease stress, and help you maintain a healthy weight.	▪ **Quit** smoking. Cigarettes contain chemicals that are detrimental to the thyroid and they also interfere with thyroxine.

What is hypothyroidism?:
It is a condition where your thyroid gland does not produce enough thyroid hormone. It regulates how the body uses and stores energy. In most cases, it is due to a problem in the thyroid gland itself where your immune system attacks your own thyroid gland.

Symptoms:
Hypothyroidism can make you feel tired, getting cold easily, gaining weight, developing thin hair or getting constipated. If it is not treated, it can also slow and weaken your heart. You may feel more tired, out of breath when you exercise and your ankles can swell up. It can also increase your cholesterol level. If you are a woman, you may also have irregular menstrual cycles.

How is it treated? You most likely have to take thyroid hormone pill called thyroxine every day for the rest of your life. After you take pills for 6 weeks, you need get a blood work to make sure your thyroid levels are where they should be.

Harm of hypothyroidism:
High cholesterol, low heart rate, **heart disease,** depression, gall bladder disease.