Title	Hypothyroidism: An Overview
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Purpose

This activity is designed to educate nurses about the etiology, signs and symptoms, diagnosis and treatment of hypothyroidism. Nurses need to be familiar with clinical presentation of hypothyroidism so that timely diagnosis and treatment can be initiated.

Objectives

1. Recognize three signs and symptoms of hypothyroidism
2. List one appropriate laboratory test to diagnosis hypothyroidism
3. Discuss one medication used in the treatment of this disorder
4. Describe two important aspects of patient education for the patient with hypothyroidism

Introduction

Hypothyroidism is a common endocrine disorder that is readily treatable with appropriate doses of thyroid hormone replacement therapy. The disease affects every major organ system and metabolic process. Primary hypothyroidism, the most common form, is believed to be an autoimmune disease resulting from Hashimoto's thyroiditis . Signs range from a firm goiter to a shrunken fibrotic thyroid gland depending on the stage of the disease. Other causes of primary hypothyroidism include drug therapy, radiation treatment for hyperthyroidism and surgical removal. The diagnosis can be perplexing to the clinician because of wide array of nonspecific manifestations.

Pathophysiology

Hypothyroidism is a syndrome affecting every cell of the human body and is due to a failure to maintain adequate tissue levels of thyroid hormone. Primary hypothyroidism is a failure of the thyroid gland to produce hormones. Secondary hypothyroidism may result from failure of the hypothalamic-pituitary axis due to a reduced or absent secretion of TSH from the pituitary gland or a decrease in the secretion of thyrotropin-releasing hormone (TRH) from the thalamus1.

Normal thyroid function is required for every metabolic process in the human body. Growth and development, protein synthesis and cell metabolism are all dependent on an adequate supply of thyroid hormone. The thyroid plays an essential role in fetal development, oxygen consumption, heat production, sympathetic nervous system function, and cardiovascular, hematopoietic, pulmonary and renal system function.

A deficiency can lead to a wide array of clinical findings. The basic function of the thyroid gland is to take iodine (which is added to salt, milk and bread in the American diet) and convert it into the two thyroid hormones: thyroxine (T4) and triiodothyronine (T3). Iodine deficiency is the most common cause of hypothyroidism worldwide1. Thyroid cells combine iodine and tyrosine, an amino acid, to make T3 and T4. The thyroid hormones T3 and T4 are transported throughout the

body where they control metabolism for every cell in the body. The thyroid gland daily produces T4 and T3, 80 to 90% of which is in the form of T4 and about 10 to 20% in the form of T32. T3, however, possesses about four times the hormone strength as T4 . The feedback control mechanisms that primarily regulate thyroid gland function are the hypothalamus, anterior pituitary gland and the metabolic demands of the body. When low levels of circulating thyroid hormone are detected, the hypothalamus secretes thyrotropin-releasing hormone (TRH). TRH in turn stimulates the anterior pituitary to secrete thyrotropin-stimulating hormone (TSH). Inhibition occurs when there are adequate levels of circulating T3 and T4. TSH stimulates the thyroid gland to release thyrotropin (T4) and a small amount of trilodothyroidpin (T3).

Enlargement of the thyroid can result from an increase in thyroid stimulating hormone (TSH) in response to an effect in normal hormone synthesis within the thyroid gland. Over time, this mass may compress the trachea and esophagus leading to symptoms of coughing, shortness of breath and difficulty swallowing. Small to moderate goiters can be treated with thyroid hormone. This will result in decreased production of TSH by the pituitary, which should result in halting further enlargement. Surgical removal may be the only means to relieve the symptoms.

Hypothyroidism affects 4.6% of the population, with most patients suffering from subclinical hypothyroidism1. The frequency increases with age with prevalence rates reported to be in 5.9% of women and 2.4% of men1.

Case Study

It is the end of a busy, tiring day in the outpatient clinic as the office nurse checks in Ms. B., a new patient. Initial vital signs are stable with a B/P of 100/60, pulse of 60, temperature 98.4 F, respirations 12. Her height is 5’4” and weight is 125 lbs. Ms. B. is a 35 y/o single mother, employed full time and has two children in elementary school. Her major complaints are fatigue, lack of energy, weight gain, and constipation. The nurse comments to the doctor that “his next patient has the same problems as she has. They both “just need a laxative and a long vacation.”

Signs and symptoms of hypothyroidism are often subtle and insidious in onset (See Table). Months to years often pass before the patient seeks treatment. The patient often does not remember when the symptoms began. The vague, general nature of the symptoms leads the patient to blame their condition on working too hard, not enough sleep, stress or other problems. It is sometimes difficult to evaluate a first time patient for hypothyroidism, as the changes from the patient’s normal appearance may not be appreciated. A family member can often provide valuable information regarding physical and behavioral changes in the client.

Close inspection of this patient reveals facial puffiness, periorbital swelling, a hoarse voice with slow speech and a dull facial expression. The lateral aspects of eyebrows are missing and the hair is dry, coarse and sparse. The patient complains that she is always cold and has become forgetful and depressed. As the disease progresses, further physical deterioration, intellectual impairment and changes in personality may result1 4.

The initial findings in this patient point to the diagnosis of hypothyroidism. A thorough physical exam is necessary to evaluate a patient suspected of being hypothyroid. Skin and hair exam often provide the initial clues to diagnosis. The tongue is checked for macroglossia. The thyroid exam may demonstrate a firm goiter or later in the disease process, as in this patient’s case, appear as a shrunken fibrotic gland. In long standing hypothyroidism, the heart may enlarge, chiefly due to accumulation of a serous effusion in the pericardial sac. Pleural or abdominal effusions may also develop.

Patients often complain of constipation. Paresthesias of the hands and feet can result from deposition of proteinaceous ground substance in the ligaments around the wrist and ankle, producing nerve compression. Reflexes in hypothyroidism are hyporeflexic. Women with

hypothyroidism may develop menstrual disorders1 4.

Ms. B has difficulty recalling information about her menstrual cycles but is not sexually active nor on birth control. The cardiac and respiratory exam was essentially normal. Further questioning elicited complaints of numbness and tingling in her feet, and an eight-pound weight gain. She has been sleeping with three pillows to prevent fluid collection in her face and eyes at night.

While primary hypothyroidism is the most common form, findings of secondary hypothyroidism must be considered during the physical exam. Skin depigmentation is often noted, breasts are atrophic and the heart may be small without effusion. The blood pressure is low and hypoglycemia may be found because of adrenal insufficiency or growth hormone deficiency in secondary hypothyroidism.

Diagnosis

A high serum TSH and a low free T4 estimate can confirm hypothyroidism.

Based on the American Thyroid Association guidelines, estimation of free T4 concentration and the serum TSH concentration are recommended as the principal laboratory tests for thyroid disease in the ambulatory patient . A rise in TSH will precede any other abnormality of thyroid function as the first evidence of primary hypothyroidism .

Hypothyroidism caused by primary thyroid failure can be confirmed by the concomitant finding of a decrease in serum free T4. When autoimmune thyroiditis is suspected, an antithyroid antibody titer should also be obtained. Hypothyroidism resulting from hypothalamic pituitary disorders is suggested with findings of a subnormal serum free T4 concentration and a normal or subnormal serum TSH value1 .

In the ambulatory setting, the TSH is a simple initial diagnostic test for hypothyroidism. Patients with severe illness, on certain medications and those with unusual thyroid disorders my present with confusing laboratory findings. In such cases, consultation with an endocrinologist is necessary.

A CBC is necessary to check for anemia, a frequent co-morbid condition with hypothyroidism. Microcytic hypochromic anemia may result from iron deficiency, decreased iron absorption, blood loss from menorrhagia and occasionally platelet dysfunction. Macrocytic anemia may be secondary to vitamin B12 or folic acid deficiency, or from no known cause. Elevated cholesterol is associated with hypothyroidism. Depression of the biosynthesis of cholesterol causes a decreased rate of cholesterol catabolism. Hypothyroid patients may have EKG changes, which include sinus bradycardia1. Patients with significant cardiac findings should have a chest x-ray to rule out cardiomegaly and congestive heart failure.

Patient presentation will vary based on the severity of the thyroid deficiency and the length of time the condition has deprived the patient of the proper amount of thyroid hormone. In the elderly patient, symptoms may be confused with signs of aging. The doctor orders a CBC, cholesterol, TSH and free T4. An EKG may be indicated in a patient with cardiac findings or an elderly client.

The patient was also advised to make an appointment with her gynecologist. She does not recall having an exam in several years. TSH was 231.0 (reference range 0.4-5.5 micrograms/ml); T4 (thyroxine) total was <1.0 (reference range 4.5-12.5 micrograms/dl). Based on these labs and the clinical findings, a diagnosis of hypothyroidism was made.

Treatment

Hypothyroidism is easily treated with Thyroxine (Levothyroxine)1 . For the management of hypothyroidism in adults, the usual initial oral dosage of levothyroxine sodium is 50 to 100 micrograms daily given as a single dose; dosage is increased by increments of 25-50 micrograms daily at intervals of four to six weeks until the desired response is obtained1 7 8. The adult maintenance dose is usually between 100 and 200 micrograms daily. In the geriatric patient, those with cardiovascular disease, or in those with long-standing hypothyroidism, treatment should be introduced more gradually: an initial dose of 12.5 to 50 micrograms daily increased by increments of 12.5 to 25 micrograms at intervals of 4to 6 weeks may be appropriate. The older patient should be closely monitored for signs of thyroid toxicity, especially angina pectoris and cardiac arrhythmias.

The TSH level is measured usually six weeks after initiation of therapy and with each dosage adjustment. The patient's symptoms generally improve within two weeks and resolve within three to six months.

Patient Education

Education needs to be based on the patient's overall mental and psychological state at the time of diagnosis. Repeated simple instructions may be necessary for the patient with memory loss and depression. Instruction to take the daily dose of medication each morning before breakfast is easy to remember. In instances where patient compliance may be problematic, weekly dosages can be given, as the half-life of T4 is approximately one week. Rest periods with gradual increases in exercise and a high fiber diet for constipation should be discussed.

On follow-up visits, patient education is important regarding the need for lifelong thyroid replacement therapy (with the exception of cases of transient hypothyroidism, usually associated with thyroiditis). A review of symptoms of hypothyroidism and hyperthyroidism, and discussing the importance of lab and physician evaluations every six to twelve months after stabilization is also necessary. Patient should not regulate his dosage of levothyroxine based on feelings of fatigue or lethargy. The normal aging process, diseases and certain medications can alter the thyroid replacement requirement.

Aluminum hydroxide, calcium carbonate, sulcrafate, the cholesterol-lowering drug cholestyramine (Questran) and iron containing drugs such as ferrous sulfate should not be taken at the same time as levothyroxine because gastrointestinal absorption is decreased . Patients taking antidiabetic medications need to be aware that as the hypothyroidism is corrected, increased metabolic functioning may increase their insulin or oral hypoglycemic requirements. Thyroid hormone enhances the effects of oral anticoagulants8. These patients should be carefully monitoring when thyroid medication is initiated or adjusted.

Thyroid hormone levels are influenced by a number of factors such as stress, exposure to cold, increased food intake and certain medications such as carbamazepine, oral anticoagulants, phenytoin, amiodarone, steroids, dopamine, ritonavir, and lithium carbonate8.

Subclinical hypothyroidism

The availability of the sensitive TSH test has lead to concerns regarding treatment of subclinical hypothyroidism. This entity may present with no symptoms or minimal symptoms suggestive of hypothyroidism with normal serum free T4 and T3 and elevated serum TSH concentrations . Some clinicians will check thyroid perioxidase antibodies in patients with subclinical hypothyroidism and treatment initiated in those with positive antibodies. A recent panel of thyroid experts recommends screening and early treatment of those with subclinical hypothyroidism, as the risks of treatment are less than the potential benefits9. Many clinicians simply monitor patients with sub clinical hypothyroidism.

Clinical Findings Suggestive of Hypothyroidism

Psychological	***Neuromuscular***	***Cutaneous***	***Respiratory***	***Hematologic***	***Gastrointestinal***
Inability to calculate	Slowed motor functions	Dry, rough, pale skin	Slow, shallow respirations	Red blood cell anemia	Constipation
Psychosis	Muscle cramps, stiffness	Coarse, dry hair	Upper airway obstruction (goiter, enlarged tongue)	Microcytic (iron deficiency)	Abdominal distention
Reduced concentration	Pain, weakness	Hair loss	Sleep apnea	Macrocytic (physiologic anemia, vit. B12 or folic acid deficiency)	Weight gain
Irritability	Paresthesia	Cold intolerance	Altered pulmonary function tests	Platelets (occasional mild bleed)	Slowed intestinal peristalsis
Slowness of thought processes	Arthralgias	Thin, brittle nails	Pleural effusion	***Gynecological***	***Cardiovascular***
Depression	Joint effusion Carpal tunnel syndromes	Decreased or loss of sweat secretion	Easy fatigability	Anovulatory cycles	Pericardial effusions
Apathy	Delayed relaxation phase of reflexes	Malar flush	Decreased exercise tolerance	Amenorrhea	Enlarged heart
Reduced memory		Edema of hands, face, eyelids	Dyspnea on exertion	Menorrhagia	Bradycardia
Drowsiness		Loss of outer eyebrow		Infertility	Low voltage EKG
Inattentiveness				Decreased libido	Elevated cholesterol
Paucity of speech with preservation					

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Course Exam

1. Hypothyroidism is an uncommon endocrine condition occurring most frequently in elderly men.

   ○ True ○ False

2. Signs and symptoms of hypothyroidism develop slowly over time as the disease progresses

   ○ True ○ False

3. Symptoms of hypothyroidism include cold intolerance, constipation, fatigue and depression.

   ○ True ○ False

4. In most patients, primary hypothyroidism is treatable with an appropriate dose of levothyroxine.

   ○ True ○ False

5. The diagnosis of hypothyroidism can be confirmed if the TSH level is low and the T4 level is high.

   ○ True ○ False

6. Primary hypothyroidism is believed to be an autoimmune disease, often resulting from Hashimoto’s thyroiditis.

   ○ True ○ False

7. Subclinical hypothyroidism presents with a normal TSH and a suppressed free T4 level.

   ○ True ○ False

8. Levothyroxine should not be taken at the same time as iron replacement for anemia.

   ○ True ○ False

9. Complications associated with hypothyroidism include lipid abnormalities and anemia.

   ○ True ○ False

10. Patient education includes the need for follow-up visits and life long treatment.

○ True ○ False