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Testing for Subclinical Hyperthyroidism on Diagnosis of Osteoporosis or Fracture

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Title: Testing for Subclinical Hyperthyroidism on Diagnosis of Osteoporosis or Fracture

Department  Nursing

Degree  Master of Science

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Abstract

Subclinical hyperthyroidism has been linked to osteoporosis and fractures in patients. Currently there are no standard guidelines for routine screening for thyroid disorders, or screening in patients who have high-risk comorbid conditions. Preventing complications of an asymptomatic condition is important, especially with older patients. Treatment of all conditions should be discussed and initiated when diagnosed. This can prevent further complications of subclinical hyperthyroidism. A case report was completed on a patient suffering from hyperthyroidism.

Utilizing the University of North Dakota’s Harley French Library, a literature review was conducted using databases Cumulative Index of Nursing and Allied Health Literature (CINAHL) and PubMed. Using keywords of subclinical hyperthyroidism, osteoporosis, fracture, and treatment or management of, ten articles were chosen for a literature review. The literature review was completed using the articles, and recommendations were made for further testing of thyroid disorders focusing on subclinical hyperthyroidism.
Background

A 65-year-old Caucasian female presented to the clinic with complaints of anxiety, sleep disturbance, palpitations, and weight loss. She was initially worked-up for the diagnosis of hyperthyroidism, anxiety, insomnia, infection, and atrial fibrillation. The patient’s medical history, surgical history, family history, and social history were reviewed. A review of symptoms and physical examination was completed. Upon receiving her laboratory blood work, urinalysis, and electrocardiogram (EKG), it was determined she likely was suffering from hyperthyroidism. Although, hyperthyroidism usually has symptoms the patient experiences, a more complex and underlying condition of subclinical hyperthyroidism may exist in patients leading to further complications. Patients who are at risk for subclinical hyperthyroidism are those who are elderly or are taking medications for hypothyroidism (Donangelo & Suh, 2017).

Thyroid disorders affect women and men across the world. Women are affected by thyroid disorders more than men (Wirth et al., 2014). There are different types of thyroid disorders including hyperthyroidism, subclinical hyperthyroidism, hypothyroidism, and subclinical hypothyroidism. Many people who suffer from thyroid disorders have co-morbidities leading to cardiovascular events and bone and mineral metabolism (Donangelo & Suh, 2017). A literature review of subclinical hyperthyroidism and its link to osteoporosis and fractures will be studied to determine the need for testing for subclinical hyperthyroidism upon diagnosis of osteoporosis or fracture. Treatments of both these conditions will be reviewed.

Subclinical hyperthyroidism is often unknown, and it will present with very few if any symptoms. Subclinical hyperthyroidism affects approximately 10% of women and 3% of men over the age of 60 (Wirth et al., 2014) The normal range for thyroid stimulating hormone (TSH) is between 0.45 and 4.5 µU/mL (Palacios, Pascual-Corrales, & Galofre, 2012). This range may
vary depending on the testing facility. In order to diagnose subclinical hyperthyroidism and determine treatment, the provider should take the following steps: (a) confirmation, (b) evaluation of the severity of the disease, (c) determine the cause, (d) assess for possible complications, (e) evaluate the need for treatment, and (f) prescribe the necessary treatment (Palacios et al., 2012). Treating subclinical hyperthyroidism can aim to prevent fractures or complications from osteoporosis. Since subclinical hyperthyroidism is often asymptomatic, it can go undiagnosed when a new diagnosis of osteoporosis or fracture occurs. Therefore, further investigation may be needed when there is a new diagnosis of osteoporosis or fracture.

**Case Report**

A 65-year-old Caucasian female presented to the clinic with complaints of insomnia and fatigue. This problem started approximately six weeks ago. She states she, has no problem getting to sleep, but wakes up about one and a half hours later and is unable to fall back asleep. She feels anxious and tired the next day. She complains of decreased concentration, hot flashes, and fluttering in her chest. There is no particular pattern to her hot flashes, and the fluttering in her chest lasts about thirty seconds. She reports a ten-pound weight loss in the last six weeks. She went through menopause in her mid-fifties. She is married and lives with her husband and dogs. She is active and swims three days per week, and walks her dogs. She does have a history of smoking while she was in college, and has an occasional glass of wine when she has friends over. She denies any substance abuse. She has no history of anxiety or depression. She is up to date on her immunizations, and denies any recent travel or trauma. She is pleasant and cooperative.

She has no known allergies. She is taking Antivert as needed, a multivitamin daily, calcium daily, and Tylenol as needed. She has a medical history of benign positional vertigo and
has given birth twice. She does have a surgical history of a thumb amputation. Her family history is significant for Alzheimer’s disease, heart disease, diabetes mellitus, chronic obstructive pulmonary disease (COPD), and stroke. Her review of symptoms is positive for heart palpitations, occasional arthralgias, weight loss, fatigue, anxiety, irritability, and decreased concentration. Physical examination reveals a healthy 65-year-old Caucasian female, whose vital signs are normal except for a temperature of 99.4 degrees. She is alert and oriented to person, place, time, and situation. No acute distress noted. Her skin is warm, dry, and intact with no lesions or rashes. The head, ears, eyes, nose, and throat examination are within normal limits. No thyromegaly noted. Cardiovascular examination reveals normal rate and regular rhythm with no murmurs, clicks, or rubs. Respiratory examination with normal respiratory rate and rhythm, lungs are clear to auscultation bilaterally. Abdomen inspected, bowel sounds are present in all four quadrants, no tenderness present on palpation. Abdomen is soft. Neurological examination intact without deficits. Musculoskeletal examination has normal range of motion, strengths are equal bilaterally on upper and lower extremities, hand grasps equal bilaterally. Patient does have a normal mood and affect. She does complain of decreased concentration and irritability. She does have anxiety with heart palpitations.

Patient was sent for an EKG, lab work, and urinalysis. The EKG shows normal sinus rhythm with no significant abnormalities. Her urinalysis was negative. Her lab work did reveal a TSH of 0.13 µU/mL, Free T4 2.93, Total T4 15.5 µU/mL, T3 1.13, and her complete blood count is normal.

After completion of lab work and diagnostic tests, it was found the patient was likely suffering from hyperthyroidism. Plan was to recheck her thyroid levels in four to six weeks, start propranolol if the patient remained symptomatic, and referral to endocrinology if her
hyperthyroidism persists and there is not clear etiology. The patient was in agreement with this plan. She was educated on hyperthyroidism, as well as, propranolol.

**Literature Review**

A search of the databases CINAHL and PubMed was completed using the search terms of subclinical hyperthyroidism, osteoporosis, and fractures. Other terms added to the search were management of and treatment of. The searches were limited to articles from 2013 to the present. Ten articles were chosen for analysis and review. Using the information available recommendations will be made regarding testing for subclinical hyperthyroidism on diagnosis of osteoporosis or fracture.

**Subclinical Hyperthyroidism**

Subclinical hyperthyroidism can result from the following conditions: Grave’s disease, thyroid nodules, toxic goiter, postpartum thyroiditis, iron deficiency, or others (Donangelo & Suh, 2017). Often asymptomatic, routine testing or screening for thyroid disorders is not commonly recommended by the U.S. Preventative Services Task Force (USPSTF) or American Academy of Family Physicians (AAFP); although, subclinical hyperthyroidism has been linked to cardiovascular problems and increased rates of bone turnover (Donangelo & Suh, 2017; LeFevre, 2015; Wartofsky, 2014). Between 18% to 25% of patients are screened yearly for thyroid disorders (LeFevre, 2015). Some symptoms a patient may experience might include: (a) frequent bowel movements, (b) fatigue, (c) nervousness, (d) heat intolerance, (e) racing heart, (f) unexplained weight loss, (g) sleep problems, and (h) more (AAFP, 2017). Subclinical hyperthyroidism has been defined as decreased TSH and normal free T4 levels and T3 levels (LeFevre, 2015; Wirth et al., 2014; Yan, Huang, Li, & Wang, 2016). There has been an increasing trend with patients whose TSH level is less than 0.1 (Blum et al., 2015).
Treatments for Subclinical Hyperthyroidism

Treatment of subclinical hyperthyroidism is controversial, and often the provider needs to determine the effect the disease is having on the patient (Palacios et al., 2012). Initially, if the TSH levels are low the provider will need to monitor the patient over the next three months (Palacios et al., 2012). If symptomatic, or the patient is at high risk for other problems associated with subclinical hyperthyroidism the provider may decide to start treatment. Treatment is typically initiated for patients over the age 65 due to cardiovascular, bone and mineral metabolism, and depression or dementia problems associated with subclinical hyperthyroidism (Palacios et al., 2012).

Treatment can consist of medical or surgical treatment with both pharmacologic and nonpharmacologic modalities (Palacios et al., 2012). Antithyroid medications available are methimazole or carbimazole, and propylthiouracil (Palacios et al., 2012). These medications are used as an alternative to radioiodine therapy, and therapy is anywhere from six to eighteen months to achieve euthyroid (Palacios et al., 2012). Propylthiouracil is only indicated in early pregnancy for treatment of hyperthyroidism (Palacios et al., 2012). Radioiodine is a treatment that is commonly used especially over the age of 60 with co-morbidities (Palacios et al., 2012). Radioiodine ablation destroys the thyroid tissue leading to euthyroid or sometimes even hypothyroidism (Palacios et al., 2012). Lastly, a thyroidectomy may be performed to remove part or all of the thyroid gland. This is commonly done with thyroid nodules or if other therapies fail. If a complete thyroidectomy is performed, the patient will need to be supplemented with levothyroxine.

The use of complementary and alternative medicine (CAM) has been increasing, and there have been benefits found in patients who use these therapies to help with fatigue and mood
(Mullur, Hart, De Marchi, & Liebell, 2017). Therapies that may be helpful include: acupuncture, acupressure, yoga, massage, and auriculotherapy (Mullur et al., 2017). CAM has risks and benefits as any other treatments (Mullur et al., 2017). The provider managing should be aware if any of these treatments are being utilized.

**Osteoporosis**

Osteoporosis is the most frequent disease of the skeletal system (Maccagnano et al., 2016). There are more than ten million people who suffer from osteoporosis in America (Jeremiah, Unwin, Greenawald, & Casiano, 2015). This number shows the importance of evaluating contributing medical problems, and how important it is to treat underlying conditions related to osteoporosis and fractures. The rates of osteoporosis increase as a person ages; for example, the older the person the more likely they will develop osteoporosis or a bone related condition such as a fracture or osteopenia. Osteoporosis has been linked to chronic diseases such as thyroid disease, hypertension, diabetes, and heart disease (Maccagnano et al., 2016). When osteoporosis results from other conditions, it is considered secondary osteoporosis. Upon diagnosis of secondary osteoporosis, recommended laboratory tests may include serum 25-hydroxyvitamin D levels, calcium, creatinine, and TSH levels (Jeremiah et al., 2015).

USPSTP recommends screening for osteoporosis in all women over the age of sixty-five years, the screening used is a dual energy x-ray absorptiometry (DEXA) scan (Jeremiah et al. 2015). This scan will give a T-score, if this score is -2.5 or greater a person is considered to have osteoporosis. Another tool that can be helpful is the fracture risk assessment tool (FRAX), this tool will give a ten-year risk of having a fracture (Jeremiah et al., 2015). Treatment for osteoporosis includes pharmacological and nonpharmacological therapies.
Treatments for Osteoporosis

If a patient completes their screening for osteoporosis, and it is determined they have osteoporosis a treatment regimen should be discussed with the patient. Some treatments may be initiated with the diagnosis of osteopenia. Initiating early treatment may prevent osteoporosis. Treatments can slow the progress of the disease of even reverse osteoporosis if started early enough. Osteoporosis is treated with both pharmacological and nonpharmacological treatments.

Nonpharmacological treatment of osteoporosis focuses on increasing strength, preventing falls, using supplements, and lifestyle modifications such as dietary modifications, quitting smoking or decreasing alcoholic intake (Jeremiah et al., 2015). Exercise programs that focus on weight-bearing exercises and balance help to improve strength and coordination leading to less falls (Jeremiah et al., 2015). A fall can result in a fracture, which can be devastating to the patient. Vitamin D and calcium supplementation may be needed. Dietary intake of calcium and Vitamin D should be recorded. If calcium intake is low supplementation should be started. Adults at risk for low Vitamin D levels may be tested or supplementation may be initiated. Lifestyle modifications are important to consider with osteoporosis treatment. Diets should include adequate protein, vegetables and fruits (Jeremiah et al., 2015). Limitations should include caffeine and alcohol restrictions (Jeremiah et al., 2015). Patients who smoke should be strongly encouraged to quit, and the provider should assist with smoking cessation as needed (Jeremiah et al., 2015).

There are several pharmacological treatment options for osteoporosis. Common therapies include: bisphosphonates, selective estrogen receptor modulators (SERMs), and human monoclonal antibody (HMA) (Jeremiah et al., 2015). Bisphosphonates are often the first line of drugs used for treatment (Jeremiah et al., 2015). Medications in this class of drugs includes both
oral and intravenous medications (Jeremiah et al., 2015). Oral medications must be taken on an empty stomach with a full glass of water, and the patient must be able to sit up for at least 30 minutes when taking the medication. SERMs are used for prevention and treatment of osteoporosis and can be used when bisphosphonates are not tolerated (Jeremiah et al., 2015). Prolia is an HMA and is known for significantly increasing bone mineral density (BMD) (Jeremiah et al., 2015). It has proven to reduce hip, spine, and non-spine fractures (Jeremiah et al., 2015). There are other pharmacological interventions available to prevent or treat osteoporosis available the market.

**Fracture Risk with Subclinical Hyperthyroidism**

There have been few studies directly related to subclinical hyperthyroidism and osteoporosis, but several articles with information concerning the effects of subclinical hyperthyroidism and osteoporosis. Osteoporosis often leads to fractures in patients, and this led to further investigation of fractures and subclinical hyperthyroidism. More information was found to correlate to an increase in fracture risk and subclinical hyperthyroidism.

A review of three meta-analyses involving fracture risk and subclinical hyperthyroidism revealed important information regarding the significance of testing for subclinical hyperthyroidism in patients who have either suffered from a fracture or have a high risk of fracture. There has been a correlation between decreased BMD and subclinical hyperthyroidism which could relate the fracture risk (Yan et al., 2016) The studies reviewed mostly non-spine fractures, such as the hip fracture (Blum et al., 2015; Wirth et al., 2014; Yan et al., 2016). All three meta-analyses found there is a correlation of increased hip fracture risk, as well as, other fractures with subclinical hyperthyroidism (Blum et al., 2015; Wirth et al., 2014; Yan et al., 2016). Patients were at an even high risk if their TSH was less then 0.1 or undetectable (Blum et
al., 2015; Wirth et al., 2014). According to Wirth et al. (2014), “no evidence of a risk of difference for fractures in women compared with men, despite the fact that women, especially postmenopausal women have an increase for osteoporosis” (p. 196). Some of the studies in the meta-analyses revealed that the information was not statistically significant for non-spine fractures, but all studies showed correlation with hip fractures (Blum et al., 2015; Wirth et al., 2014;). It has been found the longer the duration of subclinical hyperthyroidism the more likely the patient will suffer a fracture (Wirth, 2014).

Results from a several studies were reviewed in the meta-analyses, Blum et al. (2015) reviewed a study with, “70,298 patients revealed 91% of participants were euthyroid, 5.8% of participants had subclinical hypothyroidism, and 3.2% had subclinical hyperthyroidism, 2.4% of participants had low TSH and 0.8% of participants had suppressed TSH” (p. 2057). “Of these participated there was a 4.6% of participants who had a hip fracture, 9.0% of participants had a fracture in another location, and 1.3% of participants had a spine fracture” as cited in Blum et al. (2015, p. 2057). This shows the importance how thyroid function can affect fracture risk in patients. Providers need to be aware of this data in order to screen for thyroid disorders including subclinical hyperthyroidism in at risk patients. According to Blum et al., “thyroid hormones have been shown to have effects on osteoclasts and osteoblasts, with thyroid status in the upper normal range or excess thyroid hormones leading to accelerated bone turnover with bone lost and increased fracture risk” (p. 2061). Muscle strength and coordination can be affected by subclinical hyperthyroidism leading to an increase in falls (Blum et al., 2015). Falls increase fracture risk. Achieving euthyroid is the goal, and decreases the consequences of subclinical hyperthyroidism.
Recommendations were made to treat all patients over the age of sixty-five who have subclinical hyperthyroidism, even though there are currently no studies to evaluate if treatment is sufficient in decreasing the fracture rate (Blum et al., 2015; Wirth et al., 2014). Each meta-analysis recommended further randomized control studies to monitor the correlation between subclinical hyperthyroidism and fractures (Blum et al., 2015; Wirth et al., 2014; Yan et al., 2016).

**Learning Points**

- Upon diagnosis of osteoporosis, a TSH should be drawn to determine if the patient is having a thyroid abnormality. If the TSH is abnormal, further laboratory testing is required.
- Elderly patients greater than 65 years of age should be screened for subclinical hyperthyroidism or other thyroid disorders.
- If subclinical hyperthyroidism is present, repeat testing should be completed in approximately 8 weeks to confirm the diagnosis. The patient will need close monitoring and referral to an endocrinologist for treatment recommendations.
- Screening for thyroid disorders should occur with DEXA abnormalities or any new changes to DEXA scan results.
- Patients presenting with fracture or increased fracture risk should be screened for thyroid disorders.

**Conclusion**

Patients with thyroid disorders may or may not present with symptoms related to their disease, but there is significance for screening for these disorders especially, over the age of sixty-five. Some patients are already being screened even though this is not the current
recommendation by the USPSTF. There are increased risk factors associated with subclinical hyperthyroidism and osteoporosis and/or fractures. Patient presenting with new diagnosis of osteoporosis and fracture should be screened for thyroid disorders. Screening and treatment of subclinical hyperthyroidism can prevent further complications in patients.
References


